Webinar:

AS/CA S009 has been updated. Are you up to date with it?

national electrical and communications association

Webinar Agenda

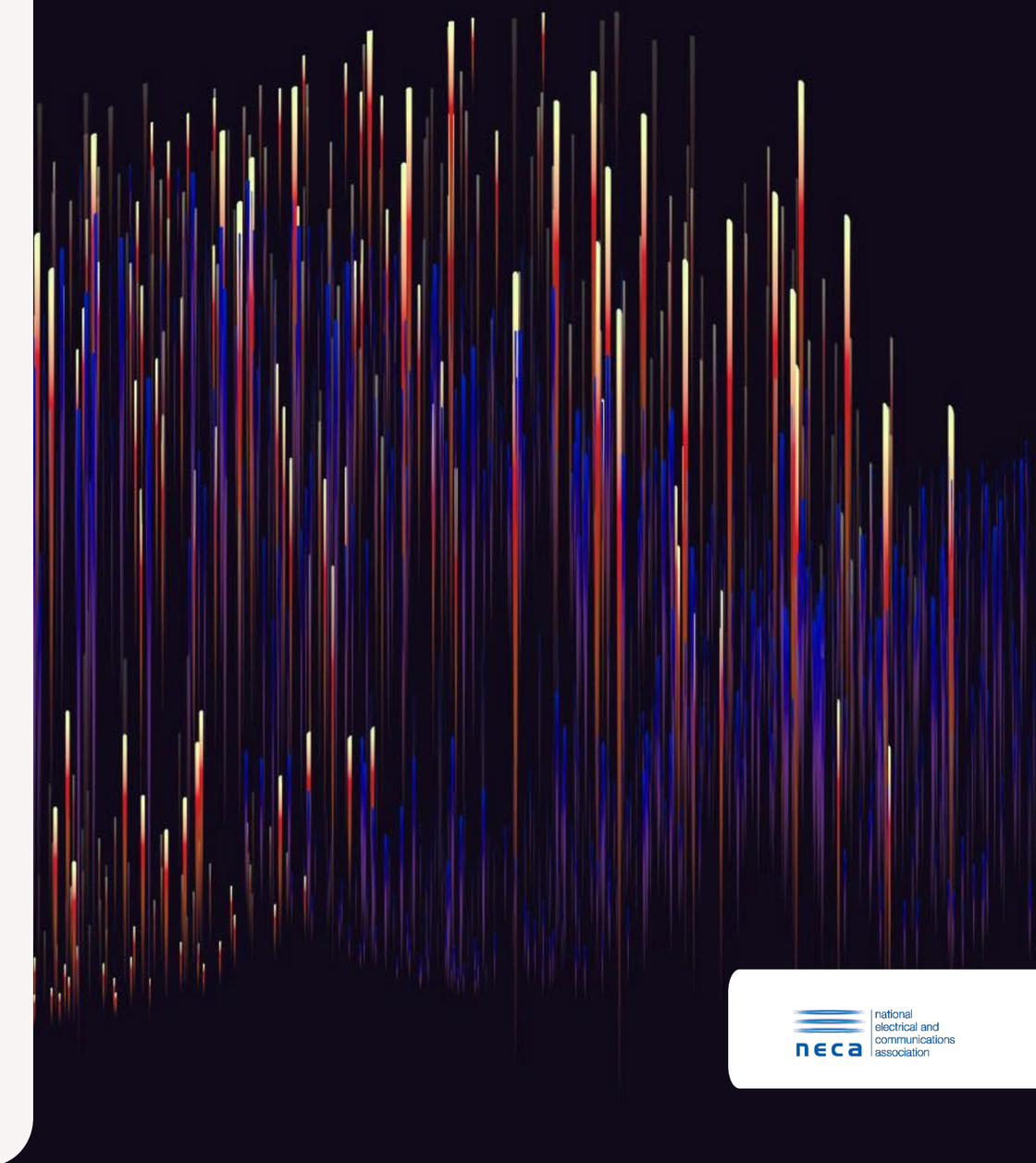
1. Changes at a glance
2. The big one: Energy Sources
3. New definitions
4. Conductor size and temperature
5. Plug terminal cabling
6. More on ES3
7. Other changes
8. The challenge is convergence
9. The message
10. Q&As

Presenter:

Ian Millner

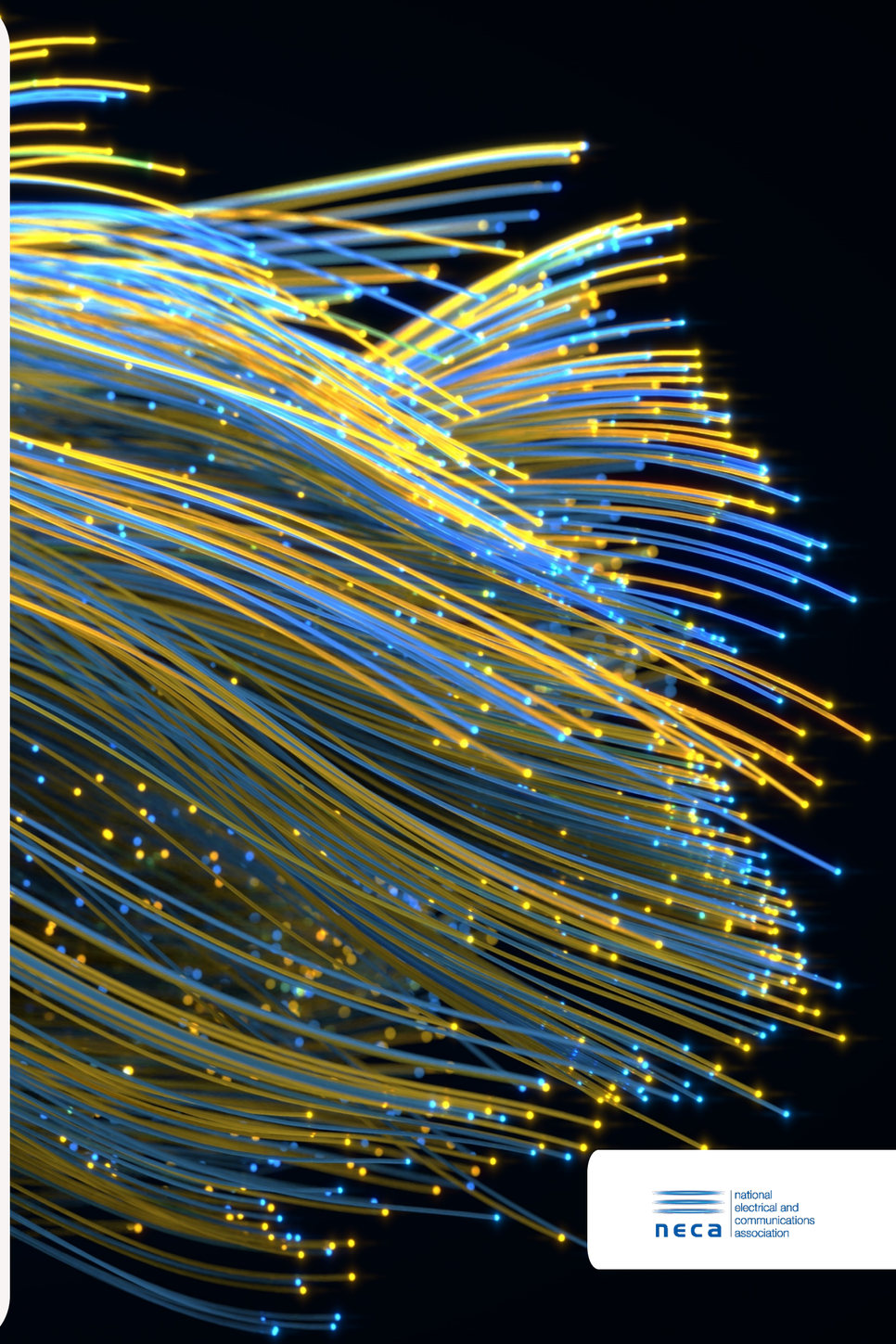
“Change is the norm”

Technology is driving the change



1. Changes at a glance

- Many changes driven by ES3 and other hazardous energy sources.
- New voltage, electrical energy sources related to AS/NZS 62368.1.
- New definitions, generic cabling, types of persons, registered engineers, RFT Circuits.
- New conductor size and temperature recommendations for generic cabling .
- New requirements for plug terminated cabling.
- Separation and subducting have been updated to cater for ES1, ES2 and ES3.
- New appendices



2. The big one: Energy Sources

New Energy classifications based on AS/NZS 62368.1:2018 Audio/Video, information and communications technology equipment

- **Electrical Energy Source Class 1 (ES1)**
- **Electrical Energy Source Class 2 (ES2)**
- **Electrical Energy Source Class 3 (ES3)**

Who can work on them

- Electrical Energy Source Class 1 (ES1)
- Electrical Energy Source Class 2 (ES2)
- Electrical Energy Source Class 3 (ES3)
- Ordinary person
- Instructed person
- Skilled person

Voltage & current limits

Extract from AS/NZS 62368.1:2018, 5.2.2.2 General:

For any voltage up to the voltage limit, there is no limit for the current. Likewise for any current up to the current limit, there is no limit for the voltage, see figure 21.

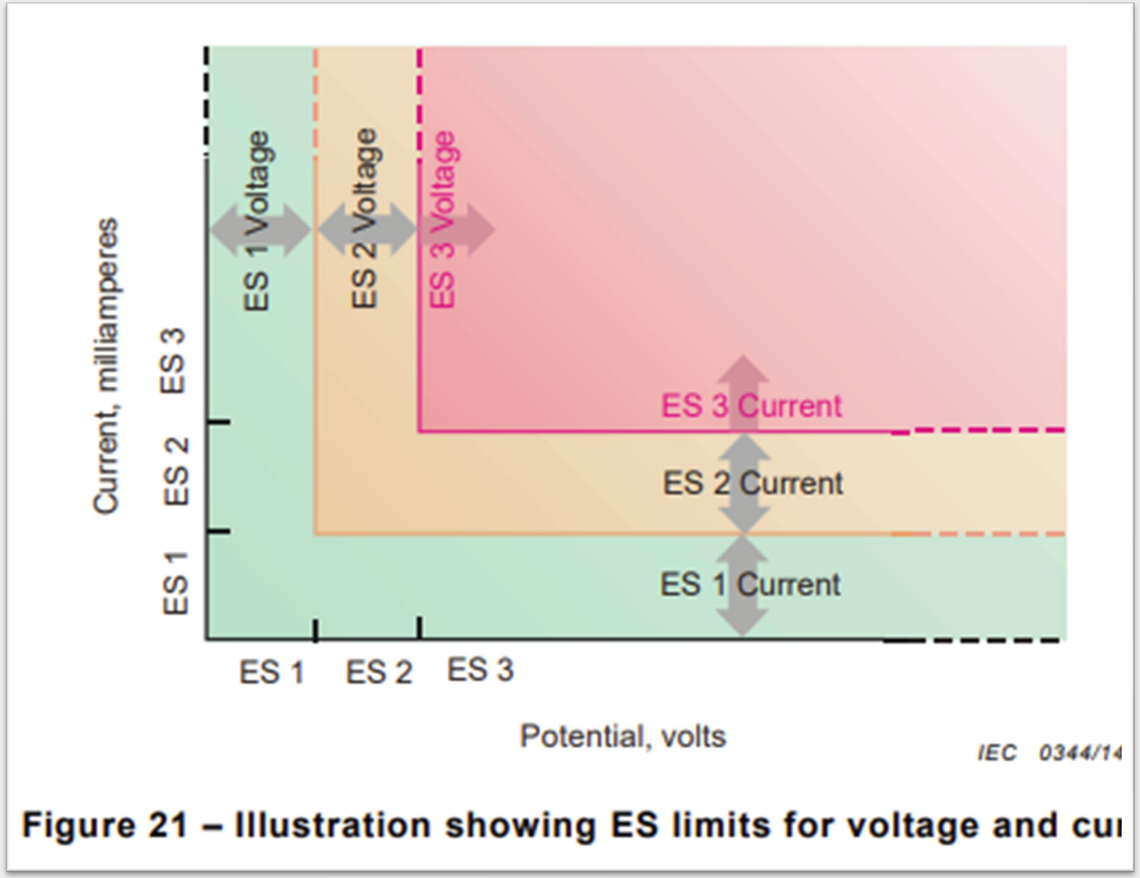


Figure 21 – Illustration showing ES limits for voltage and cu

Limits

Electrical energy source limits for steady-state ES1 and ES2.

Table 4 from AS/NZS 62368.1:2018

Table 4 – Electrical energy source limits for steady-state ES1 and ES2

Energy source	ES1 limits		ES2 limits		ES3
	Voltage	Current [a, c]	Voltage	Current [b, c]	
d.c.	60 V	2 mA	120 V	25 mA	> ES2
a.c up to 1 kHz	30 V r.m.s. 42,4 V peak	0,5 mA r.m.s 0,707 mA peak	50 V r.m.s. 70,7 V peak	5 mA r.m.s. 7,07 mA peak	
a.c. > 1 kHz up to 100 kHz	30 V r.m.s. + 0,4 f		50 V r.m.s. + 0,9 f		
a.c above 100 kHz	70 V r.m.s.		140 V r.m.s.		
Combined a.c. and d.c.	$\frac{U_{dc}\ \text{V}}{60} + \frac{U_{ac}\ \text{V r.m.s.}}{30} \le 1$ $\frac{U_{dc}\ \text{V}}{60} + \frac{U_{ac}\ \text{V peak}}{42,4} \le 1$	$\frac{I_{dc}\ \text{mA}}{2} + \frac{I_{ac}\ \text{mA r.m.s.}}{0,5} \le 1$ $\frac{I_{dc}\ \text{mA}}{2} + \frac{I_{ac}\ \text{mA peak}}{0,707} \le 1$	See Figure 23	See Figure 22	

The formulation below as a function of frequency may be of interest to designers for sinusoidal waveforms

Energy source	ES1 limits	ES2 limits	ES3
	Current [c] r.m.s.	Current [c] r.m.s.	
a.c up to 1 kHz	0,5 mA	5 mA	> ES2
a.c. > 1 kHz up to 100 kHz	0,5 mA × f [d]	5 mA + 0,95 f [e]	
a.c above 100 kHz	50 mA [d]	100 mA [e]	

f is in kHz.

Peak values shall be used for non-sinusoidal voltage and current. RMS values may be used only for sinusoidal voltage and current.

See 5.7 for measurement of **prospective touch voltage** and **touch current**.

Comparing Old & New

Table P1

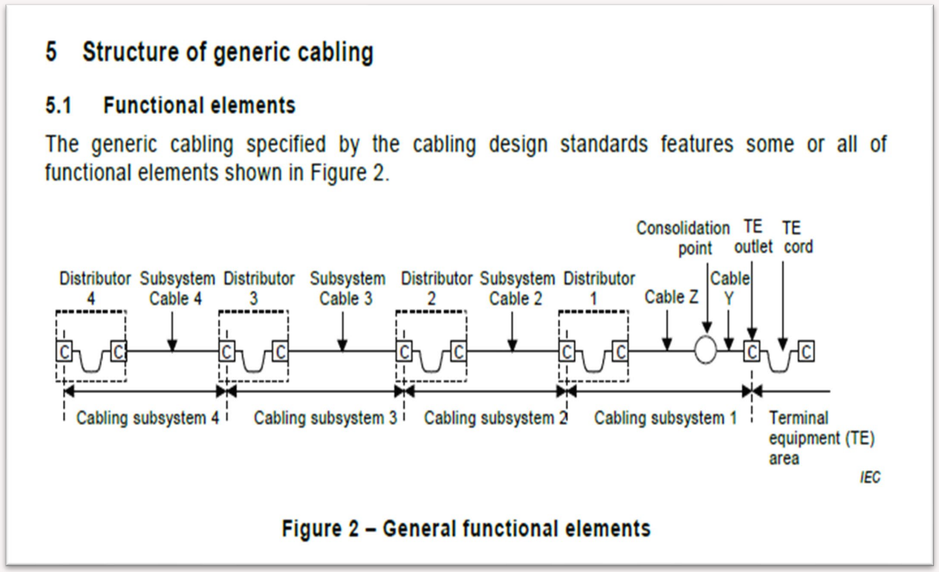
AS/NZS 60950.1 comparison of terms with AS/NZS 62368.1

AS/NZS 60950.1	AS/NZS 62368.1	Notes
ELV	ES2	ELV (up to 42.4 V peak or 60 V d.c. in AS/NZS 60950.1) is separated from hazardous energy source by basic insulation only. ELV may receive transient voltages or currents from circuits external to the Building, as such it is classified as ES2 for the purposes of this Standard.
SELV	ES1	SELV (60 V d.c. or 42.4 V peak) and ES1 both have protection against hazardous energy source by double or reinforced insulation (safeguards) and both may be touched by the user (Ordinary Person).
Limited current circuit	ES1	In AS/NZS 60950.1 a limited current circuit is limited to 2 mA d.c. or 0.7 mA peak. AS/NZS 62368.1 does not use the term 'limited current circuit' but does, have comparable requirements by way of current limits for ES1.
TNV	ES2	Telecommunications Network Voltage can be one of three levels. Generally, TNV-1 is up to 60 V d.c. but may have higher transients from circuits external to the Building; TNV-2 is up to 120 V d.c. but no transients; TNV-3 is up to 120 V d.c. but may have transients. The Ordinary Person must be separated from contact with possible transient circuits. All TNV circuits are classified as ES2 unless a professional engineer advises otherwise for each situation.
Hazardous voltage	ES3	AS/NZS 62368.1 does not use the term 'hazardous'. Instead it states that any energy source exceeding ES2 limits is classified as ES3 and as such is classified as hazardous. ES3 circuits must not be accessible to the Ordinary Person or the Instructed Person by the use of double or reinforced safeguards. The Skilled Person may have access to ES3 for safe work but protection must be provided to guard against accidental contact with another class 3 energy source.
Restricted access location	Restricted access area	Restricted Access Area is the term used in AS/NZS 62368.1. This is a change in terminology in the new safety standard.

3. New Definitions

- Generic cabling
- Movable cabling
- Types of persons
- Registered engineers
- Arm’s reach
- RFT Circuit

Generic Cable



5 Structure of generic cabling

5.1 Functional elements

The generic cabling specified by the cabling design standards features some or all of functional elements shown in Figure 2.

Figure 2 – General functional elements

4.2.51 generic cabling:

is Cabling which meets the Cabling installation conformance requirements of a Cabling design document in the AS/NZS 11801 series or ISO/IEC 11801 series of Standards.

Why the need to define generic cabling

4.2.91 special application cable

a Cable that—

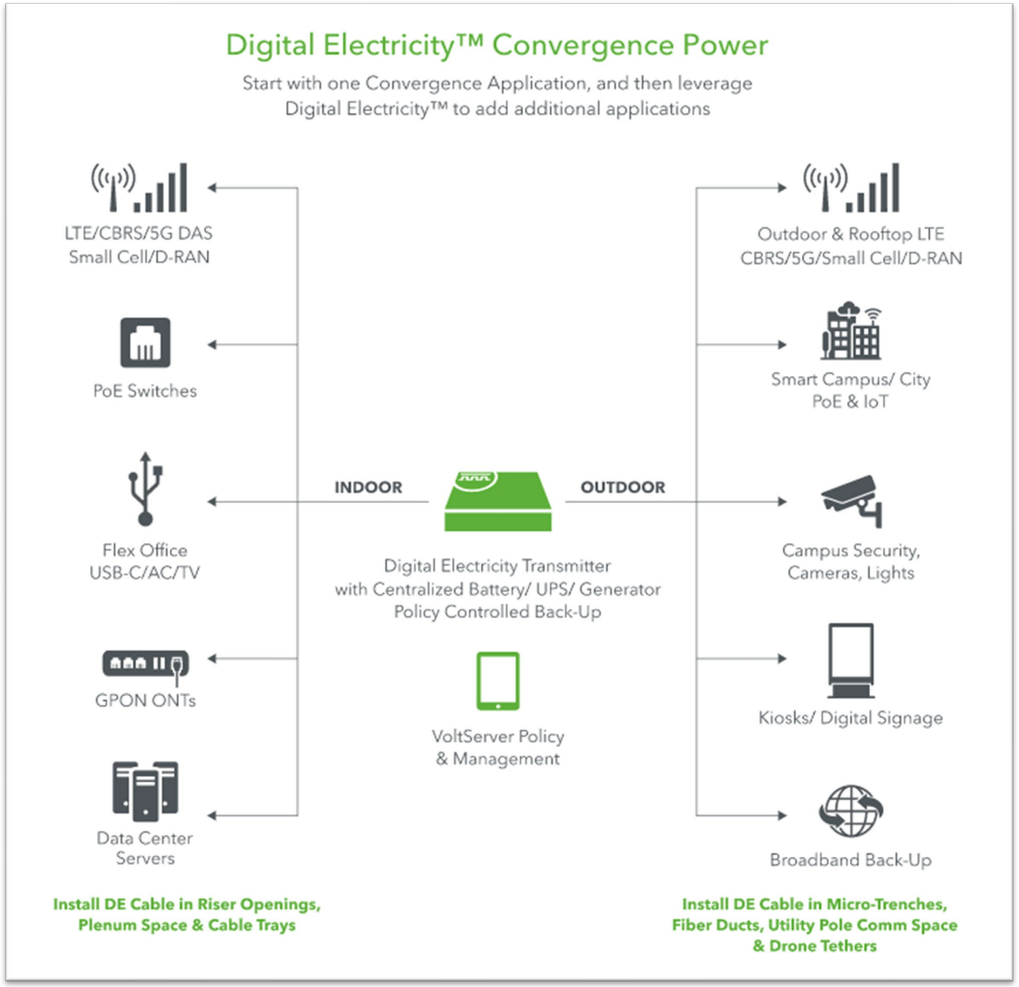
(a) is intended to carry steady-state or change-of-state DC signals or AC signals less than 300 Hz between devices;
(b) is a Cable intended to carry an industrial data signalling protocol, e.g. RS232 or RS485;
(c) is intended for multidiscipline use; or
(d) is a hybrid Cable.

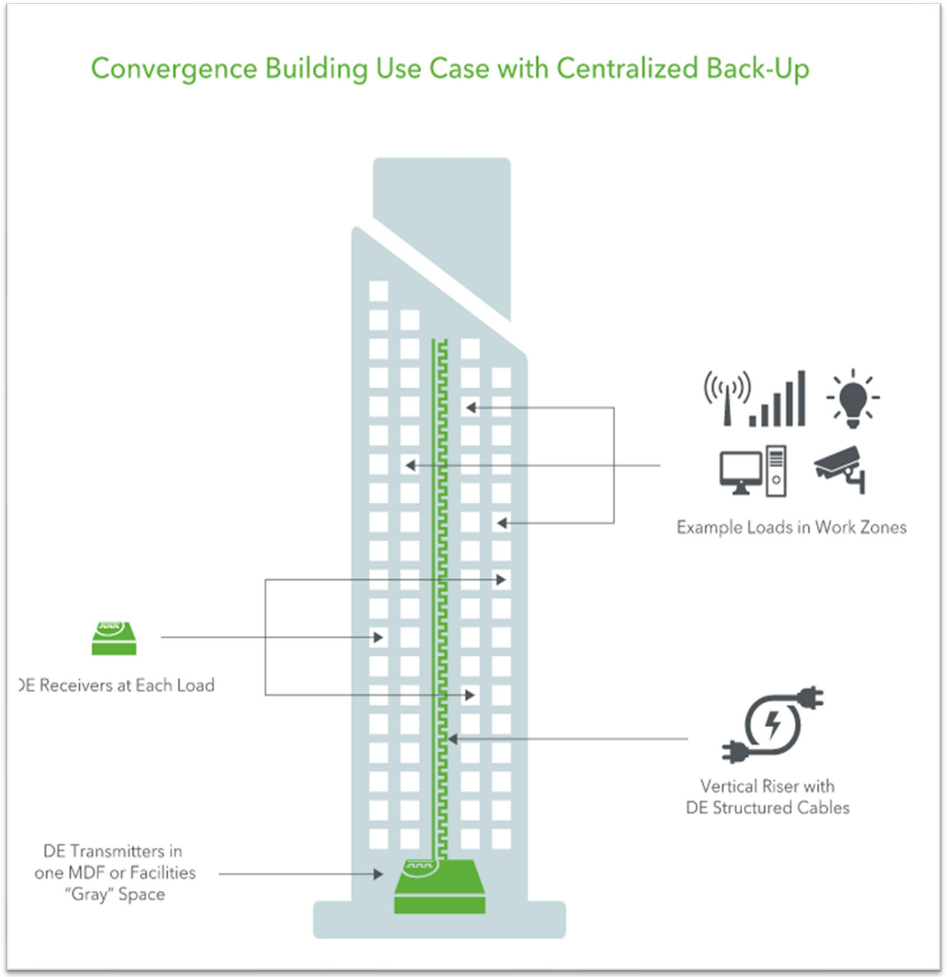
Note 1: A Special Application Cable may include, but is not limited to—

(a) a communications Cable used for DC power transfer and associated status and alarm circuits;
(b) a MIMS, EWIS or other fire detection or fire warning system Cable;
(c) a security or control system Cable; or
(d) a travelling lift or hoist Cable.

Note 2: IEC 62368-3 specifies requirements for circuits that are designed to transfer DC operating power from power sourcing equipment to a powered device through communication Cables or Ports.

Special Application


Digital Electricity™ Convergence Power
Start with one Convergence Application, and then leverage
Digital Electricity™ to add additional applications
LTE/CBRS/5G DAS
Small Cell/D-RAN
PoE Switches
Flex Office
USB-C/AC/TV
GPON ONTs
Data Center
Servers
INDOOR
OUTDOOR
Digital Electricity Transmitter
with Centralized Battery/ UPS/ Generator
Policy Controlled Back-Up
VoltServer Policy
& Management
Outdoor & Rooftop LTE
CBRS/5G/Small Cell/D-RAN
Smart Campus/ City
PoE & IoT
Campus Security,
Cameras, Lights
Kiosks/ Digital Signage
Broadband Back-Up
Install DE Cable in Riser Openings,
Plenum Space & Cable Trays
Install DE Cable in Micro-Trenches,
Fiber Ducts, Utility Pole Comm Space
& Drone Tethers


Convergence Building Use Case with Centralized Back-Up
Example Loads in Work Zones
DE Receivers at Each Load
Vertical Riser with
DE Structured Cables
DE Transmitters in
one MDF or Facilities
"Gray" Space

Moveable Cable

4.2.69 movable cabling

a section of fixed or concealed Cabling which is likely to be moved as part of—

(a) the use of the Cabling in a physically reasonable manner;

(b) the use in a physically reasonable manner, or the normal automatic operation, of anything that the Cabling is fixed to, supported by or enclosed by;

Moveable Cable

<< continued

(c)an activity (other than Cabling Work or demolition of Cabling) which is—

(i)commonly carried out at; and

(ii)reasonable for;

the type of location and type of Premises where the Cabling is installed; or

(d)a particular type of activity (other than Cabling Work or demolition of Cabling) which has been made known to the Cabling Provider, either expressly or by implication, as likely to occur at the location where the Cabling is installed.

Type of person

This is derived from

AS/NZS 62368.1:2018

- Ordinary
- Instructed
- Skilled

0.2 Persons

0.2.1 General

This standard describes **safeguards** for the protection of three kinds of persons: the **ordinary person**, the **instructed person**, and the **skilled person**. This standard assumes that a person will not intentionally create conditions or situations that could cause pain or injury.

NOTE In Australia, the work conducted by an **instructed person** or **skilled person** may require formal licensing from regulatory authorities.

0.2.2 Ordinary person

Ordinary person is the term applied to all persons other than **instructed persons** and **skilled persons**. **Ordinary persons** include not only users of the equipment, but also all persons who may have access to the equipment or who may be in the vicinity of the equipment. Under **normal operating conditions** or **abnormal operating conditions**, **ordinary persons** should not be exposed to parts comprising energy sources capable of causing pain or injury. Under a **single fault condition**, **ordinary persons** should not be exposed to parts comprising energy sources capable of causing injury.

0.2.3 Instructed person

Instructed person is a term applied to persons who have been instructed and trained by a **skilled person**, or who are supervised by a **skilled person**, to identify energy sources that may cause pain (see Table 1) and to take precautions to avoid unintentional contact with or exposure to those energy sources. Under **normal operating conditions**, **abnormal operating conditions** or **single fault conditions**, **instructed persons** should not be exposed to parts comprising energy sources capable of causing injury.

0.2.4 Skilled person

Skilled person is a term applied to persons who have training or experience in the equipment technology, particularly in knowing the various energies and energy magnitudes used in the equipment. **Skilled persons** are expected to use their training and experience to recognize energy sources capable of causing pain or injury and to take action for protection from injury from those energies. **Skilled persons** should also be protected against unintentional contact or exposure to energy sources capable of causing injury.

Ordinary person as defined in AS/CA S009:2020

4.2.72 ordinary person
a person who is neither a Skilled Person nor an Instructed Person.
[AS/NZS 62368.1]

Note: Examples of people assumed to be Ordinary Persons are End-Users and the general public.

Instructed person as defined in AS/CA S009:2020

4.2.59 instructed person
a person instructed or supervised by a Skilled Person as to energy sources and who can responsibly use equipment safeguards and precautionary safeguards with respect to those energy sources.

Note: Supervised, as used in the definition, means having the direction and oversight of the performance of others.

[AS/NZS 62368.1]

Skilled person as defined in AS/CA S009:2020

4.2.89 skilled person
a person with relevant education or experience to be able to identify hazards and to take appropriate actions to reduce the risks of injury to themselves and others.

[AS/NZS 62368.1]

Are you a skilled person that can work on ES1, ES2 and ES3?

Registered Engineers

- When and engineered solution is required
- EPR zones (Electrical Eng)
- Low Frequency Induction (Electrical Eng)
- Surge protection (Electrical Eng)
- Pits and access holes traversed by heavy vehicles (Electrical Civil)
- Use of generic cabling to support ES3 services

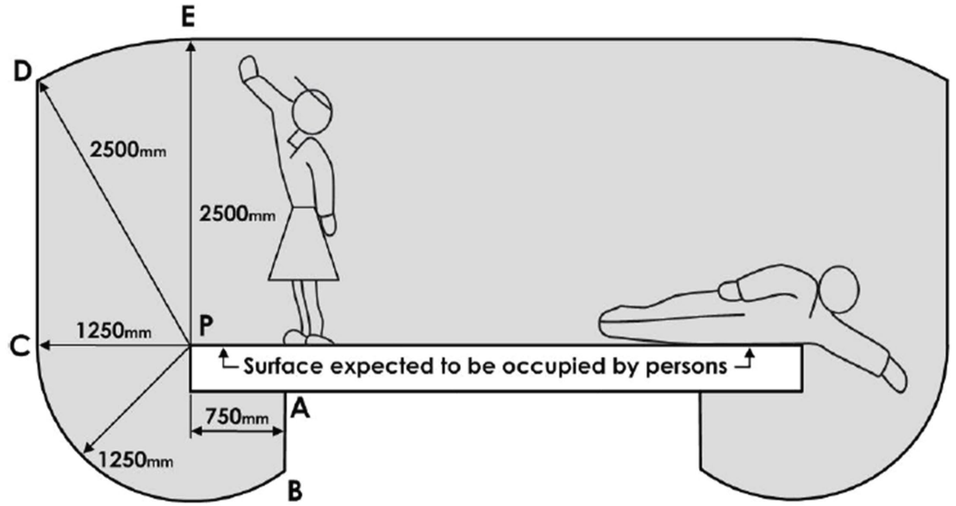
4.2.83 registered engineer

an engineer who has formal recognition of the qualification and competency of an engineer in a particular field and is current on an engineer register. The engineer register may be—

(a) a mandatory jurisdictional registration system for engineers (e.g. RPEQ), or

(b) a National Engineering Register (e.g. NER), or

(c) a Professional Engineering Registration Organisation (e.g. Engineers Australia).



Note 1: The grey area shows the zone into which a sample person can reach an arm from the surface shown if there are no permanent obstructions such as walls or balustrading. The zone reduces if a permanent obstruction prevents access. If an obstruction has an opening in it, the access through the opening is to be taken into account when assessing the zone.

Note 2: The zone of arm's reach extends in three dimensions.

Note 3: Points A to E and P are labelled for reference.

Note 4: DPE is a sector of a circle with centre P. Angle DPE is 30 degrees. BPC is a sector of a semicircle with centre P.

Figure 1
Arm's reach

Arm's Reach

4.2.2 arm's reach

a zone extending from any point on a surface where persons usually stand or move about, to the limits that a person can reach with the hand in any direction without assistance (e.g., tools or ladder), as consistent with Figure 1.

What is RFT?

Remote Feeding Telecommunications

4.2.85 RFT circuit

an equipment circuit within the ICT Network not connected to Mains power, intended to supply or receive DC power at voltages exceeding the limits of ES2, and on which transient overvoltages or overcurrents may occur.

Note 1: Communication signalling is not required to be present on an RFT Circuit.

Note 2: Examples of RFT Circuits include—

(a) for power transfer using voltages at ES1: USB, PoE, ISDN S0;

(b) for power transfer using voltages at ES2: analogue telephone during ringing, ISDN U;

(c) for power transfer using voltages at ES3: Power Feeding used by communications service providers; and

(d) utilities communication circuits such as line powered DSL equipment and G.fast).

RFT-V and RFT-C

4.2.87 RFT-V circuit

an RFT Circuit which is so designed and protected that under normal operating conditions and single fault conditions, the voltages are limited and the accessible area of contact is limited.

4.2.86 RFT-C circuit

an RFT Circuit which is so designed and protected that under normal operating conditions and single fault conditions, the currents in the circuit do not exceed defined values.

4. Conductor size and temperature (clause 5.6)

5.6.1 Conductor size

Twisted pair Cable linking Distributors or installed as Generic Cabling shall—

(a) have a maximum conductor resistance of 0.0938 Ω/m at 20° C; or

(b) be selected as part of a solution designed by a—

(i) Registered Electrical Engineer; or

(ii) Registered ITEE (Information, Telecommunications and Electronic Engineering) engineer.

Note 1: 0.5 mm nominal conductor diameter (24 AWG) Cable would typically meet this requirement.

Note 2: Additional connectors will increase the resistance of the link which may limit the ability to support remote powering.

Note 3: Cable with a smaller nominal conductor diameter (e.g., 0.40 mm such as that typically used in Underground Cable types) may reduce the length capacity of the link when providing power or other services.

Conductor size and temperature (clause 5.6)

5.6.2 Cable temperature

Cable should not be installed in a manner that may cause the maximum operating temperature rating of the Cable to be exceeded.

Note 1: Cable temperature is the sum of ambient temperature and the temperature rise due to any current feeding through the cable.

Note 2: The maximum operating temperature of a Cable should be available from the Cable manufacturer.

Note 3: The application of remote powering over new or existing Cabling may cause a Cable to exceed its safe temperature limit, making the Cabling unfit for purpose or hazardous. Consideration should be given, but not limited to, the following—

(a) the Cable type;

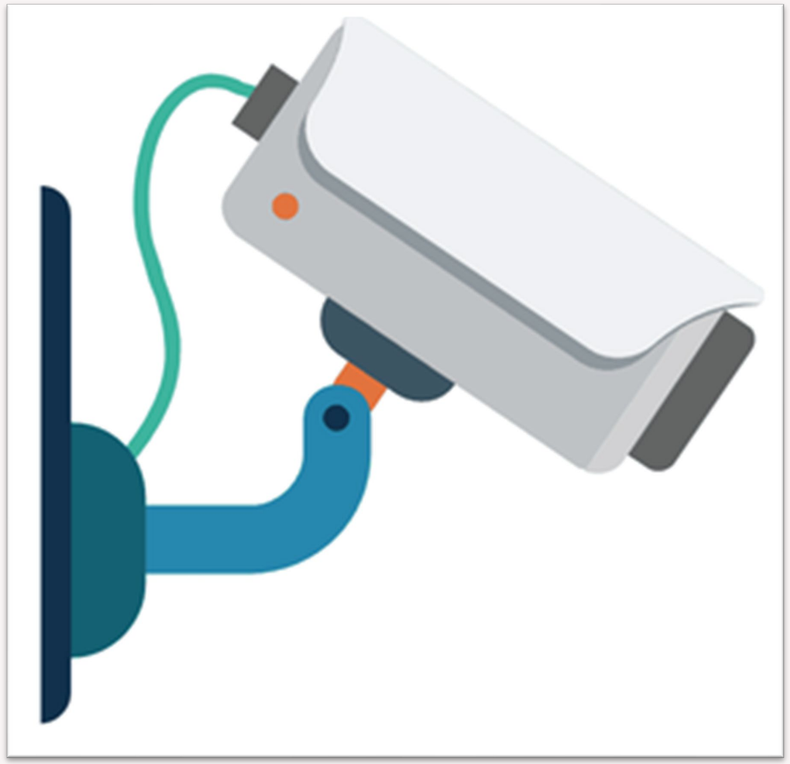
(b) the number of pairs activated in a multi-pair Cable and in a bundle of Cables; and

(c) installation factors.

Note 4: The Standards Australia Technical Specification SA TS 29125:2019 may aid in determining temperature rise above ambient in a Cable and in Cable bundles, based on the installation environment and Cable construction.

Note 5: Temperature rise data for Cable bundles should be available from Cable manufacturers.

5. Plug terminated cabling



5.9.1 Fixed or concealed cabling

Plug-terminated Cabling shall not be installed as fixed or concealed Cabling for mating of the Plug with a Port on Customer Equipment unless—

(a) the Plug is an integral part of a device that is fastened to a wall, floor or ceiling or other permanent building element; or

(b) the Plug is not fixed and—

(i) the Plug terminates a section of Movable Cabling;

(ii) the Plug is to mate with a Port on an item of fixed Customer Equipment; and

(iii) in every position to which it may be moved when the Plug is not mated with the Port, every part of the section of Movable Cabling is either out of Arm's Reach or housed in a Secure Enclosure that is fastened to a wall, floor or ceiling or other permanent building element.

6. More on ES3

Generic

- Cable be separated from other services and telecommunications circuits
- Cable meet requirements of ES3 generic cable in AS/CA S008
- Marking of cable route
- ES3 generic circuit warning markings

Special application

- Cable shall meet requirements of AS/CA S008
- Shall not use generic cabling
- Shall be separated from other services and telecommunications circuits
- Shall meet the manufacturers requirements intended for the special application

5.6.19 ES3 generic cable

ES3 Generic Cable **shall**—

(a) comply with the requirements of Clause 5.6.11 for metallic paired Cable;

(b) have a maximum conductor resistance of 0.0938 Ω/m at 20°C;

(c) have an outer sheath colour *Homebush Gold* (as defined in AS 2700) [9]; and

(d) be clearly labelled 'ES3 circuit' every 2 m in the colour *Homebush Red* (as defined in AS 2700 [9]).

Note 1: Generic Cable may include one pair, four pair or multipair Cables.

Note 2: 0.5 mm nominal conductor diameter (24 AWG) would typically meet the requirement in Item (b).

(c) have an outer sheath colour *Homebush Gold* (as defined in AS 2700) [9]; and

(d) be clearly labelled 'ES3 circuit' every 2 m in the colour *Homebush Red* (as defined in AS 2700 [9]).

ES3 generic cable

Separations

Table G1

Minimum separation distances required between different types of telecommunications and power services for safety (indoor cabling)

Dimensions in mm

Type of service		Cables						Terminations					
		ES1	ES2	ES3	LV power	HV circuit multi-core	HV circuit single core	ES1	ES2	ES3	LV power	HV circuit multi-core	HV circuit single core
Telecommunications	ES1	0	0	50 [a]	50 [a]	300 [c]	450	0	0.5	150 [b]	150 [b]	450 [d]	450 [d]
	ES2	0	0	50 [a]	50 [a]	300 [c]	450	0.5	0	150 [b]	150 [b]	450 [d]	450 [d]
	ES3	50	50	0	50 [a]	300 [c]	450	150	150	0	150 [b]	450 [d]	450 [d]
Mains Power	LV power	50 [a]	50 [a]	50 [a]	Per AS/NZS 3000			150 [b]	150 [b]	150 [b]	Per AS/NZS 3000		
	HV circuit multi-core	300 [c]	300 [c]	300 [c]				450 [d]	450 [d]	450 [d]			
	HV circuit single core	450	450	450				450 [d]	450 [d]	450 [d]			

a 50 mm or a durable barrier of insulating material or metal.

b 150 mm or a permanent, rigidly-fixed barrier of durable insulating material or earthed metal. In addition, accidental personal contact with the Hazardous Service is to be prevented by effective means.

c The separation distance may be reduced to 150 mm if there is an interposing barrier of durable insulating material or earthed metal, which is of such dimensions that the shortest path around the barrier between the Cables is at least 175 mm.

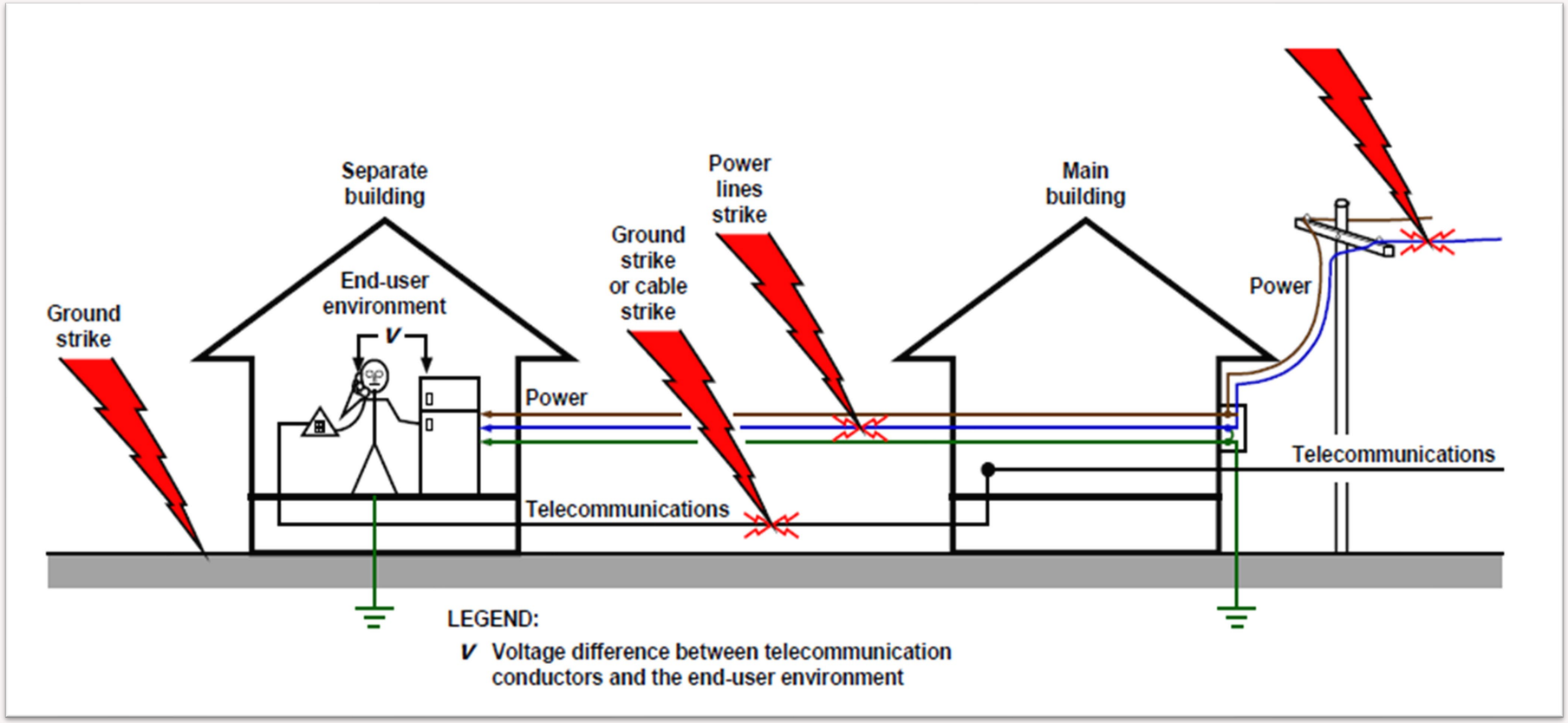
In addition to separation there are requirements:

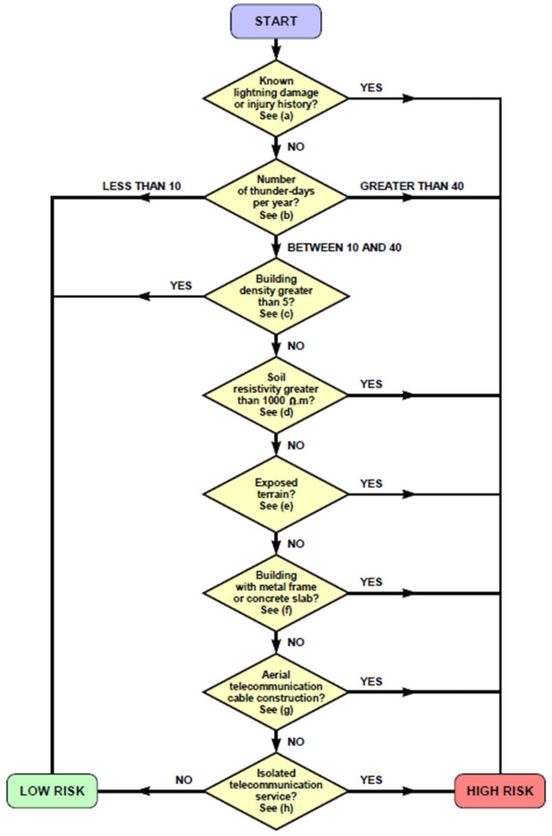
- New product and installation requirements for ES3
- Identification and warning
- Subducting
- For protection again live part of sockets to reflect ES1, ES2 and ES3

7. Other changes

- Update for optical fibre system inspecting apparatus, laser warning marking, safety and labelling
- Requirements for optical fibre system are no independent of the hazard level classification of the service
- Requirements for movable TOs and how they are attached and restrined
- New requirements for pendant TOs
- Cabling between buildings and surge suppression for paired conductors
- New requirements for installing earth bar/terminal at distributors
- Guidance on compatibility of 6P plugs and 8P sockets
- Additional info on network boundary for Fibre, HFC and wireless terminations
- Guidance on FTTC connectivity

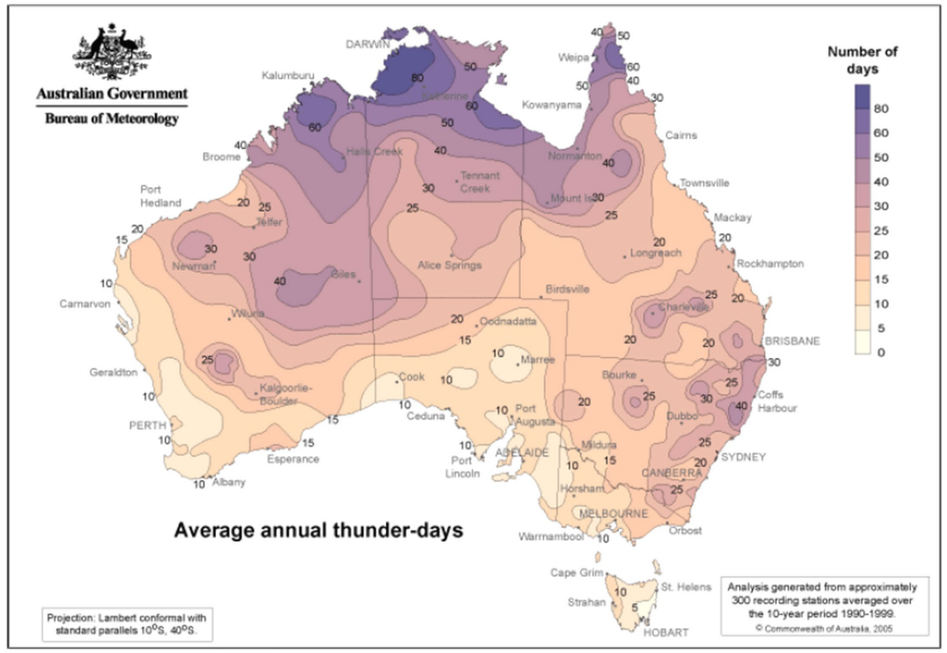
Cabling between buildings – appendix N





Note: In the case of doubt or uncertainty in assessing the risk, surge suppression should be fitted.

Figure N5
Assessment of the risk of injury due to lightning overvoltages

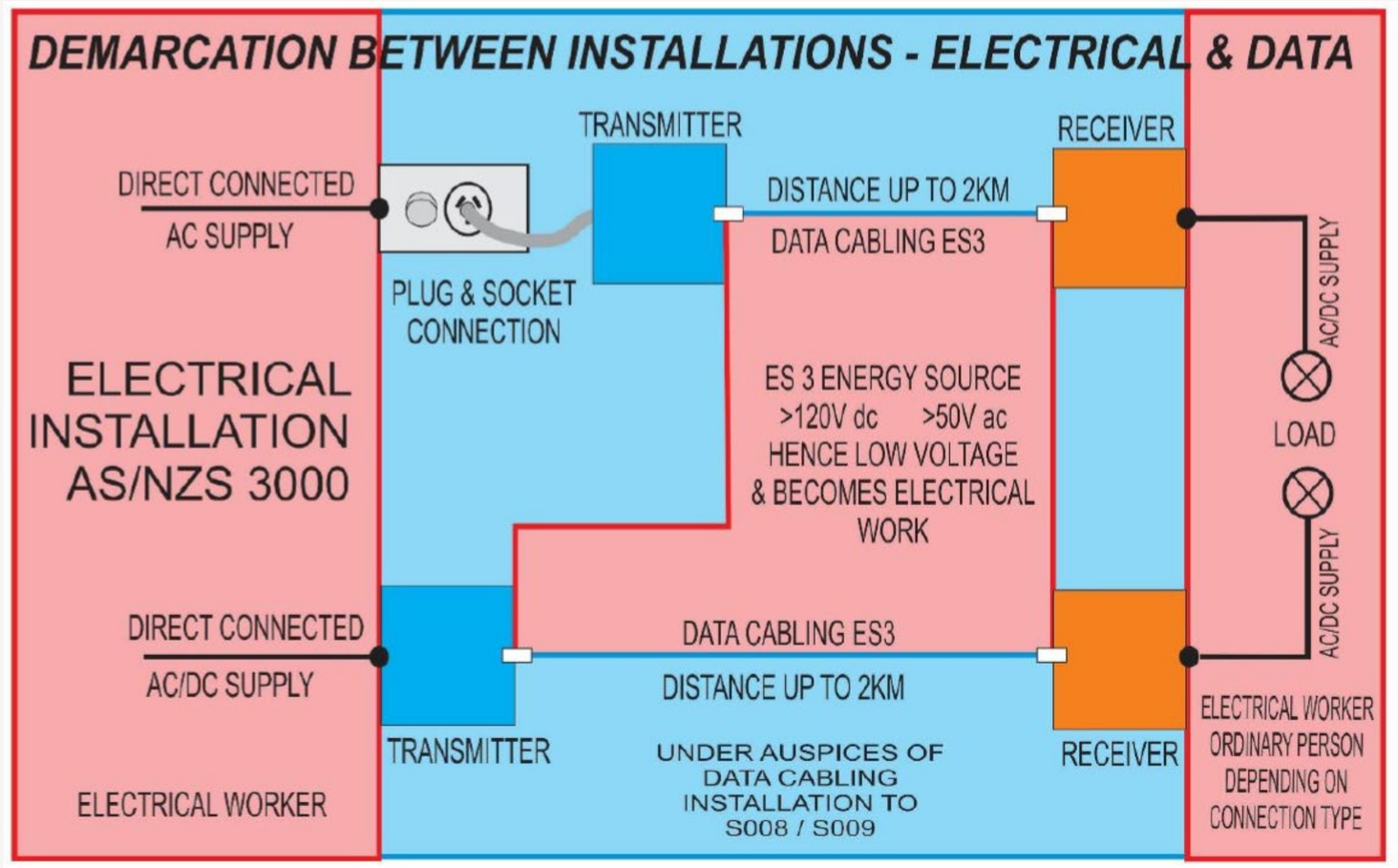


Note 1: A thunder-day is a day on which thunder is heard at least once.

Note 2: Refer to
http://www.bom.gov.au/jsp/ncc/climate_averages/thunder-lightning/index.jsp

Figure N4
Australian annual thunder-day map

8. The challenge is convergence



Delivery of power over communications cabling within customer premises

Outcomes from the Communications Alliance Cabling Convergence exploratory meetings

COMMUNICATIONS ALLIANCE LTD
www.commsalliance.com.au

Consultation

Communications Alliance is seeking feedback from stakeholders on the outcomes of a review of the regulatory and safety issues concerning the transmission and delivery of power over communications customer cabling. Specifically, Communications Alliance wishes to understand if stakeholders have identified any issues to date from the application of these techniques and if there have been impacts to their sector.

The results of the consultation will be feed back into the Communications Alliance Customer Equipment and Cable Reference Panel to determine a set of recommendations and work program.

Submissions can be sent to info@commsalliance.com.au

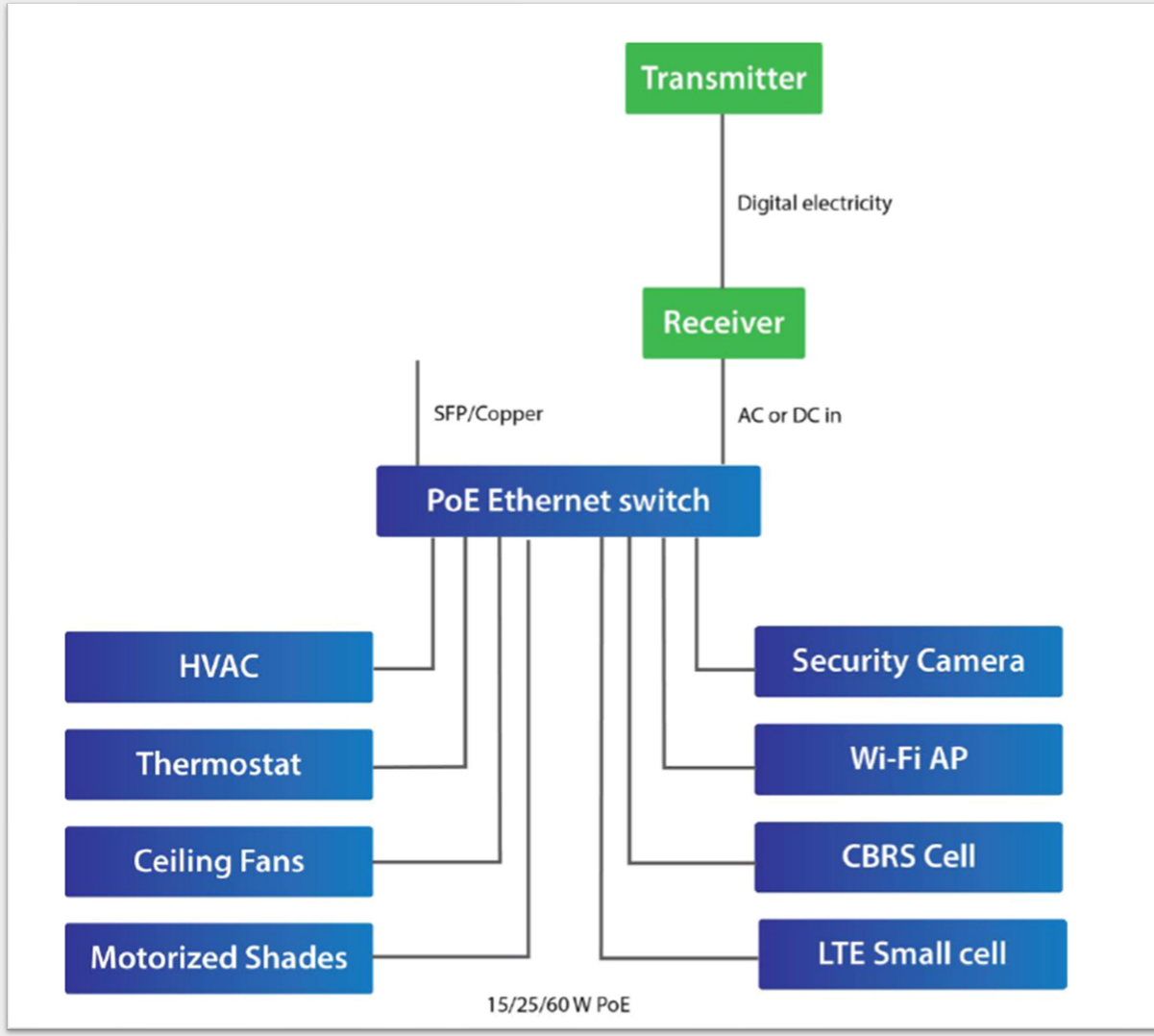
The closing date for submissions is **Thursday 8 July 2021**

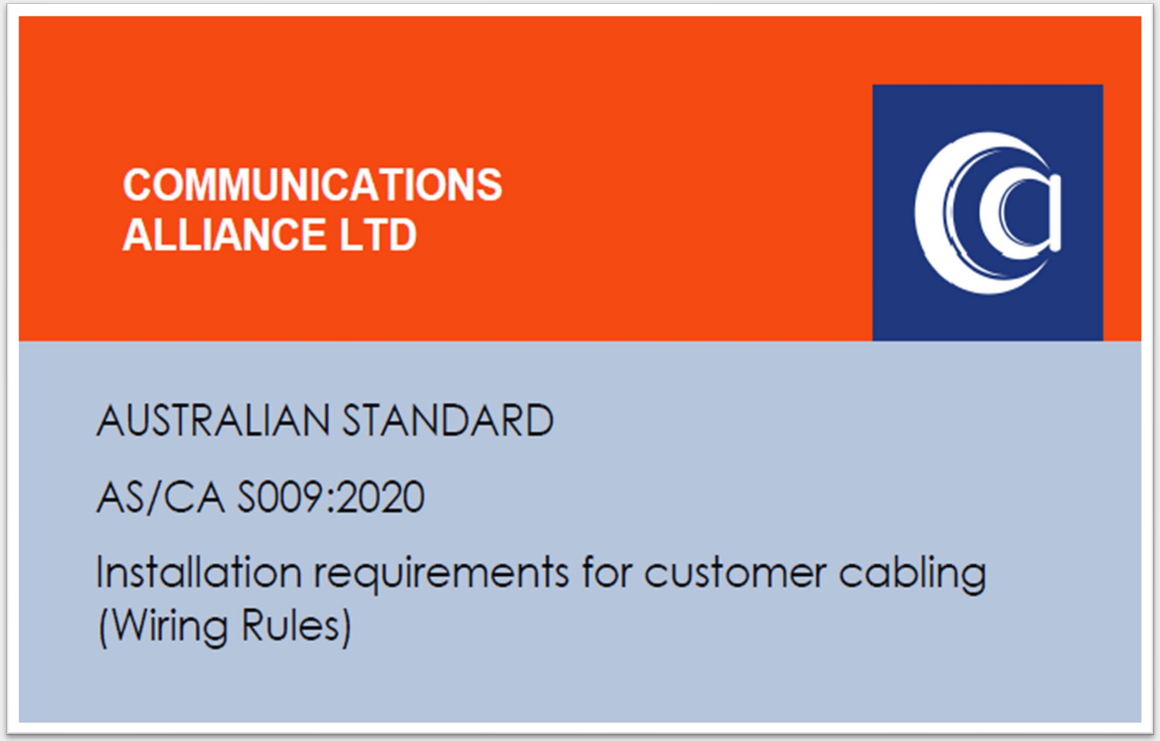
Consultation inquiries can be sent to info@commsalliance.com.au

Convergence – what do we do?

Digital power – possible scenarios

- Voltserver will supply:
- 500watts, 48V over 700m, or
- 1,000watts, 48V over 1.4Km





9. The message

- Download the latest versions of AS/CA S009 and 008
- Familiarise yourself
- If in doubt, consult the standard


10. Q&As

1. When upgrading Existing NBN who is the first contact to submit application for residential and multi residential application ?

Given you are upgrading an existing service there will be a service provider, you will need to contact that service provider. If you feel you are not able to get the information you need you can try contacting nbn directly on 1800 687 626

2. Impact of ES-3 designation and 100V AC public address and EWIS/OWS cabling type and connection to new and existing installations

Prior to ES3, EWIS was referred to as LV telecommunications cabling and as such had to be installed by a Registered Cabler and ensure separation from other services.

3. How do you install all outdoor equipment such as antennas up masts when we can't terminate male rj45 connections?

Yes, you can as long as you comply with the requirements for plug connected cabling. A cabling provider can terminate a cable onto a plug, if the equipment that it's being connected to fixed customer equipment which incorporates a port. The connection must be at Arms length.

4. Will we have a group watching for up skilling purposes including apprentices.

At this stage there is none but we will raise this with NECA.

national electrical and communications association

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