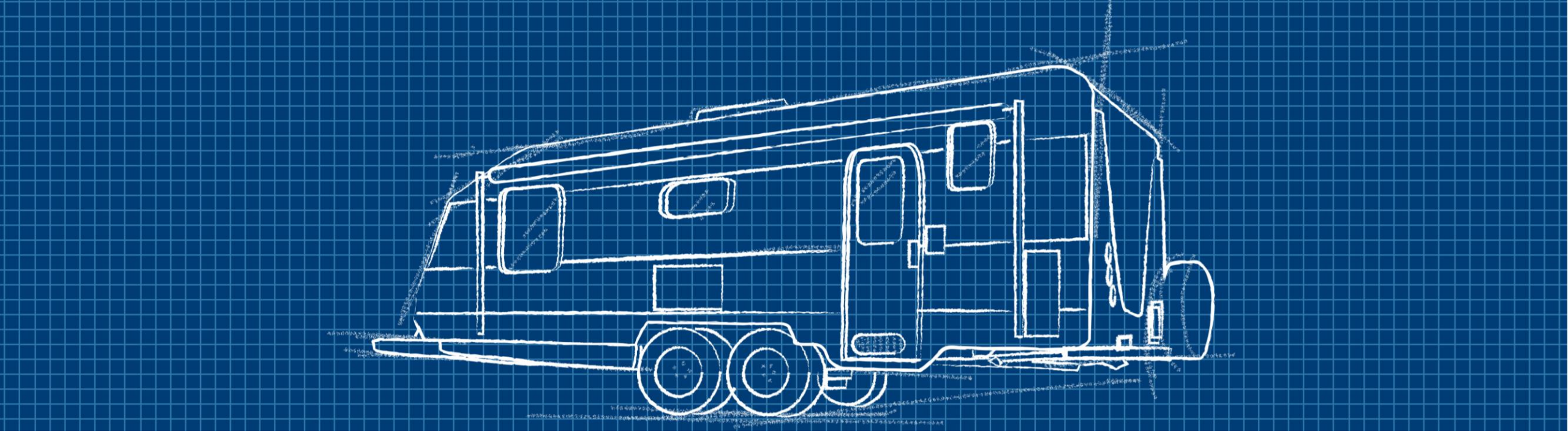

Caravanning Queensland Presentation – 9 February 2023

AS/NZS 3001.2 Electrical Installations

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New Electrical Installation Standards

AS/NZS 3001 Electrical installations

– Connectable electrical installations and supply arrangements

- AS/NZS 3001.1

  Part 1: Site supplies for connectable electrical installations
- AS/NZS 3001.2

  Part 2: Connectable electrical installations

This presentation will focus on Part 2 (AS/NZS 3001.2)

– Installations in vehicles and relocatable units.

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Sections

Section 1: Scope and General

- Scope, inclusions, and exclusions of this Standard.
- Expanded definitions and alterations and repairs section.

Section 2: Electrical Supplies for connectable electrical installations

- External and onboard supply installation requirements applicable to any connectable electrical installation

Section 3: Relocatable units

- Installation requirements specific to relocatable units

Section 4: Recreational vehicles and non-recreational vehicles

- Installation requirements specific to recreational vehicles (and non-recreational vehicles)

Section 5: Extra-low voltage d.c. electrical installations

- Installation requirements for extra-low voltage wiring systems and equipment in all connectable electrical installations

Section 6: Verification

- Verification requirements in all connectable electrical installations

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Batteries – General Requirements

Batteries should be rechargeable and have a minimum battery capacity of 40Ah at a 20h discharge rate.

Location – must allow easy access for removal or maintenance

Secure mounting – no greater than 25mm movement under a pulling force of twice the battery weight applied vertically and horizontally.

Protection against overload and short circuit – circuit breakers or fuses.

Clearance to metallic service lines – 300mm clearance around battery terminals, or appropriate shielding in place.
E.g. to gas, diesel, water lines or similar.

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Lead-Acid Batteries – External

Batteries installed externally must be

- In a battery compartment that includes a spill tray and ventilation; OR
- Open to the environment, including a spill tray

Definition: Externally

Open to the environment or not within the enclosed structure of the connectable electrical installation.

For example, a wall, compartment or barrier that prevents the egress of gases into the habitable area.

The battery location must provide mechanical protection against damage from rocks/debris during travel

Lead-Acid Batteries - Internal

Batteries installed internally must be in a battery compartment that includes a spill tray and ventilation.

The battery location must allow for easy access – maintenance or removal

Lead-Acid Batteries – Further details

A spill tray must be installed that can hold at least 20% of the electrolyte held by the battery.

Ventilation must be provided for any battery installed in a compartment.

- Must prevent any gases transferring into the habitable area.

Lead-Acid Batteries - Ventilation

Ventilation must be provided for any battery installed in a battery compartment.

Battery compartment ventilation is required via one of three prescribed methods:

1. Installing a battery that incorporates an external venting kit.
   Such a kit must be installed to the battery manufacturer's instructions.
2. Providing a suitable upper and lower vent openings in the battery compartment.
   Note: the upper vent may include a tube at the top of the battery compartment.
3. Low-level and high-level vent openings to the exterior of the connectable electrical installation eg in a compartment door or external wall.

Minimum ventilation size for each opening applies

- Calculated based on battery ratings
- Calculation formula provided (clause 5.4.11.5, p79)

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Lithium-Ion Batteries

Location:

- Batteries must be located externally
- Behind a wall, compartment or barrier that prevents any vented gases entering the habitable area

Compartment design and venting

- Must be developed in consultation with battery manufacturer

Battery Management System

Each lithium-ion battery must be provided with a battery management safety system

- Integrated or separate component

Continuous monitoring – voltage, current, temperature

Automatic disconnection

- Over and under voltage
- Over and under temperature
- Over current

Battery Monitor – each battery (or bank)

- Must display state of charge, may display voltage
- Communications may be wired or wireless connection to BMSS

Renewable Energy Sources

Installed only for charging batteries;

Only generate extra-low voltage; and

Must have a device which prevents battery(ies) overcharging

Overcurrent protection devices shall be provided at the renewable energy source

- In the positive conductors

Solar panels:

- Photovoltaic (PV) array installations – as per AS/NZS 3001.2.
- Further guidance may be sought from AS/NZS 5033.

Solar Systems – Solar Panels

Solar panels:

- Photovoltaic (PV) array installations – as per clause 5.5.2.2.
- Further guidance may be sought from AS/NZS 5033.

Wiring – PV array to power conversion equipment

- Double insulated and specifically for d.c. PV arrays
- Suitably restrained and mechanically protected
- Appropriate size – consider fault currents from PV array
- Suitable IP rated connections

PV overcurrent protection

- Circulating current within the array
- Overload and short circuit protection of wiring

Solar Systems & Road Vehicle Rules

Solar panels (& associated equipment) must comply with all national design rules for road safety (i.e. ADRs):

Height & width limits – ADR 43
External projections – ADR 92
Vehicle lighting (obstruction) – ADR 13.

Strength of attachment

- Vibration inputs – normal road travel
- Emergency situations – sudden braking, crash scenario.

Solar Systems – Components

Circuit breakers

- Clause 5.5.2.3.1

Fuses

- Clause 5.5.2.3.4

Plugs, Sockets and Connectors

- Clause 5.5.2.3.3

Onboard Power Source - Inverter

An onboard power source may supply all or part of the electrical installation – eg Inverter or inverter-charger

If an inverter (or inverter charger) is fitted:

- Controls must be readily accessible;
- Final sub-circuits supplied by an inverter or inverter charger must be protected by an RCD device.
  - (For an isolated/EPB inverter this can be integral to the unit);
- The main switchboard must contain
  1. A warning label indicating the presence of an inverter; and
  2. A visible indicator showing the status of the inverter or inverter charger – active online or in standby mode.

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Extra-Low Voltage Wiring

- Protect against physical contact with live parts
  - durable insulation material; or
  - placing live parts out of reach
- Be appropriately sized
  - current carrying capacity
  - voltage drop requirements
  - other minimum size requirements for conductors.
- Suit intended use – including specialist applications.
- Ensure electrical continuity – connections, joints, terminations.
- Provide adequate strength of supports, suspensions and fixings.
- Physical protection
  - mechanical damage
  - environmental and other external influences.

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Extra-Low Voltage (12V dc) Wiring

- Be installed in accordance with the requirements of this standards and any additional requirements as specified in the manufacturer's installation instructions.

Separation of circuits

- Where there are wiring systems operating at different voltages, low voltage and extra low voltage circuits shall not be enclosed in the same wiring system.

Extra-Low Voltage – Accessories

Socket outlets

- two pole non reversible
- different from those provided for any low voltage (240V) installation.
- Ratings should be stated on or adjacent to the outlets.
- Exterior socket outlets – protect against water/dust, rating at least IP34

Battery chargers

- Charger output should be electronically regulated to not exceed the battery manufacturer's specified maximum d.c. output (voltage/amps).

External Lights, eg door lamps

- Should be constructed or enclosed to protect against ingress of water.

Extra low voltage appliances

- fitted and connected as set out in the appliance manufacturers installation instructions.

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Multiple Supply Sources

An installation may be supplied from multiple sources

- external or on-board, and
- low voltage (eg 240V) or extra-low voltage (eg 12V d.c.)

Socket outlet labels

- When multiple sources of supply are present, low voltage socket outlets in the installation must be labelled to indicate the sources of supply.

Change-over device

- Ensuring only one source of supply can be connected at any given time
- Located on (or adjacent to) the switchboard; or
- incorporated into a source of supply (e.g. inverter charger) with a label at the switchboard indicating the location the device.

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Electrical Equipment in Damp Areas

Governed by zones designating relative areas of risk

Internal Showers and basin/sink zones remain consistent with previous standards.

Clarification added for some typical shower door arrangements seen in current vehicle designs

eg shower doors hinged part way along a door.

New requirements introduced for external showers

Zone Definitions – Internal Shower

Zone 0 – internal shower base

Zone 1 – within the shower cubicle up to the height of the ceiling.

Zone 2 – area between Zone 1 and a parallel vertical plane 600mm away, from floor to ceiling

Zones are limited by solid surfaces (eg walls, doors)

Diagrams can be found in Figure 4.7 of the standard (p67)

Zone Definitions – Other fixed Water Containers

In RV installations – sinks, basins

Apply the requirements for a container with fixed water outlets and a capacity not exceeding 40L

Zone 0 – interior of the water container

Zone 2 – extends 150mm from the internal rim of the water container, between floor and a height of 400mm above the rim.

Diagrams can be found in Figure 4.8 of the standard (p68)

Zone Definitions – External Shower

New – damp area zones around an external shower fitting

Zone 1 – the area 600mm each side of the fixed plumbing connection, from the ground to the height of the vehicle.

The zone wraps around onto the adjacent surface of a recreational vehicle to a total linear distance of 600mm from the plumbing connection.

Diagrams can be found in Figures 4.9, 4.10 and 4.11 of the standard (p69-70)

Damp Areas – Equipment Selection

A table of requirements can be found in Table 4.3 (p69)

Item	Zone 0	Zone 1	Zone 2
Power inlet socket	Not permitted	Not permitted	Not permitted
Switchboards	Not permitted	Not permitted	Not permitted
Power outlet socket	Not permitted	Not permitted	RCD protected; and in a cupboard
Switches and accessories	Not permitted	As per Zone 2	Not permitted <300mm from floor/ground Above that: IPX4 rating
Lamps	IPX7 rating; and specifically for use; and ELV supply.	IPX4 rating	IPX4 rating; or double or reinforced insulation (Class II); or ELV supply; or recessed in ceiling
Other electrical equipment	IPX7 rating; and specifically for use; and ELV supply.	IPX4 rating	IPX4 rating; or double or reinforced insulation (Class II); or ELV supply; or recessed in ceiling
Power generation systems	Not permitted	Not permitted	Not permitted

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Exclusion Zones – Cookers

Prohibited location

- Socket outlets, switches
- Low voltage and extra-low voltage devices excluded

Any surface that is within

- 150mm from edge of cooktop
- Between cooktop surface and any range hood/cupboard directly overhead
- Does not extend up surrounding walls – variation from AS/NZS 3000 requirement

Diagram can be found in Figure 4.4 of the standard (p60)

Exclusion Zones – LP Gas areas

Aligned with AS/NZS 5601.2

Controlled areas – Hazardous areas

- Different terminology but same intent
- No low voltage or extra-low voltage electrical equipment within controlled areas – near gas cylinders or gas storage compartments
- Exceptions made for essential road safety equipment and encapsulated devices (as defined)

Figure 4.6 of the standard (p63)

- Reproduces controlled area diagram from AS/NZS 5601.2

Gas Appliances

Must have a means of electrical isolation

- adjacent to the appliance
- accessible with the appliance in its installed position

This modifies AS/NZS 3000 isolation switch requirements – separate (additional) isolation switches NOT required on A/C, hot water service and cooker

Switchboard Clearances

Switchboard – Main circuit breaker located in a cupboard

Front clearance

- 600mm from the face of the device
- Modifies AS/NZS 3000 – does not measure from the edge of an open door

Protruding surface – eg bench, bed

- Maximum 600mm from face of device to edge of protruding surface

Clearance from face of device to front of cupboard

- Must not exceed 50mm

Implementation - Transition

The standard was published in Nov 2022

Is now active as a current standard

A 12-month transition time was written into the introduction of the standard

Acknowledge the significant changes & potential redesign of vehicle systems & layouts

Questions?

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