

Electrical installations in caravan/camping parks, caravans and motor caravans

As the warmer weather approaches and with summer around the corner, thoughts turn to holidays. Chief Engineer Geoff Cronshaw reminds us of the requirements of BS 7671:2008+A3:2015.

Introduction

The particular requirements of Section 708 apply to the electrical installations in caravan/camping parks and similar locations that provide connection points for supplying leisure accommodation vehicles (including caravans) and tents.

The particular requirements of Section 721 apply to the electrical installations of caravans and motor caravans at nominal voltages not exceeding 230/440 V a.c. or 48 V d.c.

Note: there are some exclusions.

The risks specifically associated with installations in caravan/camping parks, caravans and motor caravans arise from:

- open circuit faults of the PEN conductor of PME (TN-C-S) supplies raising the potential to true Earth of all metalwork to dangerous levels.
- incorrect polarity at the pitch supply point.
- possible loss of earthing due to long supply cable runs, connecting devices exposed to weather and flexible cable connections liable to mechanical damage.
- vibration while the vehicle is moving, causing faults within the caravan installation.

Particular requirements to reduce the above risks include:

- prohibition of the connection of exposed- and extraneous-conductive-parts of a caravan or motor caravan to a PME (TN-C-S) terminal. Where the supply to the site is PME (TN-C-S), the earthing arrangement at the pitch supply point shall form part of a TT system.
- additional protection by 30 mA RCDs in both the vehicle and the pitch supply point.
- double-pole isolating switch and circuit-breakers protecting the final circuit in the tent, caravan or motor caravan.
- internal wiring of the tent, caravan or motor caravan by flexible or stranded cables of cross-sectional area 1.5 mm² or greater; additional cable supports; segregation of low voltage and extra-low voltage circuits.



Caravan/camping parks

Protection against electric shock: general requirements

As you would expect, the protective measures of obstacles, placing out of reach, using a non-conducting location and ensuring protection by earth-free local equipotential bonding are not permitted. These measures are contained in Sections 417 and 418 of BS 7671:2008+A3:2015 and are not for general application. The protective measures of Section 417 provide basic protection only and are for application in installations controlled or supervised by skilled or instructed persons. The fault protective provisions of Section 418 are special and, again, subject to the control and effective supervision by skilled or instructed persons.

Protective multiple earthing

Regulation 708.411.4 of the Electricity Safety, Quality and Continuity Regulations 2002 (ESQCR) prohibits the connection of a protective multiple earthing (PME) facility to any metalwork in a leisure accommodation vehicle (including a caravan).

This does not preclude the use of a PME earthing facility as the means of earthing for other purposes, such as to the installations of permanent buildings.

What is protective multiple earthing?

The ESQCR permits the distributor to combine neutral and protective functions in a single conductor provided that, in addition to the neutral to Earth connection at the supply



transformer, there are one or more other connections with Earth. The supply neutral may then be used to connect circuit protective conductors of the customer's installation with Earth if the customer's installation meets the requirements of BS 7671:2008+A3:2015.

PME has been almost universally adopted by distributors in the UK as an effective and reliable method of providing their customers with an earth connection. Such a supply system is described in BS 7671:2008+A3:2015 as TN-C-S. Whilst a protective multiple earthing terminal provides an effective and reliable facility for the majority of installations, under certain supply system fault conditions (external to the installation) a potential can develop between the conductive parts connected to the PME earth terminal and the general mass of Earth. The potential difference between true Earth and the PME earth terminal is of importance when:

- body contact resistance is low (little clothing, damp/ wet conditions); and/or
- there is relatively good contact with true Earth. Contact with Earth is always possible outside a building and, if exposed-conductive parts and/or extraneous conductive-parts connected to the PME earth terminal are accessible outside the building, people may be subjected to a voltage difference arising between those parts and Earth. For this reason Regulation 9(4) of ESQCR **does not allow a combined neutral and protective conductor to be connected to any metalwork in a caravan.**

External influences

Any wiring system or equipment selected and installed must be suitable for its location and able to operate satisfactorily without deterioration during its working life. Suitable protection must be provided, both during construction and for the completed installation. A minimum degree of protection of IP3X is required if solid foreign bodies are present. If water is present, a minimum degree of protection of IPX4 is required.

Caravan pitch socket-outlets

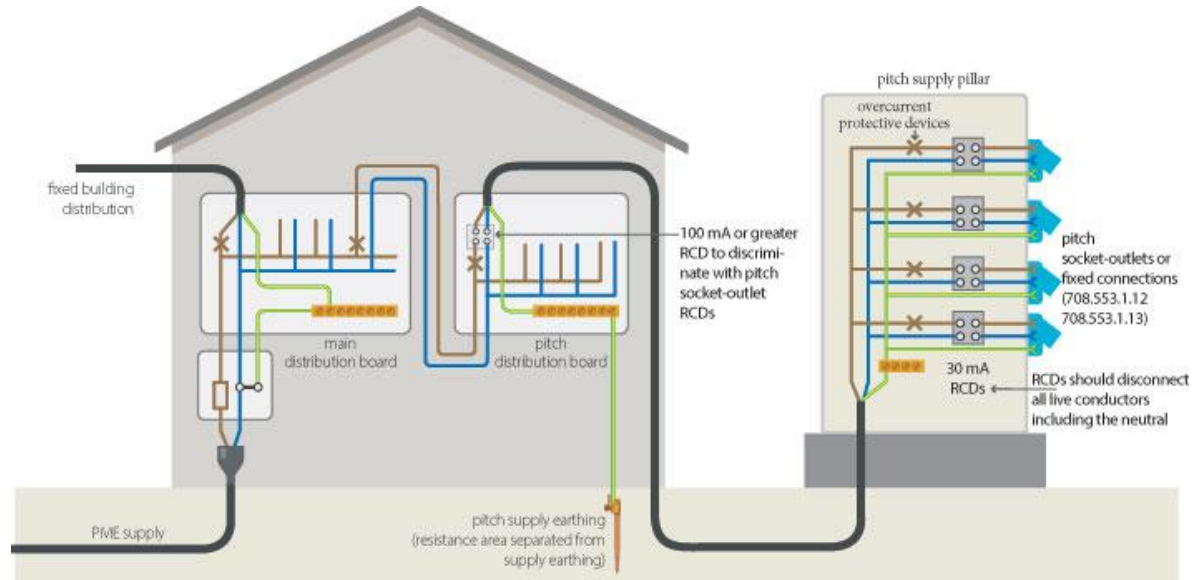
Caravan pitch socket-outlets are required to comply with BS EN 60309-2 and must have a degree of protection of at least IP44. The current rating is to be not less than 16 A but may be greater if required. At least one socket-outlet should be provided for each caravan pitch. Where socket-outlets are grouped in pitch supply equipment, there should be one socket-outlet for each pitch limited to a group of four. To be compatible with the caravan connecting cable, socket-outlets should be two-pole with the earthing contact having key position 6 h.

Each socket-outlet must be protected individually by an overcurrent device, which may be a fuse but is more usually a circuit-breaker, and individually by an RCD having the characteristics specified in Regulation 415.1.1 for additional protection. The RCD must disconnect all live conductors including the neutral.

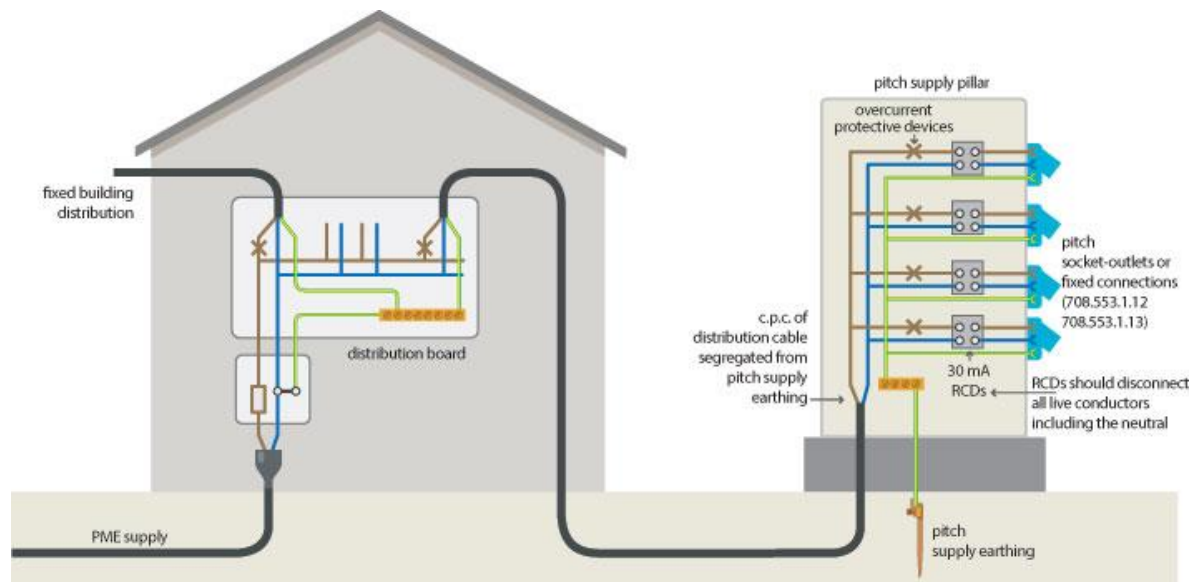
As mentioned previously the ESQCR prohibit the connection of a PME earthing facility to any metalwork in a leisure accommodation vehicle (caravan). If the caravan supply is derived from a permanent building that is supplied by a PME system then the caravan supply will have to be part of a TT system having a separate connection to Earth independent from the PME earthing.

The separation of the earthing can be effected at the main distribution board. See the below Figure 7.1 of IET Guidance Note 7 for detailed information. This enables the exposed-conductive-parts connected to each system to be more readily identified and inspected

periodically. An earth electrode for the TT system should be provided nearby and located so that the resistance areas of the PME supply earthing and earth electrode do not overlap.



Alternatively, the separation of the earthing can be made at the caravan pitch supply points. In this instance, earth electrodes will be required at these points. See the below Figure 7.2 of IET Guidance Note 7 for detailed information.



Caravans and motor caravans

Protective equipotential bonding

Regulation 721.411.3.1.2 requires structural metallic parts that are accessible from within the caravan to be connected through main protective bonding conductors to the main earthing terminal within the caravan.

Provision of RCDs

Regulation 721.411.1 requires that where protection by automatic disconnection of supply is used (Section 411), an RCD complying with BS EN 61008-1 or BS EN 61009-1 interrupting all live conductors is required to be provided having the characteristics specified in Regulation 415.1.1 (30 mA) for additional protection. The wiring system must include a circuit protective conductor connected to:

- the protective contact of the inlet;
- the exposed-conductive-parts of the electrical equipment; and
- the protective contacts of the socket-outlets.

An RCD is a protective device used to automatically disconnect the electrical supply when an imbalance is detected between live conductors. In the case of a single-phase circuit, the device monitors the difference in currents between the line and neutral conductors. If a line to earth fault develops, a portion of the line conductor current will not return through the neutral conductor. The device monitors this difference and operates and disconnects the circuit when the residual current reaches a pre-set limit, the residual operating current ($I_{\Delta n}$).

Switchgear and controlgear

The installation to the caravan should have a main disconnect, which will disconnect all the live conductors. This should be placed in a suitable position for ready operation within the caravan to isolate the supply. When a caravan only has one final circuit then the isolation can be afforded by the overcurrent protective device as long as it fulfils the requirements for isolation.

An indelible notice in the appropriate language(s) must be permanently fixed near the main isolation point inside the caravan to provide the user with instructions on connecting and disconnecting the supply (refer to Figure 721 of BS 7671).

The inlet to the caravan must be an appliance inlet complying with BS EN 60309-1. This should be installed not more than 1.8 m above ground level, in a readily accessible position, have a minimum degree of protection of IP44, and should not protrude significantly beyond the body of the caravan.

The connecting flexible cable

The means of connecting the caravan to the pitch socket-outlet should be provided with the caravan. This must have a plug at one end complying with BS EN 60309-2 and a flexible cable with a continuous length of 25 m (± 2 m). The connecting flexible cable must be in one length, without signs of damage, not contain joints or other means to increase its length, and have a connector, if needed, that is compatible with the appropriate appliance inlet. The cable should be to the harmonized code H05RN-F (BS EN 50525-2-21) or equivalent, include a

protective conductor, have cores coloured as required by Table 51 of BS 7671:2008+A3:2015 and have a cross-sectional area as shown in Table 7.1 of BS 7671:2008+A3:2015.

Periodic inspection and testing

The purpose of periodic inspection and testing is to provide an engineering view on whether or not the installation is in a satisfactory condition where it can continue to be used safely. Periodic inspection and testing is necessary because all electrical installations deteriorate due to a number of factors such as damage, wear, tear, corrosion, excessive electrical loading, ageing and environmental influences. IET Guidance Note 3 gives the recommended initial frequencies of inspection of electrical installations for caravans and caravan parks.

Conclusion

It is important to be aware that this article only gives a brief overview of electrical installations in caravan/camping parks, caravans and motor caravans. For more information refer to Sections 708 and 721 of BS 7671:2008+A3:2015.