

~~the installation of the mobile or transportable unit to accessible conductive parts of the unit, such as the chassis. As stated in Regulation 717.411.3.1.2, the bonding conductors must be of the finely stranded type, such as cables of types H05V-K and H07V-K to BS 6004.~~

~~It should be noted that RCDs, rather than overcurrent protective devices, must be used as the devices for automatic disconnection in the event of a fault where ADS is used (Regulation 717.411.1 refers). Furthermore, for all socket-outlets intended to supply current-using equipment outside the mobile or transportable unit, additional protection must be provided by an RCD having the characteristics specified in Regulation 415.1.1 (Regulation 717.415 refers). The only socket-outlets that are excused from the requirement for additional protection are those supplied from extra-low voltage circuits protected by SELV or PELV.~~

~~16.12.4 Equipment: selection and erection~~

~~Regulation Group 717.5 gives additional requirements for the selection and erection of equipment, and Table 16.20 summarizes these additional requirements.~~

16.13 Electrical installations in caravans and motor caravans

16.13.1 General

As with all special locations or installations, the general requirements apply and are supplemented or modified by the particular requirements embodied in Section 721. As indicated in Regulation 721.1, the requirements relate to installations, on single-phase or three-phase supplies of nominal voltage not exceeding 230/400 V, in caravans and motor caravans.

Installations in mobile homes, residential park homes and transportable units are subject to the general requirements, but not to the particular requirements of this section, as is also true for installations in caravans intended for habitation purposes.

The requirements of Section 721 do not apply to vehicle electrical systems employed to meet the requirements of The Road Vehicle Lighting Regulations 1989, except in the sense of the necessary segregation of the LV system from the vehicle road lighting systems as required by Section 528 (proximity to other services) of BS 7671 and Regulation 721.528.1. Similarly not covered in the scope of Section 721 are installations covered by BS EN 1648-1 *12 V direct current extra-low voltage electrical installations. Caravans* and BS EN 1648-2 *12 V direct current extra-low voltage electrical installations. Motor caravans*, except, again, to the extent of segregation. Where such accommodation includes a bath or a shower, the particular requirements of Section 701 also apply.

Initial inspection and testing and certification for caravans and motor caravans is essentially no different from general installations (see Chapter 17 of this Guide). As far as periodic inspection and testing are concerned, the intervals between inspections are largely a matter of judgement and would depend to a great extent on the extent of usage and the degree of maintenance. The generally accepted maximum interval would be 3 years (see Table 17.21).

Table 16.20 Additional requirements relating to equipment selection and erection: mobile or transportable units

Equipment	Regulation	Additional requirement	Comments
Notice adjacent to inlet connector	717.514	Permanent, durable notice to be fixed adjacent to the supply inlet connector or prominent position on the unit, giving details specified in the regulation, type of supply, voltage, number of phases, earthing arrangement and maximum power requirement	
Wiring systems	717.52.1	Flexible cables for temporary supply to unit to have conductor size not less than 2.5 mm ² and be of type H07RN-F (BS 7917) or equivalent. Cable to enter unit by means of insulated insert, arrange to minimize risk of insulation damage or fault	
	717.52.2	Wiring system for internal wiring of the unit to be either nonsheathed cables in conduit, or, subject to precautions being taken to prevent damage by sharp edges or abrasion, insulated and sheathed cables. Regulation gives more detail of cable and conduit types.	Flexible or multi-strand conductors (at least seven strands) likely to be necessary, to withstand vibration in service
Equipment in gas cylinder storage compartment	717.528.3.5	No electrical equipment permitted in compartment except extra-low voltage equipment for gas supply control Any cable running through compartment to be at least 500 mm above height of base of gas cylinders, in continuous gas-tight conduit or duct, able to withstand high-severity impact (AG3) without visible damage	
Plugs, connectors and socket-outlets	717.55.1	Plugs and connectors for temporary supply to the unit to comply with BS EN 60309-2. Plugs to have enclosure of insulating material. Degree of protection for appliance inlets and for plugs and socket-outlets used outdoors to be IP44 or better	Appliance inlet to be mounted on the unit. Socket-outlet to be mounted outside the unit, in location near where unit is to be situated
	717.55.2	Socket-outlets located outside unit to be in an enclosure providing degree of protection of IP44 or better	

16.13.2 Requirements for safety

The protective measures of obstacles and placing out of reach are, not surprisingly, precluded by Regulation 721.410.3.5 and, similarly, the protective measures of non-conducting location, earth-free local equipotential bonding are precluded by Regulation 721.410.3.6. The use of the protective measure of electrical separation is not permitted except for shaver socket-outlets, as given in Regulation 721.410.3.3.2.

Regulation 721.411.1 calls for an RCD (see Figure 16.10) where protection by ADS is used (the normal method) with a protective conductor connecting the exposed-conductive-parts of the installation, including socket-outlet protective contacts, with the earthing contact of the caravan inlet plug. The RCD must comply with BS EN 61008-1 or BS EN 61009-1, interrupt all live (line and neutral) conductors and have the characteristics specified in Regulation 415.1.1 ($I_{\Delta n} \leq 30 \text{ mA}$ and operating time $\leq 40 \text{ ms}$ at a residual current of $5I_{\Delta n}$).

All extraneous-conductive-parts accessible from within the caravan (or motor caravan) must be bonded with a main protective bonding conductor to the main earthing terminal of the installation in the caravan, as called for in Regulation 721.411.3.1.2. All that will be required, in many cases, will be a 'main' bond on to the vehicle chassis.

Regulation 721.43.1 calls for each final circuit to be protected by an overcurrent protective device which disconnects all live (line and neutral) conductors (see Figure 16.10). This will of necessity involve the use of single-pole-and-neutral (SP&N) or double-pole

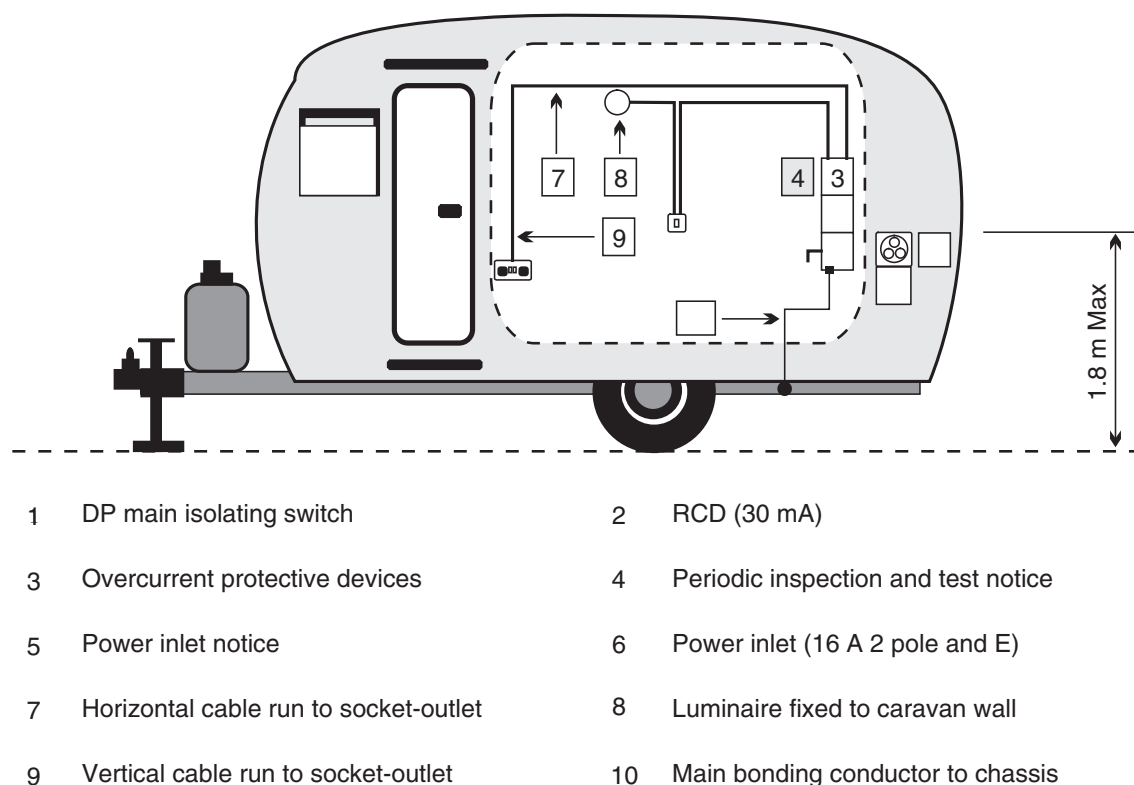


Figure 16.10 Installation in a typical caravan

(DP) circuit-breakers. DP devices will detect overcurrent in both line and neutral and interrupt both on operation, whereas SP&N devices detect only overcurrent in one pole (line) but will disconnect both poles on operation.

Where more than one electrically independent installation is present, each will require its own independent inlet plug, as indicated in Regulation 721.510.3.

Any part of the caravan installation operating at extra-low voltage must comply with the requirements of Section 414 (SELV and PELV) and for d.c. be at one of the standard voltages (12, 24 or 48 V). For a.c., permissible standard voltages are 12, 24, 42 and 48 V.

16.13.3 Wiring systems

A number of the regulations in Section 721 supplement and modify the general requirements relating to wiring systems in caravans and motor caravans, and these are summarized in Table 16.21.

16.13.4 Main isolating switch, caravan inlets and connection leads

Regulation 721.537.2.1.1 calls for the installation to be equipped with a main isolating switch that disconnects all live (line and neutral) conductors, which must be placed within the caravan and positioned for ready operation (see Figure 16.10). Isolators located in linen cupboards or under bed-box covers or blanket chests, and which need some effort to locate, are unlikely to meet the requirement for ready operation. Additionally, such devices may be the subject of adverse effects from the lack of proper ventilation and consequential temperature rise, particularly where incorporated with overcurrent protective devices. In cases where there is only one circuit, the main isolating switch may be incorporated with the overcurrent protective device, and where the latter also meets the requirements for isolation (e.g. adequate contact separation and visual indication of contacts) it may also serve as the main isolating switch. Similarly, an RCD with the necessary isolation characteristics may also serve the combined function.

The electrical inlet to the caravan must be a two pole plus earth appliance inlet (or four pole plus earth for a three-phase supply; Regulation 721.55.1.1), of adequate rating for the caravan load, complying with BS EN 60309-01, or with BS EN 60309-02 if interchangeability is required. The inlet must not be installed at a height exceeding 1.8 m from the ground (see Regulation 721.55.1.2 and Figure 16.10) and must be mounted in a readily accessible position on the exterior of the caravan and housed in an enclosure with a suitable cover, so that at least a degree of protection of IP44 is provided both with and without the connector engaged. A legible and durable notice as required by Regulation 721.537.2.1.1.1 must be affixed on or near the inlet (see Figure 9.23 for example of label details) giving details of nominal voltage and frequency together with the installation rated current.

It is a requirement of Regulation 721.55.2.6 for the caravan installation to be equipped with a flexible cord or cable to connect the caravan inlet to the park-pitch socket-outlet. The flexible link, to be complete with plug and connector both of two pole and earth with key position '6 h', must not be longer than 27 m nor shorter than 23 m. Rubber-insulated cables to HO7RN-F or equivalent are acceptable and should be sized according to the rating of the caravan installation:

Table 16.21 Additional requirements relating to wiring systems in caravans and motor caravans

Regulation	Aspect	Requirements
721.521.2	Type of wiring system	<p>Must be one of the following three types;</p> <ul style="list-style-type: none"> • single-core cables with flexible class 5 conductors in nonmetallic conduit; • single-core cables with stranded class 2 conductors (at least seven strands) in nonmetallic conduit; • sheathed flexible cables. <p>Cables to comply at least with BS EN 60332-1-2, relating to test for vertical flame propagation. (Types of cable meeting the relevant requirements include those to BS 6004 (thermoplastic), BS 7211 and BS 5467 (thermosetting) and BS 6500 (flexible cords).)</p> <p>Conduits and cable management systems to comply with BS EN 61386-21 and BS 61386 respectively</p>
721.522.7.1	Protection of wiring from mechanical damage	All wiring to be protected, either by location or by enhanced protection, against mechanical damage, particularly where cables pass through metalwork
721.522.8.1.3	Cable supports	Where cables are not contained within rigid conduit, to be supported at spacings not exceeding 400 mm for vertical runs and 250 mm for horizontal runs. (Note: designers may consider these spacings for safety are too generous to provide for an aesthetically pleasing surface installation.) See Figure 16.10
721.524.1	Minimum csa of live conductors	1.5 mm ²
721.528.1	Separation of low voltage and extra-low voltage wiring systems	LV and extra-low voltage wiring systems to be run separately from each other so there is no physical contact between them
721.528.3.5	Fuel storage	Except for extra-low voltage equipment for gas supply control, no electrical equipment (including wiring systems) to be installed in any compartment intended for gas cylinder storage. Cables running through compartment to be at least 500 mm above base of gas cylinders and enclosed in gas-tight conduit or duct able to withstand sever impact
721.543.2.1	Protective conductors	All protective conductors to be incorporated with associated live conductors in multicore cable or conduit

- 16 A – 2.5 mm²
- 25 A – 4 mm²
- 32 A – 6 mm²
- 63 A – 16 mm²
- 100 A – 35 mm².

Most, if not all, small touring caravans will not need a greater rating than 16 A.

16.13.5 *Luminaires and accessories*

There are additional requirements relating to accessories and luminaires in terms of selection, and these are summarized in Table 16.22.

Figure 16.10 identifies in graphical representation some of the requirements relating to caravans and motor caravans.

16.13.6 *Annex A of Section 721: guidance on 12 V d.c. installations*

As already mentioned in Section 16.13.1, Section 721 does not apply to installations covered by BS EN 1648-1 and BS EN 1648-2, relating to 12 V d.c. installations for habitation aspects of caravans and motor caravans respectively. However, Section 721 does include an informative annex – Annex A – with content very similar, but not identical, to that of BS EN 1648-1:2004 and BS EN 1648-2:2005. Like BS EN 1648-1:2005, Annex A also covers the design and integration of a caravan electrical system with that of a towing vehicle.

Table 16.22 Additional requirements for luminaires and accessories in caravans and motor caravans

Regulation	Equipment	Additional requirement
721.55.2.1	LV socket-outlets	Unless supplied by an individual winding of an isolating transformer, to incorporate a protective contact
721.55.2.2		All extra-low voltage socket-outlets to be clearly marked with nominal voltage
721.55.2.3	Accessories – generally	Where accessories are exposed to moisture, at least IP44 degree of protection is required either for the accessory itself or by a suitable enclosure
721.55.2.4	Luminaires – generally	Caravan luminaire preferably to be affixed directly to the structure or lining (see also Figure 16.10). Where pendant luminaires are installed, provision for securing them in transit must be made. Accessories for the suspension of luminaires must be suitable for the suspended mass
721.55.2.5		Where intended for dual-voltage operation, must comply with appropriate product standard