



THIS ARTICLE looks at Mobile and Transportable Units - a proposed new Section for BS 7671:2008, 17th Edition of the IEE Wiring Regulations.

Currently, there is no Part or Section of BS 7671:2001(2004) covering Mobile and Transportable Units but information on such installations can be found in IEC 60364-7-717, HD 60364-7-717 and Guidance Note 7, Special Locations.

The proposed Section 717 of BS 7671:2008 is based on the CENELEC Harmonised Document HD 60364-7-717, of which, the UK is to incorporate the technical intent of that standard.

Please note that Regulations and Sections quoted within this article are from the proposed BS 7671:2008 and may be subject to change.

The Scope of Section 717

The term 'unit' is intended to include a vehicle and/or transportable structure in which all or part of a low voltage electrical installation is contained, which is provided with a temporary supply by means of a plug and socket-outlet, for example. The units are either of the mobile type, such as self-propelled/towed vehicles, or of the transportable type, such as containers or cabins.

Examples of such units include:

- outside broadcast units as used in the entertainment industry
- medical services such as blood donor or mobile breast screening units
- advertising trucks and "roadshow" vehicles
- fire fighting appliances
- mobile workshops
- modular office buildings and construction site huts
- transportable catering units and fast food vans

It is important to note that the following are not within the scope of Section 717:

- transportable generating sets (Section 551)



MOBILE AND TRANSPORTABLE UNITS

by Mark Coles

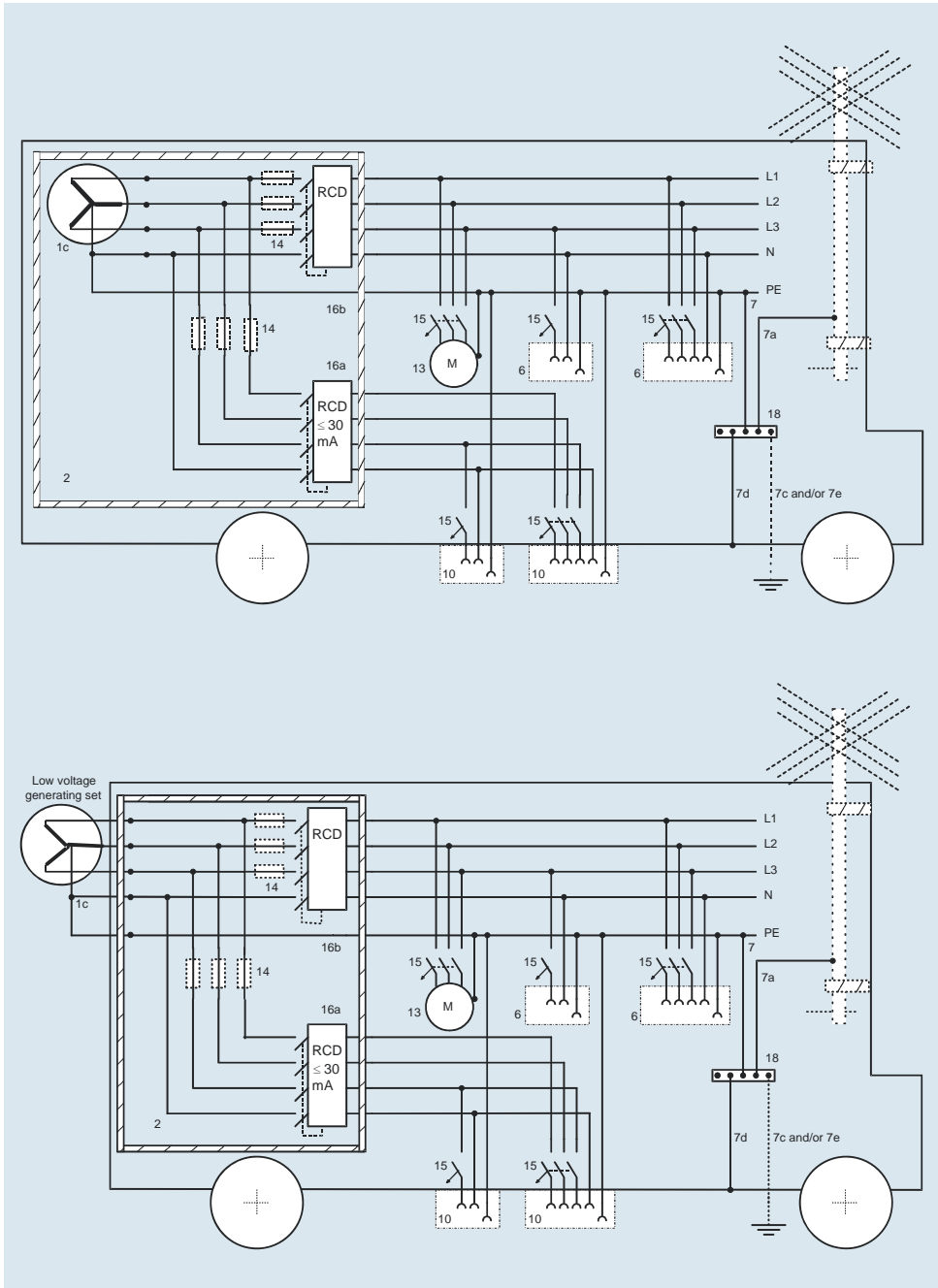
- marinas (Section 709)
- pleasure craft (IEC 60092-507)
- mobile machinery (BS EN 60204-1)
- caravans and other leisure accommodation (Section 721)

Risks

BS 7671 covers electrical installations generally and, as with all special locations, where particular risks exist, additional measures for protection are to be applied. In some instances it may be necessary to refer to other Sections of Part 7 of BS 7671, where in the case of, for example, units incorporating showers are utilised.

The following are examples of particular risks associated with mobile and transportable units:

- loss of connection to earth
- different national and local electricity distribution networks
- impracticality of establishing an equipotential zone external to the unit
- open-circuit faults of the PEN conductor of PME supplies



- shock due to high-protective-conductor currents
- vibration whilst the vehicle or trailer is in motion

Permitted types of supply to mobile and transportable units

There are a number of different types of electrical supplies permitted for mobile and transportable units.

TN-S system

TN-S systems are preferred for ease and reliability. See figure 1 and Appendix for the key to the figures.

Top, Figure 1:
Connection to a TN or TT system, with or without an earth electrode at the unit

Above, Figure 2:
Connection to a low voltage generating set located inside the unit, with or without an earth electrode

TT system

If TN-S is not available then a TT system could be utilised but it is not always easy to install a suitable earth-electrode, particularly if the anticipated time period for use of the installation at that location is short. See figure 1 and Appendix for the key to the figures.

TN-C

The use of a TN-C system is not permitted inside any unit. Regulation 8(4) of the ESQC Regulations forbids the use of combined neutral and protective conductors in a consumer's installation.

TN-C-S

TN-C-S systems should only be used where the installation is continuously under the supervision of a skilled or instructed persons and the suitability and effectiveness of the means of earthing has been confirmed before the connection is made. See figure 1 and Appendix for the key to the figures.

Low voltage generating set

The unit could also be supplied from a low-voltage generating set in accordance with Section 551 of BS 7671.

Figure 2 shows the connection to a low voltage generating set located inside the unit. Note that the generator may also be located outside the unit. An earth electrode would be necessary if the generator is providing a switched alternative to the system of distribution to the public, as Regulation 551.4.2 implies.

IT system

An IT system can be created by

utilising one of two methods.

The first is to use an isolating transformer or a low voltage generating set and incorporating an insulation monitoring device.

The second is to use a transformer providing simple separation, e.g. in accordance with BS EN 61558-1 but only in the following cases:

- a) an insulation monitoring device is installed with or without an earth electrode, providing automatic disconnection of the supply in case of a first fault between live parts and the frame of the unit.
- b) an RCD and an earth electrode are installed to provide automatic disconnection in the case of failure in the transformer which provides simple separation. Each item of equipment used outside the unit shall be protected by a separate residual current device RCD with a rated residual operating current not exceeding 30 mA having the characteristics specified in Regulation 415.1.1.

Protection against electric shock

Regulation 415.1.1 requires that additional protection by residual current protective devices with a rated residual operating current not exceeding 30 mA is necessary for all socket-outlets intended to supply current-using equipment outside the unit. An exception is permitted for socket-outlets which are supplied from circuits with protection by SELV, PELV (Section 414) or electrical separation (Section 413)

Accessible conductive parts of the unit, such as chassis, body structure or tube systems, should be interconnected and, through the protective equipotential bonding conductors in accordance with Regulation 411.3.1.2, connected to the protective conductor of the TT, IT or TN systems within the unit.

The main equipotential bonding conductor should be finely stranded, to BS 6004, Table 4B (harmonised code H07V-K), to allow for movement.

Identification and labelling

A permanent notice should be fixed to the unit in a prominent position, preferably adjacent to the supply inlet connector. The notice should state in clear and unambiguous terms the following information:

- the type of supply which may be connected to the unit
- the voltage rating of the unit
- the number of phases and their configuration
- the onboard earthing arrangement
- the maximum power requirement of the unit



Wiring systems - external

Flexible copper cables according to BS 7919 should be used (harmonised codes H07BB-F, H07RN-F, H07BN4-F). The minimum cable size used should be 2.5 mm².

The flexible cable should enter the unit by an insulating inlet in such a way as to minimize the possibility of any insulation damage or fault which might energize the exposed conductive parts of the unit. The cable sheath should be firmly gripped by the cable gland of the connector or otherwise anchored to the unit.

Wiring systems - internal

As some movement of wiring systems is inevitable, internal wiring should be of the flexible type:

- Where wiring is to be in conduit systems, then PVC insulated cable to BS 6004, Table 4B, should be used (harmonised code H07V-K).



- Where wiring is to be carried out using PVC sheathed cable then PVC/PVC cable to BS 6500 (harmonised code H0VV-F) should be used.
- Green/yellow protective bonding conductors and earthing tails should be finely stranded flexible cable to BS 6004, Table 4B (harmonised code H07V-K).

Other equipment - Plug and socket-outlets

Plugs and socket-outlets used externally to the unit should be to BS EN 60309-1, with pin configurations to BS EN 60309-2. Plug and socket-outlet enclosures connecting the unit to the supply should be of an insulating material and if mounted outside must have an Index of Protection not less than IP44*.

* The Index of Protection IP44 gives protection against ingress of moisture from water splashing from any direction and ingress of solid foreign objects of 1.0 mm and greater. For socket-outlets outside the unit (e.g. for supplies to equipment outside the unit) the degree of protection should be not Less than IP 54.



Verification

The frequency of inspection should be assessed by a competent person who is aware of the operating conditions for that vehicle. Some trucks could be static for long periods whilst others may be moved from location to location on a daily basis so it is important to assess the risks associated with different units. Minimally, the unit should be inspected and tested annually, with a Periodic Inspection Report obtained on its condition and the necessary maintenance work implemented.

A visual inspection should be carried out on the connecting cable and all plugs and socket-outlets before each and every transported use of the unit. The results of the visual inspection should be entered in a log-book as a permanent record of the condition of the electrical equipment.



Appendix

Key to diagrams - Mobile and Transportable Units

- 1a Connection of the unit to a supply through a transformer with simple separation in accordance with Regulation 717.411.6.2
- 1b Connection of the unit to a supply in which the protective measures are effective
- 1c Connection to a LV generator set in accordance with Section 551
- 2 Class II or equivalent enclosure up to the first protective device (see item 8 or 9) providing automatic disconnection of supply
- 6 Socket-outlets for use exclusively within the unit
- 7 Protective equipotential bonding in accordance with Regulation 717.411.3.1.2.1
 - 7a To an antenna pole, if any
 - 7c To a functional earth electrode, if required
 - 7d To the conductive enclosure of the unit
 - 7e To an earth electrode, for protective purposes, if required
- 8 Protective devices, if required, for overcurrent and/or for protection by disconnection of supply in case of a second fault
- 10 Socket-outlets for current-using equipment for use outside the unit
- 13 Current-using equipment used exclusively within the unit
- 14 Overcurrent protective device, if required
- 15 Overcurrent protective device (e.g. one P or PN circuit-breaker)
- 16a Residual current protective device rated with a rated residual operating current not exceeding 30 mA for protection by automatic disconnection of supply for circuits of equipment for use outside the unit
- 16b Residual current device for protection by automatic disconnection of supply
- 18 Main earthing terminal or bar

Thanks to Julian Parsons at BBC OB Resources for the images used.