

Fairgrounds: what you need to know

You might find yourself working on fairground or amusement park installations this year. Geoff Cronshaw, Chief Engineer at the IET, gives us an overview of Section 740 of BS 7671:2008+A3:2015 – Temporary electrical installations for structures, amusement devices and booths at fairgrounds, amusement parks and circuses.

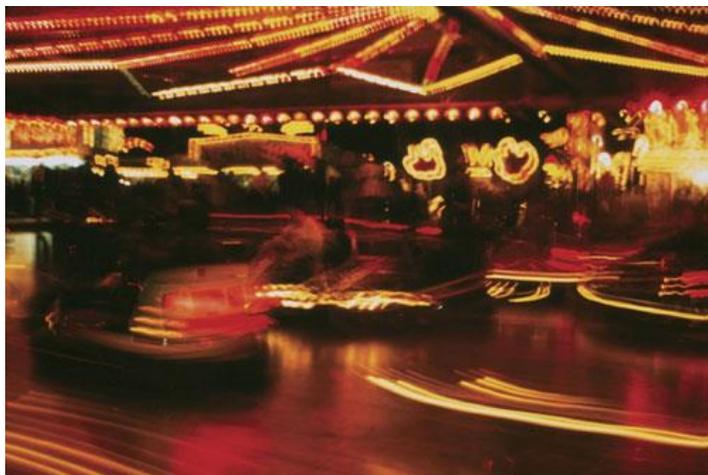
Section 740 specifies the minimum electrical installation requirements to facilitate the safe design, installation and operation of temporary erected mobile or transportable electrical machines and structures that incorporate electrical equipment. The machines and structures are intended to be installed repeatedly and temporarily, without loss of safety, at fairgrounds, amusement parks, circuses or similar places. The permanent electrical installation is excluded from the scope. Section 740 does not apply to the internal electrical wiring of the machines.

Protection against electric shock

As you would expect, the protective measures of obstacles, non-conducting location and 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.

However, placing out of arm's reach is acceptable for electric dodgems operated at extra low voltage under special conditions.



RCD protection

Automatic disconnection of supply to the temporary electrical installation must be provided at the origin of the installation by one or more RCDs with a rated residual operating current not exceeding 300 mA. The RCD shall incorporate a time delay in accordance with BS EN 60947-2 or be of the S-type in accordance with BS EN 61008-1 or BS EN 61009-1 where necessary to provide discrimination with RCDs protecting final circuits.

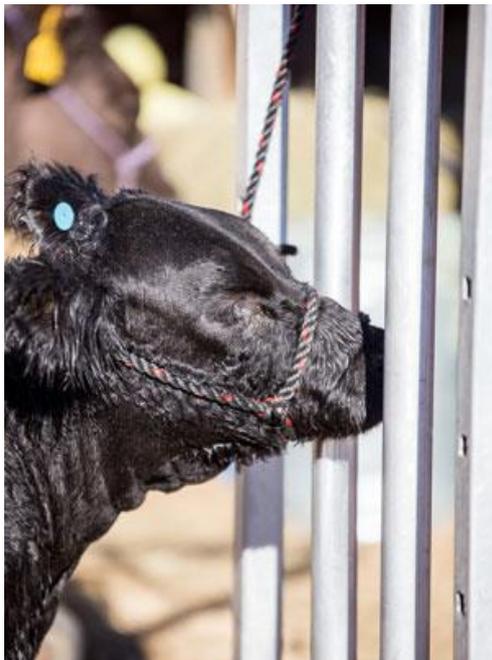
Important, please note: for d.c. installations seek advice from the manufacturer for the correct type of RCD.

All final circuits in the installation for lighting, socket-outlets rated up to 32 A, and mobile equipment connected by a flexible cable and rated up to 32 A, are to be protected by RCDs having a rated residual operating current not exceeding 30 mA for additional protection. However, there are some exceptions.

The requirement for additional protection relates to the increased risk of damage to cables within an installation of this nature.

Supplementary equipotential bonding

In addition to the general rules on protective equipotential bonding, Section 740 requires that, in locations intended for livestock, supplementary equipotential bonding shall connect all exposed-conductive-parts and extraneous conductive-parts that can be touched by livestock. There are also requirements for supplementary equipotential bonding of concrete reinforcement. See 740.415.2.1 for details.



Protective multiple earthing

Regulation 740.411.4.1 states:

A PME earthing facility shall not be used as the means of earthing for an installation falling within the scope of this section.

The Electricity Safety, Quality and Continuity Regulations 2002 (as amended) permit 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. This protective multiple earthing (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 as TN-C-S. Whilst a PME 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:

- (a) body contact resistance is low (little clothing, damp/wet conditions); and/or
- (b) 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 appearing between these parts and Earth.

External influences

Any wiring system or equipment that is selected and installed must be suitable for its location and able to operate satisfactorily without deterioration during its working life. The presence of water can occur in several ways, for example, rain, splashing, steam/humidity, condensation and, at each location where it is expected to be present, its effects must be considered. Suitable protection must be provided, both during construction and for the completed installation. For example, Regulation 740.512.2 states:

Electrical equipment shall have a degree of protection of at least IP44.

The IP classification code, BS EN 60529:1992 (2004)+A2:2013, describes a system for classifying the degrees of protection provided by the enclosures of electrical equipment. The degree of protection provided by an enclosure is indicated by two numerals. The first numeral indicates protection of persons against access to hazardous parts inside enclosures or protection of equipment against ingress of solid foreign objects. The second numeral indicates protection of equipment against ingress of water. More information on the IP classification code is given in IET Guidance Note 1 *Selection and Erection*.

Lighting installations



Section 740 includes a number of requirements for lighting installations and luminaires. These include requirements such as the IP rating, fixing arrangements, mounting heights, guards to prevent risk of injury to persons or ignition of materials, access requirements, restrictions on

the type of lamp holders that can be used, special requirements for neon signs, emergency switching, protection against accidental damage from projectiles (in, for example, shooting galleries), types of cable that can be used, and protection against mechanical damage. Regulation 537.6.1 gives requirements for firefighter's switches for certain types of installations.

Wiring systems

Section 740 includes requirements for protection against mechanical damage, such as use of armoured cables, types of conduit and trunking and requirements for buried cables etc. It also covers electrical connections, including cable anchorage(s), to avoid strain on terminals.

Other equipment

Safety isolating transformers shall comply with BS EN 61558-2-6 or provide an equivalent degree of safety. Electronic convertors shall conform to BS EN 61347-2-2.

When used outdoors, plugs, socket-outlets and couplers shall comply with BS EN 60309-2, or where interchangeability is not required, BS EN 60309-1. National standard socket-outlets with suitable mechanical protection not exceeding 16 A may also be used.

All generators shall be so located or protected as to prevent danger and injury to people through inadvertent contact with hot surfaces and dangerous parts. Earthing arrangements must comply with Regulation 542.1 and, where earth electrodes are used, and with Regulation 542.2. See 740.55.1 for more detail.

Inspection and testing

Regulation 740.6 requires that the electrical installation between the origin and any electrical equipment is to be inspected and tested after each assembly on site.

Conclusion

Please note that this article is only a brief overview of some of the requirements of Section 740. Please refer to BS 7671:2008+A3:2015 Section 740 for more information.