By Geoff Cronshaw

The three most significant changes introduced by the 17th edition were:

Firstly the scope in the 17th edition was extended to include the basins of fountains.

Secondly zones A, B and C in the 16th Edition were replaced by zones 0, 1 and 2 (although the dimensions of the zones remained the same), except that there is no zone 2 for fountains.

Thirdly a solution was included for the installation of 230 volt luminaires for swimming pools where there was no zone 2 (previously zone C).

In comparison Amendment number 1 includes only a few minor changes. In this article will look at the main requirements for swimming pools only. The basins of fountains are not considered in this article.

THE RISKS

The risk of electric shock is increased in swimming pools and their surrounding zones by the reduction in body resistance and by good contact with Earth arising from wet partially clothed bodies.

Because of this risk, additional requirements for safety beyond the general requirements in parts 1 to 6 of BS 7671 apply to basins of swimming pools and paddling pools and their surrounding zones. The additional requirements are detailed in Section 702 of BS 7671.

ZONES

The requirements for the classification of external influences are based on the dimensions of three zones (examples are given in Figures 702.1 to 702.4 of BS 7671:2008). For a swimming pool, zones 1 and 2 may be limited by fixed partitions having a minimum height of 2.5 m (see Figure 1).

PROTECTION FOR SAFETY

Not surprisingly, the protective measures of obstacles and placing out of reach (Section 417) are not permitted. Also, the protective measures of non-conducting location (Regulation 418.1) and earth-free local equipotential bonding (Regulation 418.2) are not permitted.

Supplementary equipotential bonding is required between all extraneous-conductive-parts and the protective conductors of all exposed-conductive-parts in zones 0, 1 and 2, irrespective of whether they are simultaneously accessible, in accordance with Regulation 415.2. In zones 0, 1 and 2, any metallic sheath or metallic covering of a wiring system (e.g. conduit), either surface-run or embedded in walls, floors etc. at a depth not exceeding 50 mm, must be connected to the supplementary equipotential bonding.

There is no particular requirement to install a metal grid in solid floors. However, where there is a metal grid, it must be connected to the local supplementary bonding. It is important to note that Section 753 ‘Floor and ceiling heating systems’ has requirements (such as a metal grid) where electric floor warming is installed.

The requirements for electric floor warming in swimming pool locations would be similar to the requirements for locations containing a bath or shower.

The 17th Edition of the Wiring Regulations (BS 7671:2008) introduced a number of notable changes to Section 702 (Swimming pools and other basins) when it was published in 2008.
PROTECTIVE MULTIPLE EARTHING

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. 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.

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 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:

i. body contact resistance is low (little clothing, damp/wet conditions), and/or

ii. there is relatively good contact with true Earth.

Therefore, a distributor may decide not to provide a PME earthing terminal for an installation such as that of a swimming pool. Where, however, a PME earthing terminal is provided, BS 7671 does not preclude its use for an installation that includes a swimming pool but recommends that an earth mat or earth electrode of suitably low resistance e.g. 20 ohms or less, be installed and connected to the equipotential bonding.

EXTERNAL INFLUENCES

Electrical equipment must have at least the following degree of protection according to BS EN 60529:

(i) Zone 0: IPX8

(ii) Zone 1: IPX4, IPX5 where water jets are likely to be used for cleaning purposes

(iii) Zone 2: IPX2 for indoor locations, IPX4 for outdoor locations, IPX5 where water jets are likely to occur for cleaning purposes.

ZONES 0 AND 1

Switchgear, controlgear, accessories and junction boxes are not to be installed (except for SELV junction boxes in zone 1). Only current-using equipment specifically designed for a swimming pool application may be installed. However, socket-outlets may be installed in zone 1 (where it is not possible for them to be located outside zone 1) providing they are more than 1.25 m horizontally from the border of zone 0, at least 0.3m above the floor, protected by a 30mA RCD or by electrical separation with the safety isolating transformer installed outside of the zones.
The only wiring permitted in zones 0 and 1 is that necessary to supply equipment in these zones. Cables should preferably be installed in conduits made of insulating material.

ZONE 2
Equipment, socket-outlets, switches, and accessories are permitted in zone 2 but must be protected by electrical separation or SELV or a 30 mA RCD. Cables should preferably be installed in conduits made of insulating material.

LUMINAIRES FOR SWIMMING POOLS
In zone 0 and 1, only protection by SELV is permitted.

In zone 0, only protection by SELV at a nominal voltage not exceeding 12 V a.c., rms or 30 V ripple-free d.c. is permitted, the source for SELV being installed outside zones 0, 1, and 2.

In zone 1, only protection by SELV at a nominal voltage not exceeding 25 V a.c., rms or 60 V ripple-free d.c. is permitted, the source for SELV being installed outside zones 0, 1, and 2.

Note: For equipment for use in the interior of basins which is only intended to be in operation when people are not inside zone 0. See Regulation 702.410.3.4.1.

In zone 2, luminaires are required to be protected either by SELV, a 30 mA RCD or electrical separation. Luminaires can be protected by 30 mA RCDs, but the high protective conductor currents often found in such equipment must be carefully considered.

The luminaire manufacturer’s advice should be sought with the objective of determining the standing protective conductor current during starting so that the luminaires do not cause unwanted tripping of the 30 mA RCD. If RCD protection is used, then the luminaires should be on more than one circuit with separate RCDs.

A solution is included for the installation of 230 volt luminaires for swimming pools where there is no zone 2. Regulation 702.55.4 states that for swimming pools where there is no zone 2, lighting equipment supplied by other than a SELV source at 12 V a.c., rms or 30 V ripple-free d.c. may be installed in zone 1 on a wall or on a ceiling, provided that the following requirements are fulfilled:

i. the circuit is protected by automatic disconnection of the supply and additional protection is provided by an RCD having the characteristics specified in Regulation 415.1.1, and

ii. the height from the floor is at least 2 m above the lower limit of zone 1.

In addition, every luminaire shall have an enclosure providing Class II or equivalent insulation and providing protection against mechanical impact of medium severity.

Please note there are special requirements for underwater luminaires for swimming pools. Refer to BS 7671:2008 incorporating Amendment 1.

It is important to be aware that this article only gives an overview of electrical installations in swimming pools. For more information refer to Section 702 of BS 7671:2008 incorporating Amendment 1.