The IET

WIRING MATTERS

Spring 2005

Part P comes into force

Your questions answered

Radon Gas

Swimming Pools

Installing Recessed Luminaires

PART P COMES INTO FORCE

By Geoff Cronshaw

Overview

Part P of the Building Regulations came into force on 1 January 2005. Part P doesn't just apply to flats and houses. Dwellings and business premises that have a common metered supply – for example, shops and public houses with a flat above – are covered too, along with common access areas in blocks of flats and shared amenities such as laundries and gymnasiums. However, if the business unit is separately metered to the dwelling it does not come under Part P. The legislation also extends to parts of installations in or on associated land. This would include fixed lighting and pond pumps in gardens, or a supply to outbuildings such as sheds, detached garages and greenhouses.

A clear distinction has to be made between residential accommodation that are places of work such as university halls of residence, residential care homes and dwellings. University halls of residence, and residential care homes do not come under Part P since these are covered by the Electricity at Work Regulations and would be subject to HSE investigations in the event of an incident. The local authority Building Control officer or an approved inspector will be able to confirm whether Part P of the Building Regulations apply in a specific case.

Significant work, such as house rewires, new circuits, and any additions to existing circuits in kitchens, bathrooms or outside the house will be 'notifiable' , however, the local authority Building Control officer or an approved inspector will be able to confirm whether work is notifiable in a specific case. That means it will have to be certificated by a member of one of the competent person self-certification schemes that have been approved by the Government or notified to the local authority, which will then be responsible for inspection and testing. Part P covers the fixed electrical installation i.e. fixed wiring and equipment. It is understood that equipment plugged into a 13A BS 1363 socket outlet for example does not come under Part P.

TYPICAL QUESTIONS

Work in a kitchen – Cooker

Q If I connect a new cooker to an existing cooker control unit in a kitchen do I have to notify the local authority?

A No, because this is regarded as replacement work under Part P.

Work in a bathroom – Shower

Q If I replace an existing electric shower with a new electric shower connected to an existing shower circuit is this notifiable work?

A No, providing the shower is a like for like replacement.

Light fitting

Q Is the replacement of a light fitting in a bathroom notifiable work?

A No, providing that the light fitting is a like for like replacement. For example if a light fitting was replaced by a number of down lighters this would be classed as alteration work rather that replacement work and would be notifiable.

Work outside – Wall mounted outside light

Q Is the installation of a wall mounted outside light fitting installed on the outside wall of a house notifiable work?

A The general view of the ODPM is that it is not notifiable. Even though this work is outside the house it is generally considered not notifiable providing the supply is taken from an existing lighting circuit and the connection is not made in the kitchen or a special location.

Extra low voltage wiring – Alarm wiring

Q Is the installation of intruder alarm wiring notifiable?

A No, providing the intruder alarm wiring is not in a special location. Therefore intruder alarm wiring in, for example, a kitchen would not be notifiable. Telephone or extra low voltage wiring and equipment for the purposes of communications, information technology, signalling control and similar purposes that is not in a special location need not be notified to Building Control bodies.

Caravans, mobile homes, and park homes

Q Do caravans, mobile homes, and park homes come under part P?

A Caravans, mobile homes, and park homes are treated as caravans under legislation, and do not ordinarily fall within the definition of a building in the Building Regulations, and therefore would not normally come under Part P. Also, to clarify the situation most two-unit caravans (those which are delivered in two sections and bolted together on site) fall within the definition of caravans as referred to above.

The

Published by **IEE Publishing & Information Services** Michael Faraday House, Six Hills Way, Stevenage, Herts, SG1 2AY, United Kingdom
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IEE Wiring Matters is a quarterly publication from the Institution of Electrical Engineers (IEE). The IEE is not as a body responsible for the opinions expressed.

Co-operating Organisations The Institution of Electrical Engineers acknowledges the contribution made by the following organisations in the preparation of this publication: British Electrotechnical & Allied Manufacturers Association Ltd – R Lewington, P D Galbraith, M H Mullins | Office of the Deputy Prime Minister – K Bromley, I Drummond | Electrical Contractors Association – D Locke, S Burchell | City & Guilds of London Institute – H R Lovegrove | Energy Networks Association –D J Start | Electrical Contractors Association of Scotland SELECT – D Millar, N McGuiness | Health & Safety Executive – N Gove | National Inspection Council for Electrical Installation Contracting | The Radon Council B H Ahern

What is radon gas, and how can it be reduced?

By John Ware

Radon – a brief explanation

Radon is a naturally occurring gas that has no colour, smell or taste. The gas comes from minute amounts of uranium present in all earth materials such as rocks, soil, bricks and concrete.

Radon is present in all parts of the UK, but in the most populous areas the levels are quite low. Some of the highest levels are found in the south west, but levels well above average have been found in some other parts of England and parts of Scotland, Wales and Northern Ireland. However, even in these areas most homes have low levels. Maps showing the areas of the country affected by radon are available from the National Radiological Protection Board (NRPB). However, radon can be found in other areas and, even though levels may be low, isolated high levels can occur. The only way to be sure is to conduct a radon test in the building.

Basic methods of radon reduction

The objective of all radon reduction schemes is to reduce radon levels within a building so that levels of exposure to occupants is reduced. It is not possible to remove radon entirely.

New Buildings

Given that radon enters a building from the ground on which it is built, it follows that the most effective means of reduction is to prevent it entering in the first place. This can be achieved by placing a radon barrier over the entire footprint of the building prior to construction. Providing the barrier is gas tight and not perforated, very low indoor levels can be achieved, even in areas known to have high levels of radon.

Existing Buildings

The majority of the housing stock in the UK consists of existing buildings, many of which are older and built using traditional methods. It has been necessary to design suitable systems for radon reduction, once a building has been found to have high levels. Available methods of radon reduction include mechanical ventilation. Three methods of radon reduction using mechanical ventilation have proved to be effective and are described below.

1) Sump with extract fan

This is the most effective method so far devised for reducing high levels of radon. The sump is constructed either by

vertical internal coring or external horizontal coring into the sub-slab space beneath the damp proof course membrane. The sump is connected via ducting to an in-line fan that sucks out soil gases and exhausts them to atmosphere. The extract fan is mounted either inside the building or, in most cases, externally on an outside wall giving reduced noise and easier access.

Advantages:
- Effective at high and very high radon levels.

Disadvantages:
- The installation is frequently not effective for timber (suspended) floors.
- The installation is clearly visible in the case of the external fan arrangement.

2) Positive pressurisation

A building has an inherent negative pressurisation because warm air rises and the method of positive pressurisation partly overcomes this natural airflow. Positive pressurisation is achieved by fitting a purpose-built fan system in the attic space. The fan blows air downwards into the property through a ceiling diffuser, usually above a stairwell. Such systems were initially used for reducing condensation but have subsequently been found to be effective at reducing levels of radon. For reasons of reducing draughts and noise the fan operates at low speed and power level, hence it is only suitable in 'air tight' properties with relatively low radon levels.

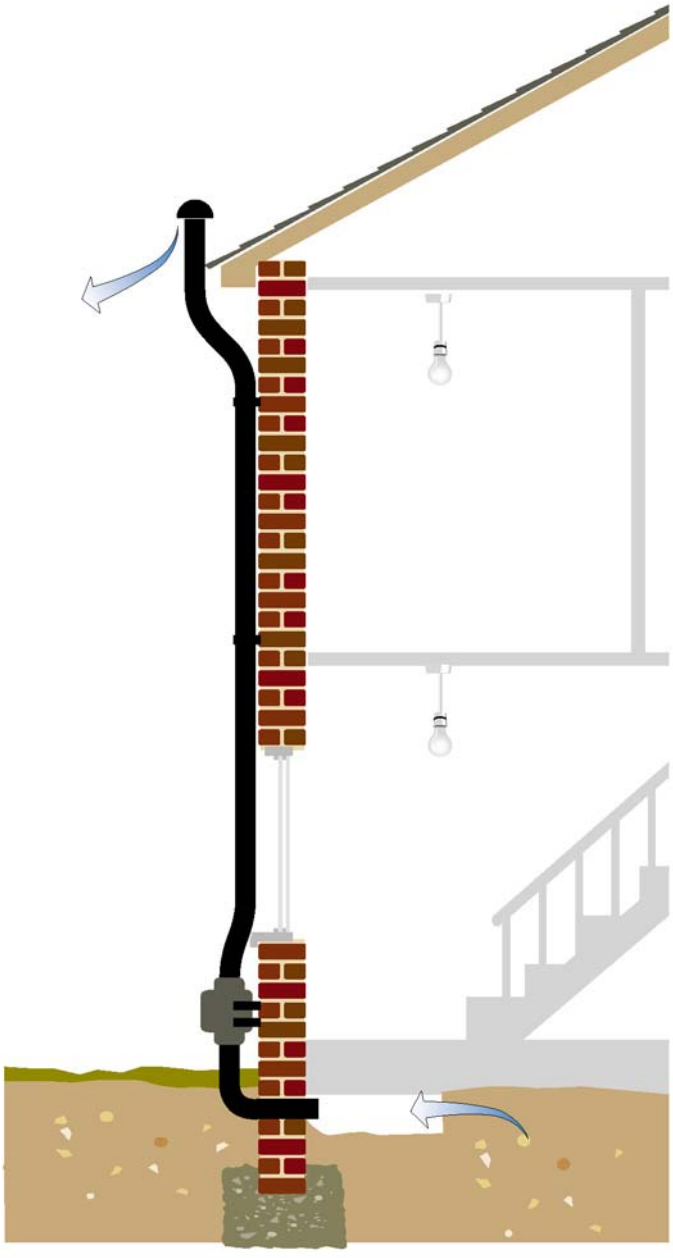
Advantages:
- Easy and unobtrusive installation, condensation reduction.

Disadvantages:
- Only effective in certain properties and at fairly low radon levels. Opening the windows and doors, in summer for example, reduces the effectiveness of the system.

3) Dilution

Radon levels in properties with suspended timber floors can be reduced by increasing the air-flow beneath the floor. Increased air flow is achieved by the use of an in-line fan forcing air from one side of the building and exhausting via airbricks on the other.

Advantages:
- The fan can be mounted beneath the floor and would be unobtrusive.



A sump is excavated under the property and an extract fan exhausts gases to the outside air

Disadvantages:
- Not always successful and fan noise can be a problem.

Recommendations applicable to fan-operated radon reduction systems

The fan of a fan-operated radon reduction system should be supplied by a permanent connection to the fixed wiring of the installation. A fan should not be

connected via a 13A plug and socket arrangement or other removable means.

The supply for a fan-operated radon reduction system should be supplied by one of the following:

- An independent circuit at the dwelling's main distribution board, in which case no other electrical equipment should be connected to the circuit and RCD protection should not be provided, unless necessary for reasons of electrical safety.
- A separate electrically-protected regularly-used local lighting or ring or radial final circuit.

The use of moulded, non-conductive fan assemblies is recommended.

Prior to making an alteration or addition to an electrical installation

No addition or alteration, temporary or permanent, can be made to an existing electrical installation unless it has been ascertained that the rating and condition of any existing equipment is adequate for the altered circumstances and that the earthing and bonding arrangements are adequate (Regulation 130-07-01 of BS 7671 refers).

In the case of a fan-operated radon reduction system, the additional load of the fan placed on an existing circuit will not be large. The installer must ascertain that the rating and condition of the existing circuit is adequate, that the protective device for the existing circuit is suitable and will provide protection for the modified circuit and any other relevant safety provisions are satisfactory.

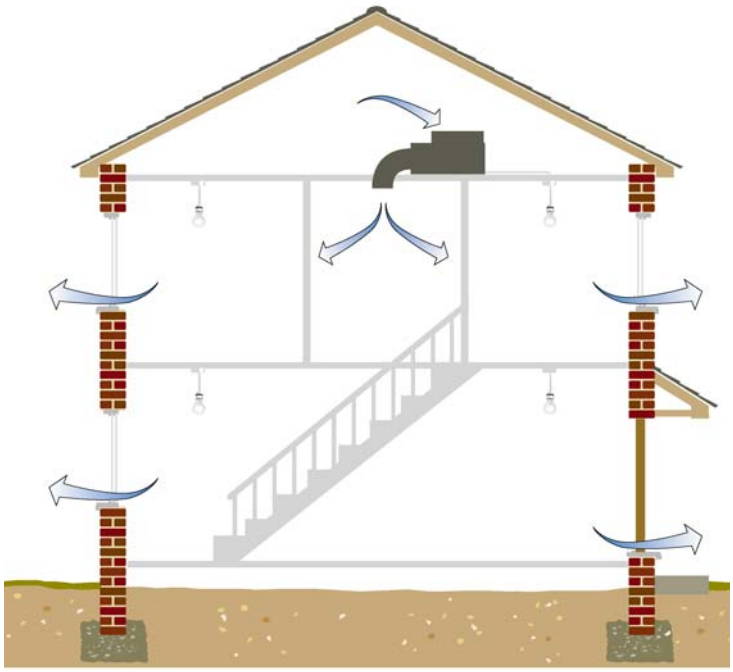
The installer is also required to check that the installation's earthing and bonding arrangements are adequate. The presence and adequacy of a means of earthing for the installation must be checked as must the equipotential bonding arrangements.

Sump and similar ventilation systems using a fan mounted inside the building

Providing the protective device for the existing circuit is suitable and provides protection for the modified circuit, and that other relevant safety provisions are satisfactory, the fan should be supplied from an existing ring or radial final circuit via a fused spur. Isolation at the consumer unit would permit fan replacement or maintenance as necessary.

Sump and similar ventilation systems using a fan mounted outside the building

The external fan selected should be in a dust protected, splash proof housing to IP54 or better. The fan should be mounted on an external wall and due consideration should be taken of external influences such as the possibility of mechanical damage or the ingress of water, for example, due to leaking rainwater gutters and downpipes. External wiring should be minimised. Electrical connection should be made within the building to an existing local ring final or radial circuit via a fused spur. Isolation at the consumer unit would permit fan replacement or maintenance as necessary.



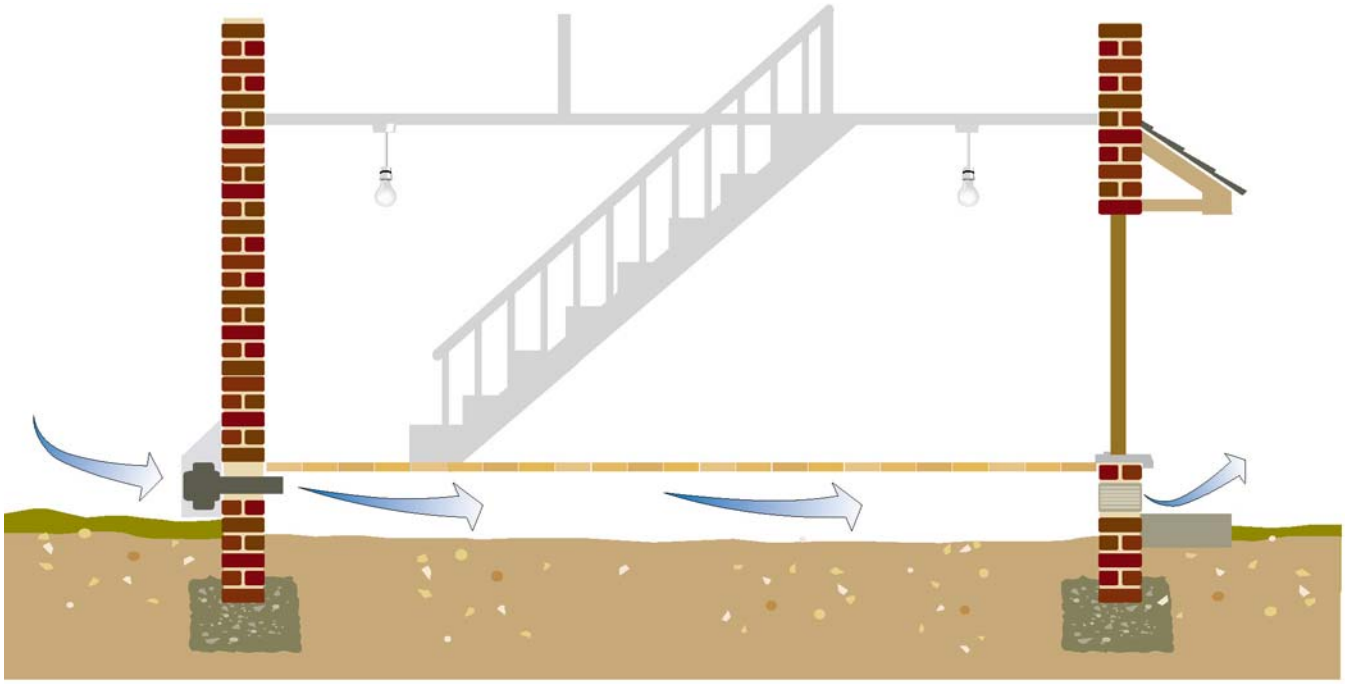
Air from the attic space is blown downwards into the building

Loft mounted positive pressurisation system

The fan should be wired into the existing lighting circuit. A local double pole isolating switch should be provided to permit isolation of the supply so that the fan can be replaced or maintained as necessary without the need to switch off the lighting circuit. Alternatively, such maintenance could be performed by isolating the entire installation at the main switch in the consumer unit.

Inspection, testing and certification

It must be verified that every alteration or addition to an electrical installation complies with the requirements of BS 7671 (Regulation 721-01-02 of that Standard refers). Inspection and testing must be performed. (Chapter 71 refers). Inspection includes



Radon levels in properties with suspended timber floors can be reduced by increasing the air flow beneath the floor

checking that installed electrical equipment is suitable, correctly installed, not damaged so as to impair safety and that the detailed requirements of BS 7671 have been met (Refer to Regulation 712-01-03). Requirements for testing are detailed in Regulation 713 and should include, as a minimum, tests of continuity, insulation, polarity and earth fault loop impedance.

The electrical installer must issue either an Electrical Installation Certificate or Domestic Electrical Installation Certificate if the work involves a new circuit or a Minor Works certificate provided that the alteration or addition to the installation is minor and does not include the provision of a new circuit. A Minor Works certificate could be issued for the addition of a fused spur to an existing ring or radial final circuit or for the addition of a point to an existing lighting circuit.

User instructions

It is important that appropriate documentation and instructions are given to the user of the installation. Such instructions should include:

- An explanation of radon gas and its effects
- An explanation of the need to keep the fan operational
- Routine checks that should be made
- Contact numbers

The Radon Council

The Radon Council is a non-profit making self-regulatory body formed in 1991 in response to calls from the Chairman of a Parliamentary Select committee on Indoor Pollution. The organisation runs full day training courses with an examination, and issues an annual list of contractors who have successfully completed one of its courses and have signed a Code of Practice.

For further information on radon, contact the Radon Council at PO Box 39, Shepperton, Middlesex, TW17 8AD. Telephone 01932 221212 and website www.radonhotline.org.

Another valuable contact is the Building Research Establishment, Bucknalls Lane, Garston, Watford WD25 9XX. Telephone 01923 664707, Fax 01923 664711 or www.bre.co.uk/radon.

The National Radiological Protection Board (NRPB) may be contacted at Chilton, Didcot, Oxon OX11 0RQ, Telephone 01235 831600 and website www.nrpb.org.uk. A free answerphone for householders is available on 0800 614529 and a radon report service on 01235 822784.

INSTALLING RECESSED LUMINAIRES IN CEILINGS

by Bill Allan

THE IEE receives a number of enquiries from designers and installers and others regarding the application of Regulation 527-02-01 when installing recessed luminaries in ceilings in domestic premises. Regulation 527-02-01 is clear enough. It requires that where a wiring system passes through elements of building construction such as floors, walls, roofs, ceilings, partitions or cavity barriers, the openings remaining after passage of the wiring system shall be sealed according to the degree of fire resistance required of the element concerned (if any). The two words in brackets at the end of the Regulation, (if any), highlight the problem. Simply stated, the question is: if an electrician is installing one or more recessed downlighters in a location such as a domestic kitchen, for example, what degree of fire resistance is required? Is any degree of fire resistance required? This question has been highlighted by the introduction of Part P into the Building Regulations. This article will not deal with protection against thermal effects, for which reference should be made to Chapter 42 of BS 7671: 2001 and IEE Guidance Note 4, Protection Against Fire. Reference should always be made to Part B of the Building Regulations for fire safety requirements. For sound insulation requirements, reference should be made to Part E of the Building Regulations. It should be emphasised at the outset that this article is intended to provide guidance, which, it is hoped, will prove helpful; it is recommended that the local building control be consulted for advice.

Fire compartments

Let's begin with a brief review of some theory about fire safety. The spread of fire within a building is restricted by sub-dividing the building into compartments separated from one another by walls and/or floors of fire-resisting construction. There are two reasons for this:

- To prevent the rapid spread of fire that could trap occupants of the building; and
- To reduce the chance of fires becoming large on the basis that large fires are more dangerous not only to occupants and fire service personnel but to people in the vicinity of the building.

Dwellings

Walls that separate semi-detached houses or terraced houses are constructed as fire compartment walls and the houses are considered as separate buildings. Where a domestic garage is attached to a house, (or forms an integral part of it), the garage should be

separated from the rest of the house. In buildings containing flats or maisonettes, every floor is constructed as a fire compartment floor (unless it is within a maisonette, i.e. between one storey and another within one dwelling) and every wall that separates a flat or a maisonette from any other part of the building is constructed as a fire compartment wall. Otherwise, the walls and ceilings within detached, semi-detached and terraced houses are not constructed as fire compartment walls and ceilings.

Installing downlighters in ceilings that are not fire compartments

Downlighters are commonly installed in locations such as kitchen ceilings, which are not fire compartment ceilings. But because they are not fire compartment ceilings does not mean that they don't require some degree of fire resistance. The minimum fire resistance of a floor in a two-storey house, for example, is given in Appendix A of Approved Document B , 'Fire Safety', as 30 minutes (See Table A1). The idea is that, in a fire situation, the floor will not collapse for at least 30 minutes, enabling building occupants to leave safely.

Downlighters are usually made of steel or aluminium and have a diameter of approximately 50mm (the holes themselves being about 60mm). Common sense suggests that cutting a number of holes in the plasterboard ceiling of a timber joisted floor may compromise its fire resistance capability. One measure to help the situation is to keep the number of downlighters in any one area to a minimum and to space them as far apart as possible. Solutions proposed to restore the integrity of the ceiling's fire resistance include building a plasterboard box around luminaires or installing commercially available 'fire hoods'. But is it necessary to restore the fire resistance capability of ceilings?

The TTL tests

In 1996, the DoE and TRADA commissioned TRADA Technology Limited (TTL), a member of the TTL Chiltern group of companies, to test the effect of recessed downlighters (with no boxing in or fire hoods) on the fire resistance of plasterboard ceilings with conventional rectangular joists. TTL has been involved in fire research and testing for many years and is the UK's leading authority on the fire protection of timber. During 1994/95, TTL carried out the tests. The results of the tests were published in the July 1996 edition of Building Control magazine. These results were, perhaps, surprising in that they confirmed that downlighters, even without being boxed in and with no fire hoods, in plasterboard ceilings have little significant effect on fire resistance ratings up to 30 minutes. It must be inferred from these tests therefore, that, at least with plasterboard ceilings with conventional rectangular joists, it is not necessary to 'box in' luminaries or to use fire hoods for the purpose of restoring the fire resistance capability of ceilings which are not of fire compartment construction.

Downlighters in ceilings under roof spaces

However, in situations where downlighters are installed in ceilings under roof spaces, where debris or thermal insulation may accumulate on top of the luminaire, a case could be made for building a plasterboard or metal box around the luminaire or installing a fire hood. When boxing in a luminaire, in the absence of any manufacturers' guidance, a gap of about 100mm around the luminaire and 75mm above is recommended to allow for heat dissipation.

Downlighters in flats and maisonettes

As mentioned earlier, in buildings containing flats or maisonettes, floors are constructed as fire compartment floors. However, suspended ceilings, comprising metal grids and plasterboard with voids of approximately three inches, are frequently installed for sound insulation and to hide services. Where suspended ceilings have been installed in flats and maisonettes, they can conveniently be utilised to install downlighters without fireproofing. In Scotland, the Building Regulations don't allow downlighters to be installed in fire compartment ceilings if they are timber-based, unless a suspended ceiling has been provided. It is understood that this requirement is to reduce noise transmission between dwellings.

Installing downlighters in fire compartment ceilings

For fire compartments to be effective, there must be continuity at the junctions of the fire-resisting elements that enclose them, and any openings from one compartment to another should not present a weakness. Section 9 of Approved Document B, 'Fire Safety' permits openings to be made in compartment walls and floors for certain purposes, including the passage of pipes, etc, that meet the provisions in Section 11. Clearly, the requirements of Approved Document B must be satisfied when installing downlighters in fire compartment ceilings. The advisability of keeping the number of downlighters in any one area to a minimum and to space them as far apart as possible was mentioned earlier but it is especially important when installing downlighters in fire compartment ceilings. As the period of fire resistance for fire compartment ceilings will be at least 60 minutes, it will be necessary to restore their fire resistance capability. The use of fire hoods or 'boxing in' of luminaries could be considered as a way of achieving this. Any openings remaining after the installation of downlighters must be sealed according to the degree of fire resistance required of the ceiling. The fire resistance of a fire compartment floor is typically 60 minutes but reference should be made Table A2 of the above document.

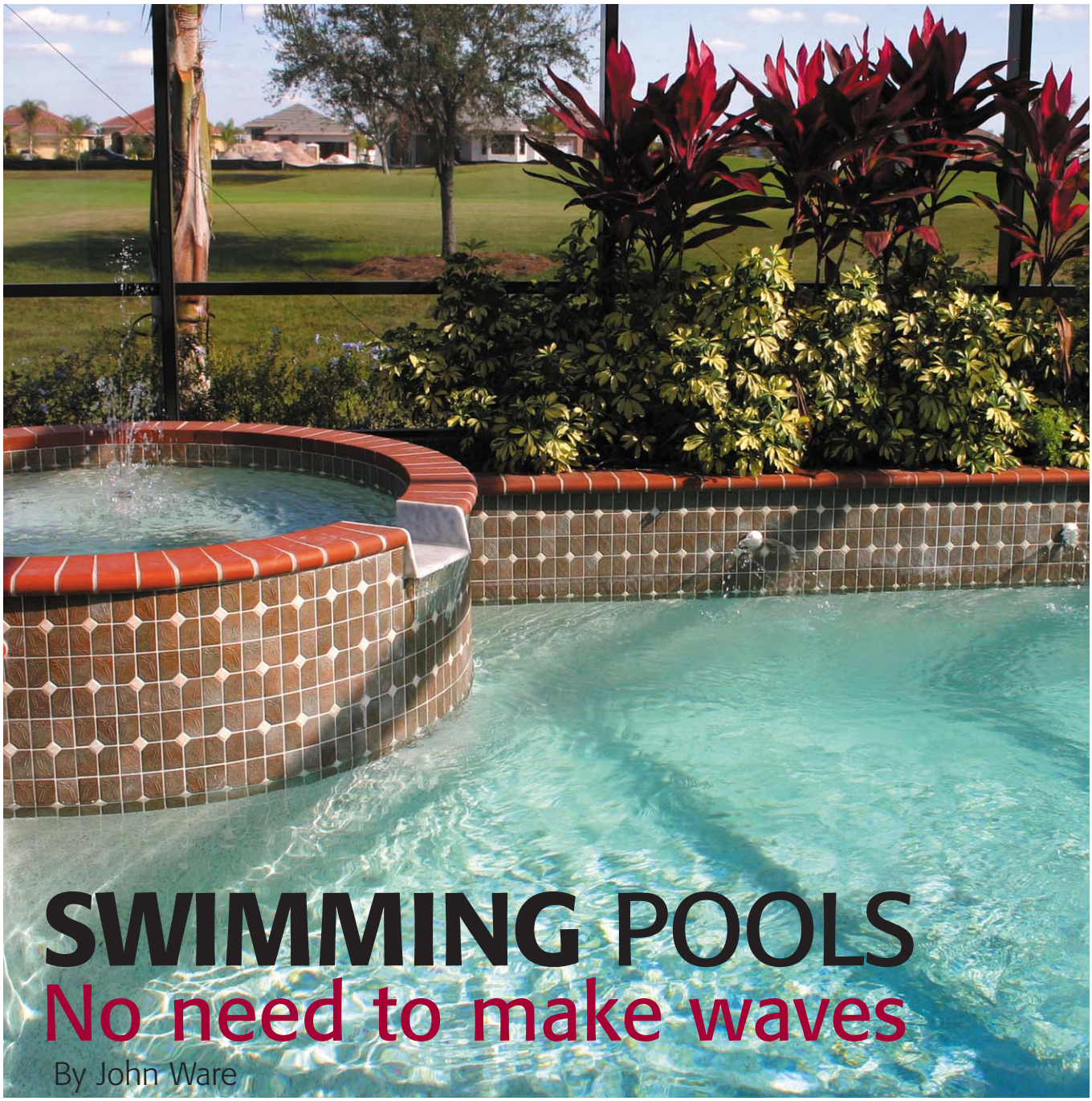
Smoke alarms

It would seem remiss not to mention that The Building Regulations 2000 and the Building Standards (Scotland) Regulations 1990 require all new and refurbished dwellings to be fitted with mains-operated smoke alarms, which may have a secondary power supply such as a battery (either rechargeable or replaceable) or a capacitor. These must be installed in accordance with BS 5839, Part 6: 2004. Such alarms, along with the fire resistance capability of building elements, are an important part of the strategy for protecting building occupants in case of fire. They would, after all, be reasonably expected to operate within minutes of a smoke situation developing.

Conclusion

It should be pointed out that manufacturers' instructions must be followed when installing downlighters. It is hoped that this article will prove helpful in the application of Regulation 527-02-01 to the installation of downlighters.

For such installations, it is recommended that the local authority building control be consulted.



SWIMMING POOLS

No need to make waves

By John Ware

The IEE's technical helpline continues to receive regular questions about Section 602 – Swimming Pools, which include queries on the zonal concept and earthing and bonding. This article is intended to provide guidance that, it is hoped, will prove helpful.

A SWIMMING POOL will often form part of a sports complex, however, these days, swimming pools are becoming commonplace and are often installed for home use.

The increased risk associated with swimming pools is that of electric shock due to a reduction of body resistance because a person is wet and, also, the possibility that a person is in contact with Earth potential. Because of this risk, additional requirements for safety above and beyond the general requirements placed by BS 7671 apply to basins of swimming pools and paddling pools and their surrounding zones. The additional requirements are detailed in Section 602 of BS 7671.

Zonal concept

The basins of swimming pools and their surrounding areas are divided into zones A, B and C for shock protection purposes and for the purpose of selecting suitable equipment.

Protection against electric shock

In zones A and B, protection against electric shock must be achieved by one of the following:

■ SELV. The SELV nominal voltage must not exceed 12V a.c. or 30V d.c. and the safety source must be installed outside of zones A, B and C.

■ If floodlights are required in zones A or B, each floodlight must be supplied at an open-circuit voltage not exceeding 18V from its own transformer or from its own winding of a multi-secondary transformer

■ Socket-outlets should not normally be installed in zone B. For a smaller swimming pool, where it is not possible to install the socket-outlets outside of zone B, the socket-outlets must be protected by an RCD with a residual operating current not exceeding 30mA or by electrical separation (Regulation 602-07-01 refers).

The following, rather uncommon, measures of protection against electric shock must not be used in any zone of a swimming pool:

■ Obstacles and Placing out of reach (for protection against direct contact)

■ Non-conducting location and Earth-free equipotential bonding (for protection against indirect contact)

Supplementary equipotential bonding

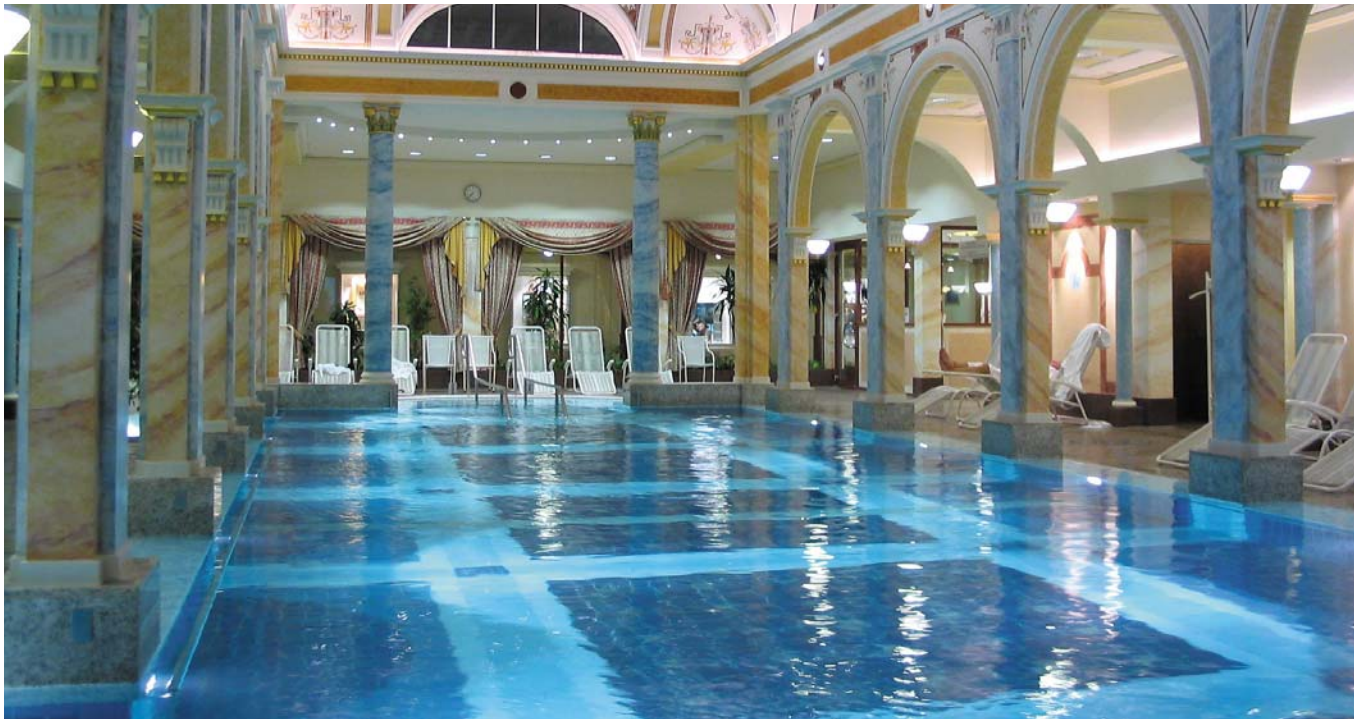
Supplementary equipotential bonding (or 'supplementary bonding' for short) is a complementary measure for protection against indirect contact that is required for locations containing a swimming pool. Supplementary bonding involves connecting together the conductive parts (exposed and extraneous) of electrical items and non-electrical items to prevent the occurrence of a voltage between them under earth fault conditions. Such a voltage could present a risk. Where supplementary bonding is necessary, it must connect together the exposed-conductive-parts of equipment in the circuits concerned including the earthing terminal of socket-outlets and extraneous-conductive-parts. (Regulation 413-02-27 refers).

Local supplementary bonding is required in zones A, B and C to connect together all extraneous-conductive-parts (which could include metal handrails, pipes, exposed steelwork, etc) and the protective conductor of all exposed-conductive-parts, irrespective of whether the conductive parts are simultaneously-accessible. If a metallic grid is installed, it must be connected to the supplementary bonding – but note that there is no requirement to provide such a grid.

Supplementary equipotential bonding must not be connected to SELV circuits.

Protective Multiple Earthing

Protective Multiple Earthing (PME) is an earthing arrangement commonly used by electricity distributors for their distribution networks where the supply neutral conductor provides the function of both neutral conductor and protective conductor (A TN-C-S system). Where PME is used, the public supply neutral conductor is referred to as the PEN (combined protective and neutral) conductor or CNE (combined neutral and earth) conductor and to improve the security of the earthing arrangements, the neutral conductor is earthed at several



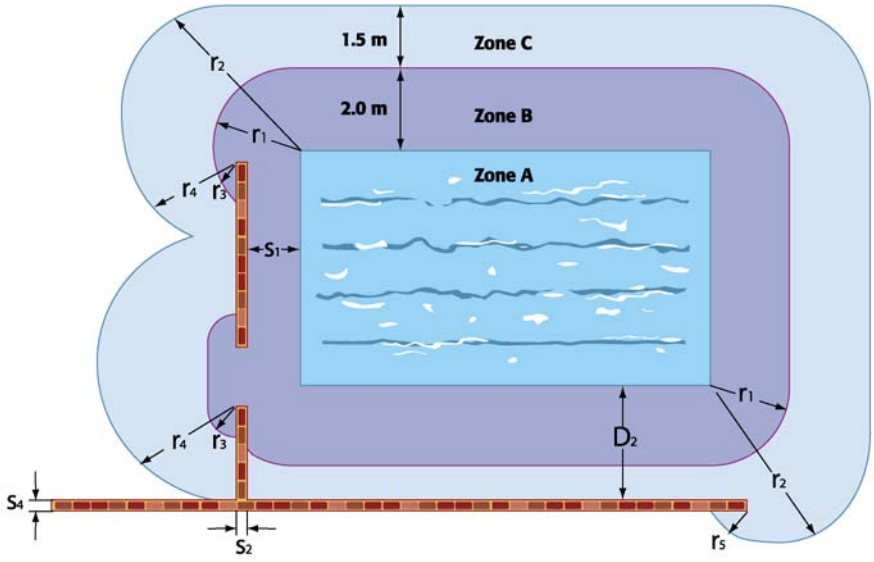
points (multiple-earthed). The Electricity Safety, Quality and Continuity Regulations (ESQCR) 2002 permit an electricity distributor to provide a consumer with an earthing terminal which is connected to the supply neutral conductor.

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 the installation designer may decide not to employ it because of the possibility of perceived electric shock within the installation or the possible danger from a broken PEN conductor.

Perceived electric shock

A small voltage difference may exist, under normal operating conditions, between the PME earthing terminal at the origin of an installation and 'true' Earth potential. The potential difference is due to the voltage drop

Zone	Minimum degree of protection
A	IPX8
B	IPX5 IPX4 where water jets are not likely to be used for cleaning
C	IPX2 for indoor pools IPX4 for outdoor pools IPX5 where water jets are likely to be used for cleaning



The zonal concept for a particular swimming pool

in the PEN conductor caused by load current returning to the source of the supply through the PEN conductor which has a certain impedance. The small voltage, above Earth potential could, under certain conditions such as reduced body resistance due to the presence of water, create the possibility of a perceived electric shock for a person simultaneously in contact with a conductive part (for example, a handrail that is connected to the supplementary bonding) and 'Earth potential' (for example, an uninsulated, wet, solid floor). Electricity distributors have in the past received complaints of perceived electric shock by persons in such locations.

In order to avoid the risk of perceived electric shock, the installation within the location containing a swimming pool may be made part of a TT system. In such a system, the exposed-conductive-parts and the extraneous-conductive-parts within the location are separated from the PME earthing terminal and the installation in the location is configured to meet all the associated requirements of BS 7671 applicable to a TT system including being connected to earth by a suitable installation earth electrode.

Broken PEN conductor

Under very exceptional circumstances, the supply PEN conductor connection to an installation could be lost due to a failed joint. Where the phase conductor remains unbroken, a risk of electric shock from exposed-conductive-parts and extraneous-conductive-parts could forseeably arise. In most installations, the main equipotential bonding plays an important role in protecting against the danger from the loss of a PEN conductor.

External influences and accessibility

Each item of electrical equipment in the electrical installation must be selected and erected to take account of the external influences at the particular place where it is installed (Section 522 refers). In a swimming pool environment the presence of water (Regulation 522-03) and corrosive or polluting substances (Regulation 522-06) are of particular concern. The general requirements of Section 522 are supplemented by the additional requirements placed in

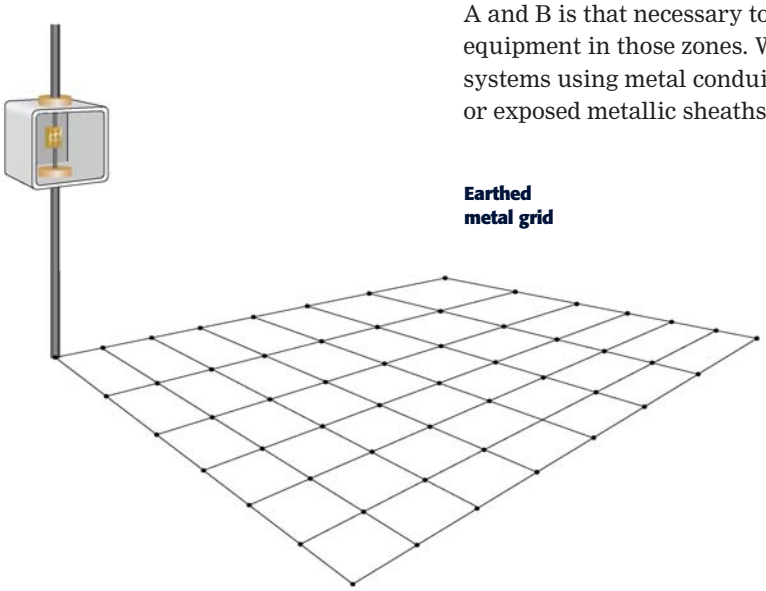
Section 602, which require that the minimum degrees of protection are as indicated in the table in this article.

All electrical equipment must be accessible, for example, luminaries should not be mounted over water unless suitable access is available.

Types of socket-outlet

A socket-outlet must be either:

- An industrial type complying with BS EN 60309-2; or
- A shaver socket-outlet complying with BS EN 60742[1] Chapter 2 Section 1.



Zones A and B

Switchgear, controlgear and accessories are not to be installed. Only current-using equipment specifically designed for a swimming pool application may be installed. Socket-outlets may be installed in zone B providing they are more than 1.25m from the border of zone A, 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 A and B is that necessary to supply equipment in those zones. Wiring systems using metal conduit, trunking or exposed metallic sheaths is not permitted. Exposed earthing or bonding conductors must not be used; neither must metal enclosures or metal junction boxes.

Zone C

Except for instantaneous water heaters, equipment in zone C must be protected by a 30 ma RCD, SELV, or electrical separation.

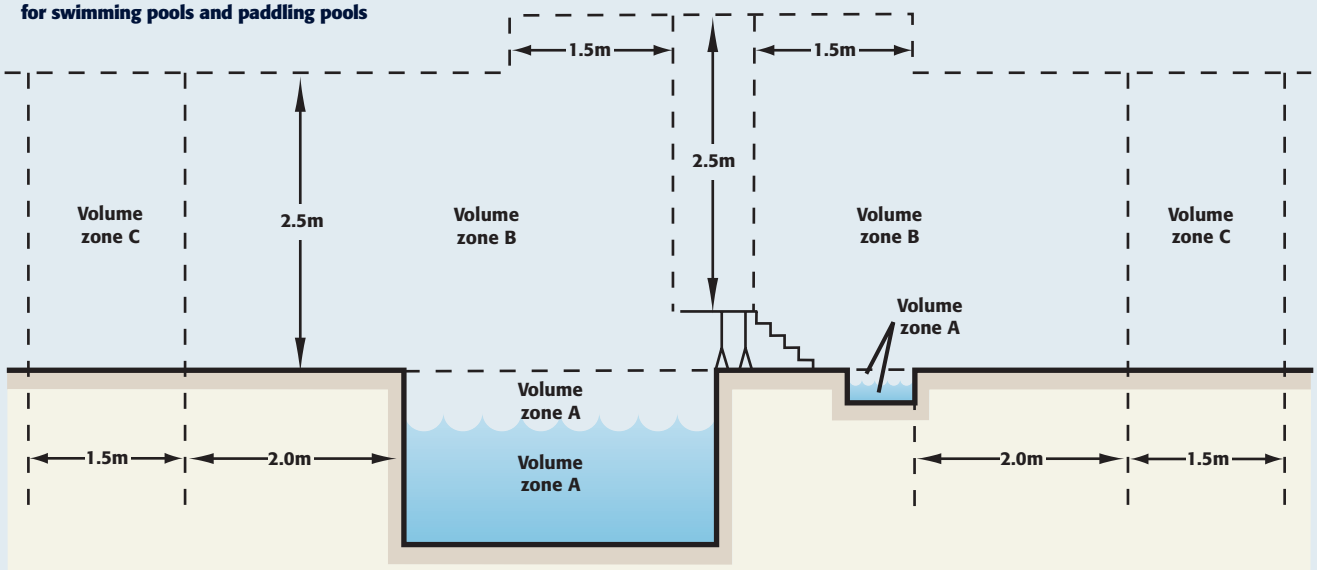
A socket-outlet, switch, accessory is permitted in zone C but must be protected by electrical separation, SELV, a 30 mA RCD. Shaver socket-outlet complying with BS EN 60742(1) Chapter 2 Section 1 are permitted. Cords of cord-operated switches are permitted in zone C.

Electric heating embedded in the floor

Electric heating embedded in the floor is permitted in zones B or C and must either incorporate a metallic sheath or be covered by an earthed metallic grid. In either case, the sheath or the grid must be connected to the local supplementary bonding.

[1] BS EN 60742 has been superseded by BS EN 61558-2-5.

Extract from BS 7671, Fig 602A- zone dimensions for swimming pools and paddling pools



NOTE: The dimensions are measured taking account of walls and fixed partitions