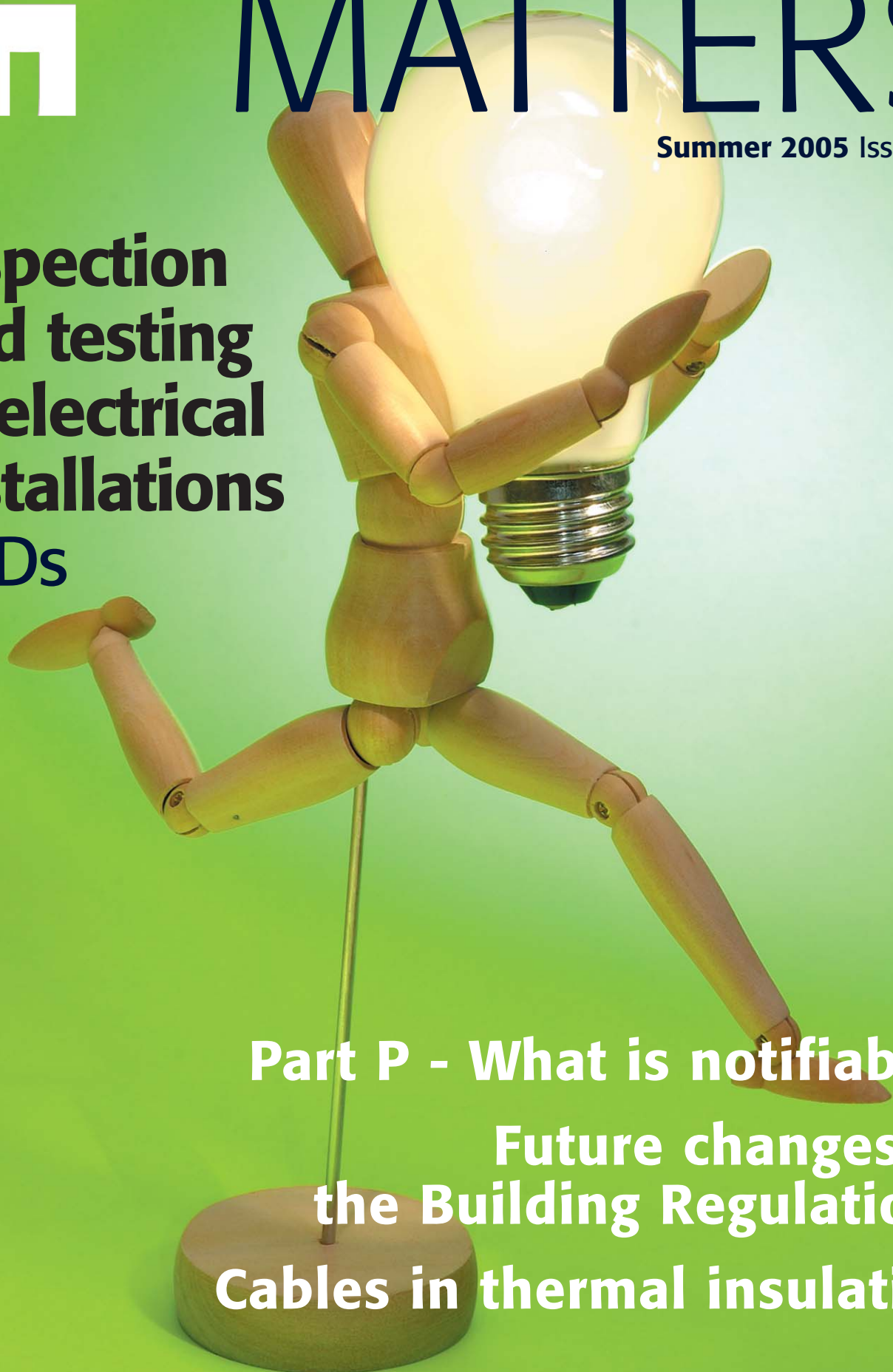




[?]WIRING MATTERS

Summer 2005 Issue 15

**Inspection
and testing
of electrical
Installations
RCDs**



Part P - What is notifiable?
**Future changes to
the Building Regulations**
Cables in thermal insulation



By kind permission of MK

INSPECTION AND TESTING OF ELECTRICAL INSTALLATIONS

RESIDUAL CURRENT DEVICES

By Mark Coles

The IEE receives many enquiries relating to the inspection and testing of electrical installations and the applicable requirements of BS 7671: 2001 (2004). The queries vary greatly and cover all aspects of inspection and testing, from the initial verification process of domestic installations to the periodic inspection of major industrial installations. In this, the first of a series of articles, we will look at Residual Current Devices (RCDs).

1. What is an RCD and what does it do?

An RCD is defined, in BS 7671, as: *'A mechanical switching device or association of devices intended to cause the opening of the contacts when the residual current attains a given value under specified conditions'.*

An RCD is a protective device used to automatically disconnect the electrical supply when an imbalance is detected between live conductors. In the case of a single-phase circuit, the device monitors the difference in currents between the phase and neutral conductors. In a healthy

circuit, where there is no earth fault current or protective conductor current, the sum of the currents in the phase and neutral conductors is zero. If a phase to earth fault develops, a portion of the phase conductor current will not return through the neutral conductor. The device monitors this difference, operates and disconnects the circuit when the residual current reaches a preset limit, the residual operating current ($I_{\Delta n}$).

RCDs are used to provide protection against the specific dangers that may arise in electrical installations including:

- > protection against indirect contact
- > supplementary protection against direct contact
- > protection against fire and thermal effects

An RCD on its own does not provide protection against overcurrents. Overcurrent protection is provided by a fuse or a miniature circuit-breaker (MCB). However, combined RCD and MCBs are available and are designated RCBOs.

	Type of RCD	Description	Usage
RCCB	Residual current operated circuit-breaker without integral overcurrent protection	Device that operates when the residual current attains a given value under specific conditions	Consumer units Distribution boards
RCBO	Residual current operated circuit-breaker (RCCB) with integral overcurrent protection	Device that operates when the residual current attains a given value under specific conditions and incorporates overcurrent protection	Consumer units Distribution boards
CBR	Circuit-breaker incorporating residual current protection	Overcurrent protective device incorporating residual current protection.	Distribution boards in larger installations
SRCD	Socket-outlet incorporating an RCD	A socket-outlet or fused connection unit incorporating a built-in RCD.	Often installed to provide supplementary protection against direct contact for portable equipment used out of doors
PRCD	Portable residual current device	A PRCD is a device that provides RCD protection for any item of equipment connected by a plug and socket. Often incorporates overcurrent protection	Plugged into an existing socket-outlet. PRCDs are not part of the fixed installation
SRCBO	Socket-outlet incorporating an RCBO	Socket-outlet or fused connection unit incorporating an RCBO	Often installed to provide supplementary protection against direct contact for portable equipment used out of doors

2. Types of RCDs

RCD is the generic term for a device that operates when the residual current in the circuit reaches a predetermined value.

The list above indicates the different types of RCD available, a description of each device and examples of how the device is used.

2.1 Older installations with ELCBs

Historically, two basic types of earth-leakage circuit-breaker (ELCB) were

recognised by the Regulations; the familiar current-operated type and the earlier voltage-operated type. The voltage-operated type ceased to be recognised by the Regulations in 1981 and today, only the current-operated type is recognised. The voltage-operated device can be distinguished by its two separate earthing terminals – one for the connection of the earthing conductor of the installation and the other for a connection to a means of earthing. Such devices were

often used on installations forming part of a TT system where the means of earthing was an earth electrode. The major drawback with the voltage-operated earth leakage circuit-breaker is that a parallel earth path can disable the device.

2.2 Recognised devices

RCDs are manufactured to harmonised standards and can be identified by their BS EN numbers. An RCD found in an older installation may not provide



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. To receive a free copy of Wiring Matters email: advertising@iee.org.uk

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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 | ERA Technology Limited – M Coates | British Cables Association – C Reed

protection in accordance with current standards. The following list identifies the applicable current standards:

> **BS 4293 : 1983 (1993)**

Specification for residual current operated circuit-breakers. (Replaced by BS EN 61008-1: 1995, BS EN 61008-2-1: 1995 and BS IEC 61008-2-2: 1990). This Standard remains current

> **BS 7071 : 1992 (1998)**

Specification for portable residual current devices

> **BS 7288 : 1990 (1998)**

Specification for socket-outlets incorporating residual current devices. (SRCDs)

> **BS EN 61008-1 : 1995 (2001)**

Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs)

> **BS EN 61009-1 : 2004**

Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs)

2.3 Characteristics of RCDs

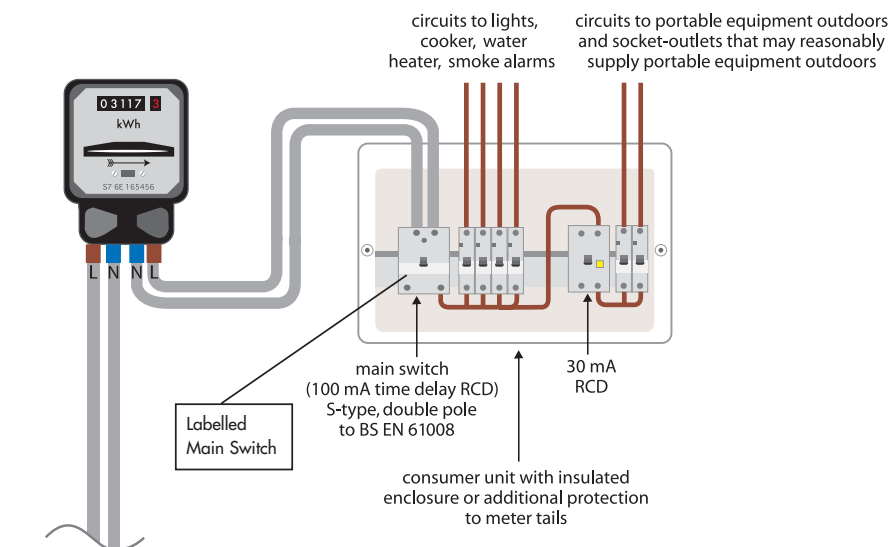
RCDs are defined by a series of electrical characteristics, three main characteristics are:

1. The rating of the device in amperes, I.
2. The rated residual operating current of the protective device in amperes, I_{Δn}.
3. Whether the device operates instantaneously or incorporates an intentional time delay to permit discrimination. Such devices are called 'S' or Selective.

Devices are manufactured with different values of rated current and rated residual operating current but we will just consider the rated residual operating current of the protective device in amperes, I_{Δn}.

3. Applications

The correct device must be selected for



Above: Discrimination achieved

the particular application. Choosing the wrong device could have serious consequences and could result in electric shock or fire.

The list overleaf gives examples of particular applications of RCDs and includes references to the relevant Regulations in BS 7671.

3.1 Unwanted tripping

Unwanted tripping of RCDs can occur when a protective conductor current or leakage current causes unnecessary operation of the RCD. An RCD must be so selected and the electrical circuits so subdivided that any protective conductor current that may be expected to occur during normal operation of the connected load(s) will be unlikely to cause unnecessary tripping of the device (Regulation 531-02-04 refers). Such tripping can occur on heating elements, cooking appliances etc., which may have elements that absorb a small amount of moisture through imperfect element-end seals when cold. When energised, this moisture provides a conductive path for increased leakage and could operate the RCD. The moisture dries out as the element heats up. Although not precluded in BS 7671, it is not a

requirement to use an RCD on such circuits if other satisfactory means of protection are available. Providing an RCD with a higher rated residual operating current may solve the problem but the requirements of the Regulations would still have to be met.

3.2 Discrimination

Where two, or more, RCDs are connected in series, discrimination must be provided, if necessary, to prevent danger (Regulation 531-02-09 refers). During a fault, discrimination will be achieved when the device electrically nearest to the fault operates and does not affect other upstream devices.

Discrimination will be achieved when 'S' (Selective) types are used in conjunction with downstream general type RCDs. The 'S' type has a built-in time delay and provides discrimination by simply ignoring the fault for a set period of time allowing more sensitive downstream devices to operate and remove the fault.

For example, when two RCDs are connected in series, to provide discrimination, the first RCD should be an 'S' type. RCDs with built in time delays should not be used to provide personal protection.

RCD, $I_{\Delta n}$	Application	Regulation
10mA	A very sensitive device that is sometimes used to protect laboratory benches in schools	412-06-02
30mA	Portable equipment used outdoors must be protected by an RCD with a rated residual operating current not exceeding 30mA	471-16-01 412-06-02
30mA	Certain equipment in bathrooms and shower rooms must be protected by a 30mA RCD. For example, a 230V fan in zone 1 of a bathroom, that cannot be located elsewhere, must be protected by a 30mA device and must have an IP rating of at least IPX4 (IPX5 if hosed down)	601-09-02 601-06-01
30mA	Mains-supplied socket-outlets in bedrooms with showers must be protected by an RCD. Note that such socket-outlets must be located outside of the zones	601-08-02
30mA	Socket-outlets in workshops, school laboratories, used by performers and entertainers. Street market stalls are often protected by 30mA RCDs.	412-06-02
30mA	In zone C of swimming pool installations, luminaires must be protected either by electrical separation, SELV or a 30mA RCD.	602-08-03
30mA	Any socket-outlet used on a building site must be to BS EN 60309-2 and must be protected by a 30mA RCD.	604-08-03 604-12-02
30mA	Caravans, motor caravans and caravan parks. 30mA RCDs must be provided both in the vehicle and the park installation.	608-03-02 608-07-04 608-04-01
30mA	Caravan pitch socket-outlets – Each socket-outlet must be protected individually by an overcurrent device, which may be a fuse but is more usually a circuit-breaker and either individually or in groups of not more than three socket-outlets by an RCD having the characteristics specified in Regulation 412-06-02. Note: the CENELEC harmonisation document HD 384.7.708 allows only three sockets to one RCD while the international standard IEC 364-7-708 permits six.	608-13-04 608-13-05
30mA	Underfloor heating systems are installed in bathrooms and swimming pools supplied at voltages other than SELV, the heating element should be provided either with a metallic sheath or screen overall or a metallic grid installed above the heating elements. The screen or grid shall be incorporated within the supplementary bonding for the facility. In addition, the supply to the heating elements should be protected by an RCD with a residual operating current not exceeding 30mA.	601-09-04
100mA	For an installation forming part of a TT system, a 100mA RCD is generally installed at the origin. A time-delayed or 100mA 'S-type' (or selective) device is often used to permit discrimination with a downstream 100mA device	413-02-19 531-02-09 314-01-02
100mA	Where an RCD is fitted only because the earth loop impedance is too high for shock protection to be provided by an overcurrent device, for example in a TT system	413-02-16
100mA	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. However, there are areas of special risk within or outside buildings and there are special situations and installations where it is appropriate to take additional measures for part or all of the installation. Alternatively, it may be appropriate not to use the PME earthing terminal and provide earth fault protection with a separate earth electrode and RCD. Seek advice from the local supply authority when exporting PME supplies.	413-02-17
300mA	In TN and TT systems, in locations with risks of fire due to the nature of processed or stored materials, wiring systems, except for MICC and busbar trunking systems must be protected against insulation faults to earth by a 300mA device	482-02-06
500mA	In agricultural and horticultural premises, a 500mA device must be installed to protect equipment against fire and harmful thermal effects, other than that essential to the welfare of livestock.	605-10-01
500mA	At exhibitions, shows & stands, where there is increased risk of damage to cables, distribution circuits should be protected by an RCD with a residual operating current not exceeding 500mA.	GN7, p95
Adjustable ≤2000 mA	Devices with a residual operating current of 2A or more are sometimes used in specific industrial and distribution applications. Advice must be sought from the designer	531-02-10

Device	Instrument test current setting	Satisfactory result
General purpose RCDs to BS 4293 and RCD protected socket-outlets to BS 7288	50% of operating current	Device should not operate
	100% of operating current	Device should operate in less than 200ms. Where the RCD incorporates an intentional time delay it should trip within a time range from 50% of the rated time delay plus 200ms' to 100 % of the rated time delay plus 200ms
General purpose RCCBs to BS EN 61008 or RCBs to BS EN 61009	50% of operating current	Device should not operate
	100% of operating current	Device should operate in less than 300ms unless it is of 'Type S' (or selective) which incorporates an intentional time delay. In this case, it should trip within a time range from 130ms to 500ms
Supplementary protection against direct contact $I_{\Delta n} \leq 30\text{mA}$	Test current at 5 $I_{\Delta n}$ The maximum test time must not be longer than 40ms, unless the protective conductor potential does not exceed 50V. (The instrument supplier will advise on compliance).	Device should operate in less than 40ms.

4. Labelling

Regulation 514-12-02, states that:

"Where an installation incorporates a residual current device a notice shall be fixed in a prominent position at or near the origin of the installation. The notice shall be in indelible characters not smaller than those here illustrated and shall read as follows:"

This installation, or part of it, is protected by a device which automatically switches off the supply if an earth fault develops. Test quarterly by pressing the button marked 'T' or 'Test'. The device should switch off the supply and should then be switched on to restore the supply. If the device does not switch off the supply when the button is pressed, seek expert advice.

5. Testing

RCDs must be tested. The requirements are stated in the following Regulations:

- The effectiveness of the RCD must be verified by a test simulating an appropriate fault condition and independent of any test facility, or

test button, incorporated in the device (Regulation 713-13-01)

- Where an RCD of 30mA provides supplementary protection the operating time must not exceed 40 ms at a residual current of 5 $I_{\Delta n}$. (Regulation 412-06-02 refers)

Tests are made on the load side of the RCD between the phase conductor of the protected circuit and the associated cpc. Any load or appliances should be disconnected prior to testing. RCD test instruments require a few milliamperes to operate; this is normally obtained from the phase and neutral of the circuit under test. When testing a three-phase RCD protecting a three-wire circuit, the instrument's neutral is required to be connected to earth. This means that the test current will be increased by the instrument supply current and will cause some devices to operate during the 50% test, possibly indicating an incorrect operating time. Under this circumstance it is necessary to check the operating parameters of the RCD with the

manufacturer before failing the RCD.

5.1 Range of tests

While the following tests are not a specific requirement of BS 7671, it is recommended that they are carried out.

5.2 Integral test device

An integral test device is incorporated in each RCD. This device enables the mechanical parts of the RCD to be verified by pressing the button marked 'T' or 'Test'.

6. Test Instrument

The test instrument used to test RCDs should be capable of applying the full range of test current to an in-service accuracy, as given in BS EN 61557-6. This in-service reading accuracy will include the effects of voltage variations around the nominal voltage of the tester. To check RCD operation and to minimise danger during the test, the test current should be applied for no longer than 2s. Instruments conforming to BS EN 61557-6 will fulfil the above requirements. ■

ESTABLISHING CURRENT RATINGS FOR CABLES IN THERMAL INSULATION

by John Ware

THE IEE recently commissioned ERA Technology Ltd to perform a series of tests to establish the accuracy of the derating factors given in BS 7671 for flat twin-and-earth cables installed in the increased thicknesses of loft insulation now being installed in dwellings. The results will be used to provide tables of standard circuits for cables in thermal insulation in future IEE publications such as the Electrician's Guide and the Guidance Notes.

Test setup

A thermally insulated ceiling was constructed in the laboratory and flat twin-and-earth cable run in three positions, as shown in fig 1. The three positions are:

- (a) laid flat along the ceiling
- (b) clipped to the side of a joist at the bottom (in contact with the ceiling), and
- (c) clipped to the side of a joist at the top.

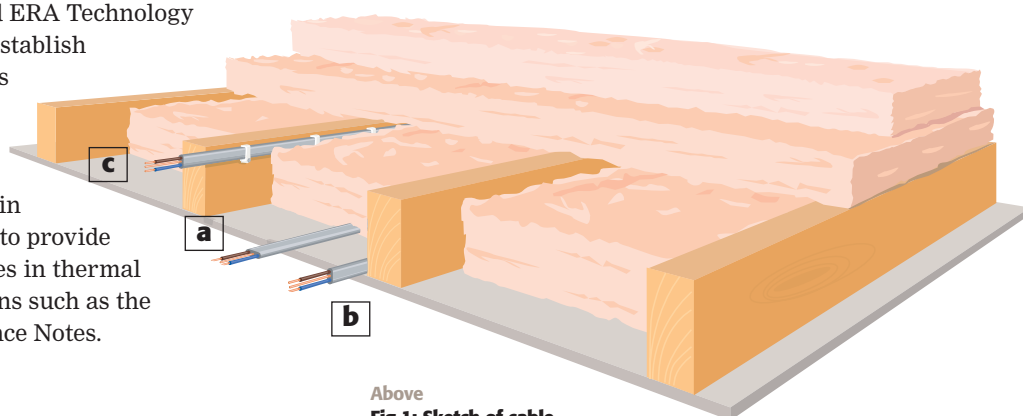
The ceiling was then covered with a 100mm layer of mineral wool insulation. The cables were energised and the test results recorded.

Results

Table 1 illustrates the results for three sizes of cable and three thicknesses of insulation. The series of tests also produced information concerning time constants and results for cables run at 90°C.

Time constants

The time constant of a cable is defined as the time taken for the cable to reach 63.2% of its final temperature after a change in the load. The time constant for each cable, installed at the top of the joist



Above

Fig 1: Sketch of cable and insulation arrangements

with 270mm of insulation, was derived from the chart recorder plots. Examples of the temperature plots for these time constants are reproduced in fig 2.

Cables operating at 90°C

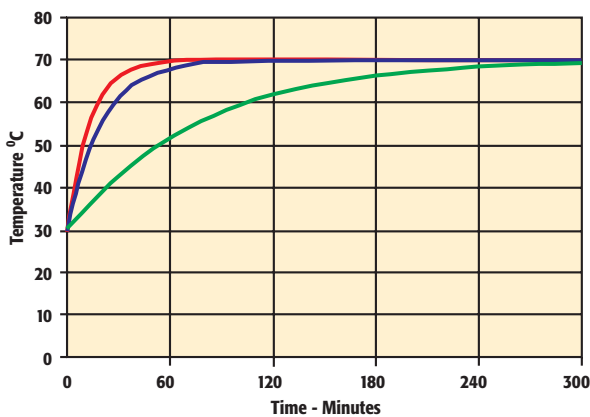
Certain cables are permitted to run at 90°C. However, a problem arises as most accessories are rated to 70°C. The installation may be configured such that there is a length of cable beyond the thermal insulation, prior to connection to an accessory. Such an exposed length of cable would allow cooling so that the 70°C accessory was not subject to excessive temperatures. The graph (fig 3) indicates that approximately 0.5m of cable should be allowed beyond the thermal insulation if an accessory rated at 70 °C is fitted to a cable operating at 90°C within thermal insulation.

Conclusions

The current rating of any selected cable was highest when it was installed along the bottom of the joist.

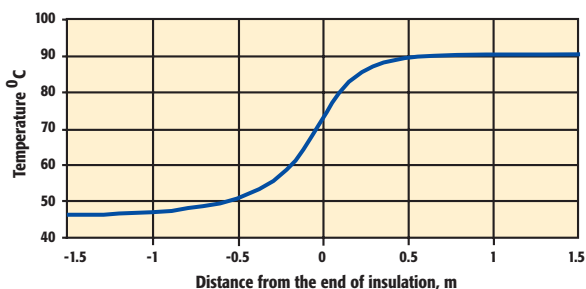
Cable size (mm ²)	Current rating (A)		
	Top of joist		
	100	270	440
2.5	21	17.5	16.7
6	34	28	27
16	57	45	46
Cable size (mm ²)	Bottom of joist		
2.5	22	22	21
6	36	35	34
16	62	60	58
Cable size (mm ²)	Laid on the ceiling		
2.5	19.7	18.7	18.6
6	36	35	34
16	59	57	55

Above Table 1: Corrected current ratings for insulation thicknesses 100, 270 and 440 mm for cables of 2.5, 6 and 16 mm²



Above Fig 2: Temperature rise curves.

The red curve represents the temperature rise curve for 2.5 mm² twin-and-earth flat cable.
The blue curve represents the temperature rise curve for 6 mm² twin-and-earth flat cable.
The green curve represents the temperature rise curve for 16 mm² twin-and-earth flat cable.



Above Fig 3 Temperature profile along a cable

This cable is in contact with both the joist and the ceiling. The current ratings derived from the tests have, within the limits of experimental accuracy, confirmed a number of points.

1) The ratings given in BS 7671 for cables installed in an insulated wall may be used for cables installed in a ceiling constructed of wooden joists and plasterboard and insulated with 100mm of mineral wool insulation.
2) The ratings given in BS 7671 for cables installed in an insulated wall should not be used for cables installed in a ceiling where the insulation thickness is increased to that now recommended, 270mm unless the cable is in contact with the ceiling.

3) Increasing the insulation thickness to greater than 270mm has small effect on the current rating.

4) Instead of increasing the conductor size where a cable runs in thermal insulation a different cable type having a higher operating temperature could be selected. The effect of the higher temperature on the accessories would have to be considered. If the cable was run outside of the thermal insulation for a distance of approximately 0.5m before entering the accessory then its temperature at the accessory would be considerably lower than that in the insulation as indicated in fig 3.

5) Where a lighting circuit, protected by a 6A or 10A overcurrent protective device, is fixed to a joist under thermal insulation, a 1mm² or 1.5mm² flat twin-and-earth cable can be used providing it is not subject to other derating factors.

6) Where the cable of a ring final circuit protected by a 32A fuse or circuit-breaker is installed fixed to a joist and with more than 100mm of thermal insulation the installation designer may have to consider using a cable larger than 2.5mm².

7) For cables carrying higher loads such as cookers or electric showers the cable sizes that are commonly used may need to be increased where they are installed under thermal insulation in lofts.

The results of this research will be incorporated in IEE publications, such as future editions of the *On Site Guide*, *IEE Guidance Notes*, and the *Electrician's Guide to the Building Regulations*.

Please note that the series of British Standard BS 5803: *Thermal insulation for use in pitched roof spaces in dwellings* gives further information on the specifications for thermal insulation. ■

The IEE wishes to express its thanks to ERA Technology Limited, in particular Mark Coates, for the report upon which this article is based.

ESCAPE LIGHTING AND THE SITING OF LUMINAIRES

by John Ware

EMERGENCY LIGHTING is a primary life safety system provided to assist occupants to evacuate in the case of an emergency and, if necessary, to permit certain tasks, such as a controlled shutdown, to be performed in safety. Emergency lighting includes standby lighting and emergency escape lighting. Escape lighting is further subdivided into escape route lighting, open area lighting and high risk task area lighting.

> **Emergency Escape Lighting** is emergency lighting provided to enable safe exit in the event of failure of the normal supply.

> **Standby Lighting** is emergency lighting provided to enable normal activities to continue in the event of failure of the normal mains supply.

> **Escape Route Lighting** is emergency lighting provided to enable safe exit for building occupants by providing

appropriate visual conditions and direction finding on escape routes and in special areas/locations, and to ensure that fire fighting and safety equipment can be readily located and used.

> **Open Area (or Anti-Panic Area) Lighting** is emergency escape lighting provided to reduce the likelihood of panic and to enable safe movement of occupants towards escape routes by providing appropriate visual conditions and direction finding.

> **High Risk Task Area Lighting** is emergency lighting provided to ensure the safety of people involved in a potentially dangerous process or situation and to enable proper shut down procedures to be carried out for the safety of other occupants of the premises.

Emergency lighting is provided to prevent a hazard in the event of the loss of supply to the normal lighting

At a final exit door and an emergency exit door to provide illumination of the escape route. Escape route corridors must be illuminated to at least 1 lux on the centre line of the escape route



Within 2m of a junction of corridors



Within 2m horizontal distance of a change of direction in an escape route



Within 2m horizontal distance of a change in floor level or any stair. Each tread of the stairs must receive direct light



Externally, within 2 metres horizontal distance of any final exit. The purpose is to provide sufficient light for a roll call



Within 2m horizontal distance of a fire alarm call points, fire fighting equipment and a first aid point. To illuminate safety signs.



installation. One of the most important functions of the emergency lighting is to provide reassurance to occupants and to allow orderly and speedy evacuation of a building, should this be necessary. While, in general, emergency lighting is considered to be escape lighting, all hazards that might arise as a result of loss of the normal lighting must be considered. Emergency lighting may be required to illuminate switchrooms and control rooms, to facilitate restoration of supplies or management of facilities to allow dangerous plant to be shut down.

Emergency lighting is provided by two basic types of luminaire – maintained and non-maintained.

- > **Maintained emergency lighting (M)** – a lighting system in which all emergency lighting lamps are in operation at all material times.
- > **Non-maintained emergency lighting (NM)** – a lighting system in which all emergency lighting lamps are in operation only when the supply to the normal lighting fails.

Categories

Luminaires are categorised by being maintained or non-maintained and by the duration or number of hours during which they can maintain their light output to an acceptable level after supply failure. For example, a non-maintained luminaire with a duration of two hours is given the designation NM/2 and a maintained luminaire with a duration of three hours is given the designation M/3.

To illuminate an escalator. An escalator should not be used as an escape route, but nonetheless requires illumination to protect people on it should the supply fail



In any toilet exceeding 8m² in area or where natural light is not present. All toilets for the disabled should be provided with emergency lighting



To provide emergency illumination in any lift



Escape lighting

Escape lighting must:

- 1) Indicate the escape routes,
- 2) Illuminate these escape routes,
- 3) Illuminate fire alarm call points and fire fighting equipment.

Escape lighting must be provided not only as a consequence of complete supply failure but also on local failure. For example, escape lighting must be available should a single lighting final circuit supplying luminaires in a stairwell fail.

Siting of escape luminaires

An escape lighting luminaire must be installed at each exit door including emergency exit doors and at any other location that will aid escape, facilitate initiation of alarm, and identification of fire equipment. Emergency lighting luminaires must be installed as illustrated below. ■

Further information

Information on emergency lighting systems is given in **BS EN 50172: 2004 Emergency escape lighting systems, BS 5266-1: 1999 Emergency lighting Part 1: Code of practice for the emergency lighting of premises other than cinemas and certain other specified premises used for entertainment** and the ICEL Group (The Industry Committee for Emergency Lighting) on www.icel.co.uk who offer the following downloadable publications:

ICEL: 1001: 1999. Scheme of Product and Authenticated Photometric Data Registration for Emergency Luminaires and Conversion Modules.

ICEL: 1004: 2003. Requirements for the Re-Engineering of Luminaires for Emergency Lighting Use. May 2003.

ICEL: 1006: 1999. Emergency Lighting Design Guide. Third Edition. May 1999

ICEL: 1008: 2001. Risk Assessment Guide. Third Edition. April 2001

ICEL: 1009: 2001. Emergency Lighting Central Power Supply Systems Standard and Registration Scheme

Emergency Lighting Pictorial Checklist: 2003.

We would like to thank ICEL for their considerable assistance in the production of this article.

To provide emergency illumination in a control room such as a motor generator control and plant room and a switchroom



To illuminate (i) an open areas, (ii) an open area with a particular hazard, (iii) an open area with an escape route passing through it and (iv) an open area larger than 60m² Open areas must be illuminated to at least 1lux average and 0.5lux in the central core of the area to within 0.5m of the walls



To illuminate an area of high risk. Such an area Should be illuminated to at least 10% of the normal lighting level or 15lux, whichever is greater. The risk assessment may identify the need for higher levels of illumination



THE DOMESTIC INSTALLER

by Paul Cook

THE LEVEL 2 Certificate for Domestic Electrical Installers Qualification (Vocationally related qualification) has been developed by EMTA Awards Ltd together with the Electrical Contractors Association, the National Inspection Council for Electrical Installation Contracting and CORGI. The qualification was developed with the Part P requirements of Part P of the Building Regulations particularly in mind.

The aim of the qualification is to give successful persons the minimum knowledge and understanding of the skills and competences necessary to carry out electrical work in dwellings in accordance with the Building Regulations and BS 7671. It will also provide a route to training and employment as an electrician. It is important to note that a domestic installer is not an electrician. It is a Level 2 qualification and not the Level 3 qualification of an electrician.

COMPLIANCE WITH THE BUILDING REGULATIONS

The Building Regulations require a domestic installer not only to have a knowledge of electrical work but also knowledge of related Building Regulations including Parts A, B, C, E, F, L, and M.

It is necessary for the firms working to the Building Regulations to have a good background understanding of basic employment safety legislation as well as knowledge of the constructional requirements of the Building Regulations themselves.

THE ELECTRICIAN'S GUIDE TO THE BUILDING REGULATIONS

The IEE has published a new book, 'The Electrician's Guide to the Building Regulations'. As well as providing information that electricians need to know about the Building Regulations (not only the electrical requirements in Part P) it has also been written for persons training to become Domestic Installers.

Type of final circuit	Cable size pvc/pvc	Circuit-breaker rating	Max. floor area	Maximum cable length		Maximum test loop impedance [†]	
				TN-C-S PME earth Ze up to 0.35 Ω	TN-S sheath earth Ze up to 0.8 Ω	Type B BS EN 60898/BS EN 61009	Type 1 BS 3871
	mm ²	A	m ²	m	m	Ω	Ω
Ring, supplying 13 A socket-outlets	2.5/1.5	32	100	90	90	1.2	1.5
Radial, supplying 13 A socket-outlets	2.5/1.5	20	50	30	30	1.92	2.4
Cooker (oven+hob) control unit with socket-outlet	6/2.5	32	-	40	40	1.2	1.5
Cooker (oven+hob) control unit with no socket-outlet	6/2.5	32	-	40	40	1.2	1.5
Oven (no hob)	2.5/1.5	16	-	30	30	2.4	3.0
Immersion heater	2.5/1.5	16	-	30	30	2.4	3.0
Shower to 30 A (7.2 kW)	6/2.5	32	-	40	40	1.2	1.5
Shower to 40 A (9.6 kW)	10/4	40	-	40	40	0.96	1.20
Storage radiator	2.5/1.5	16	-	30	30	2.4	3.0
Fixed lighting	1.5/1.0	10	-	100*	100*	3.84	4.8

*100 m cable including switch drops, 35 m loop on length

[†] Measured values at an ambient temperature of 10° C to 20° C

Above: Simple circuit schedule from 'The Electrician's Guide to the Building Regulations' Table 4.1.1

The IEE has been aware, from market research, that college lecturers are reporting trainees getting into a little trouble with the Onsite Guide and have had in mind preparing a more easy to use guide. 'The Electrician's Guide to the Building Regulations' provides detailed drawings of typical circuit arrangements and provides standard circuit arrangements that require no calculations. Copied above and on the following page are examples of the

approach taken. The table shows the standard circuit requirements for type B circuit breakers. The figures on the right show the typical detail.

'The *Electrician's Guide to the Building Regulations*' is the most user-friendly publication that the IEE has produced to date on electrical installations in dwellings. As well as being written as a course book for the domestic installer, it provides very useful references for all persons involved in Building Regulations work, including plumbing and other trades. Companies that carry out electrical work as an ancillary part of their main work, such as plumbing or gas installation, must be registered to avoid the need to notify Building Control in advance of the work, thereby accruing a fee. These firms will be registering as level B or C Enterprises and will need to employ supervisors or responsible persons. The *Electrician's Guide* has also been written for these supervisors and provides clear guidance.

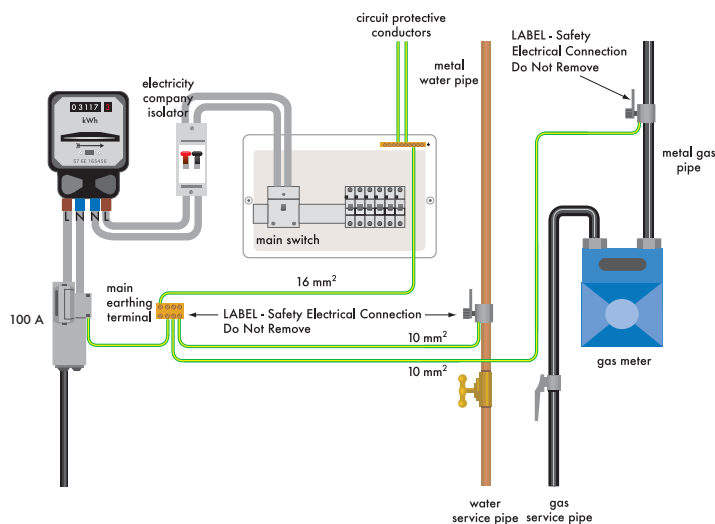
DEMAND FOR SKILLED PERSONS

Part P of the Building Regulations is extremely comprehensive, requiring all bar minor works outside kitchens and bathrooms to be notified to Building Control or carried out by registered Competent Persons. There is a need for an increase in the training base for the building trade and the IEE is playing its part in this by preparing publications and running training courses. ■

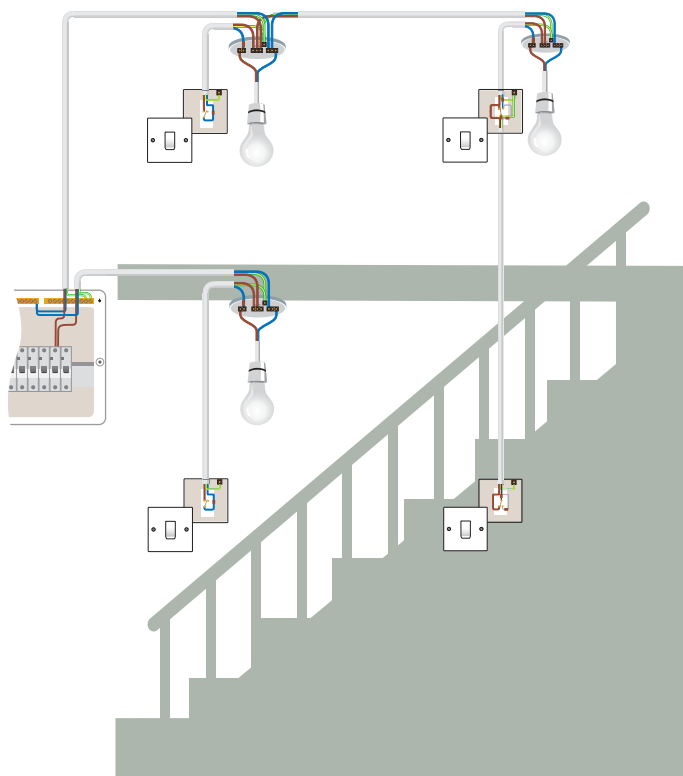
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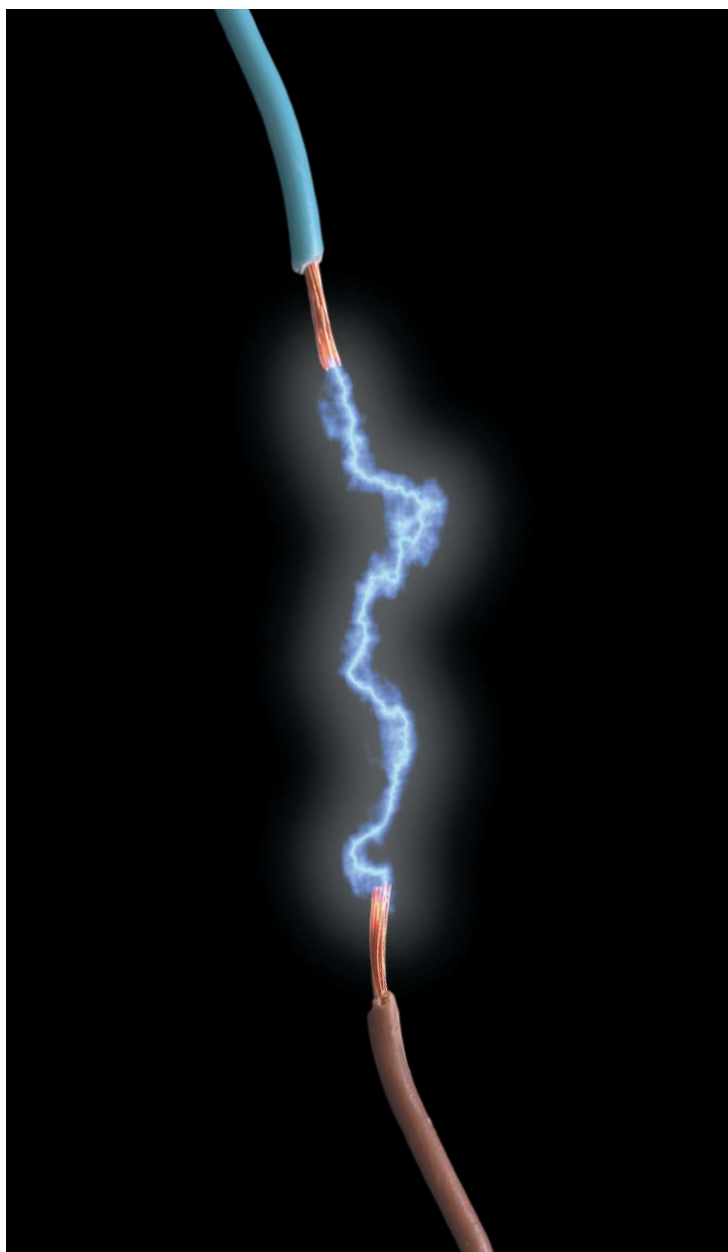


Above: The origin of an installation forming part of a PME system from 'The Electrician's Guide to the Building Regulations'



Above: Two way lighting drawing from 'The Electrician's Guide to the Building Regulations'

CHANGES TO THE BUILDING REGULATIONS – A PROGRAMME



by Nick Canty, IEE Business Development Manager, Standards & Compliance Department

CHANGES ARE IN HAND to amend the Regulations and/or the Approved Documents for Parts B (Fire), F (Ventilation), G (Sanitation and Hot Water), L (Conservation of Fuel and Power), M (Access for the Disabled) as well as Part P (Electrical safety) of the Building Regulations. Some of the proposed changes have already been out for consultation and others are awaited. The programme opposite shows the likely timescale of the changes.

The consultation papers are available on the ODPM website (www.ODPM.gov.uk) and can be viewed by clicking on 'Building Regulations', then clicking on 'Consultation papers' and finally clicking on Consultation archive.

Part F (Ventilation)

The consultation period for Part F was 21 July to 22 October 2004

The basic changes are that ventilation rates are specified for the entire house and this may include mechanical ventilation.

Proposal for amending Part L and implementing the EPBD (Energy Performance of Buildings Directive)

The consultation period for Part L was 21 July to 22 October 2004

Energy used in buildings is responsible for roughly half the UK's carbon dioxide emissions and the revised Part L proposals are intended to raise performance standards, including the efficiency of

boilers and air conditioning systems. It is hoped that this will make a difference in the initiatives to tackle climate change and should also create warmer homes. The changes that will affect persons carrying out electrical installations include:

- > increased levels of thermal insulation, which may well affect cable selection
- > reduced and controlled ventilation rates. These will reduce natural ventilation, making the building more air tight and requiring controlled ventilation including the provision of suitable fans
- > provision of energy meters to facilitate the understanding of energy consumption and to thereby encourage energy saving.
- > provision of more energy efficient luminaries. Such luminaries should have an efficacy greater than 40 lumens per circuit watt and should be provided in the locations where the most use can be expected.
- > provision of power factor correction if appropriate.

The changes to the Building Regulations will be introducing the requirements of the EPBD (Energy Performance of Buildings Directive) into UK legislation and are due to come into effect on 4 January 2006.

The Consultation documents proposed that, where the costs of an alteration or extension to a building exceed a specified amount, then cost-effective improvements may need to be made to the existing dwelling and these could include the installation of additional thermal insulation as well as a more efficient boiler system. Electricians will have an interest in the impact of these changes on the electrical installation.

Part M (Access and Use of Buildings)

It is understood that there will be a consultation paper in the middle of 2006 for implementation in 2007. The likely changes are to improve the 'visitability' of all homes for disabled persons. Electricians will have to keep this in mind as it can have a considerable impact on the location of electrical accessories in the home and the nature of the electrical accessory. It is not only access for wheelchair users that must be given consideration but also the general ease of use of all electrical equipment, including accessories.

Part P (Electrical safety)

It is understood that there will be no changes to Part P of the Building Regulations in the near future but amendments may be made to the Approved Document in 12 months time.

SUSTAINABLE AND SECURE BUILDINGS BILL

A Private Members Bill by Andrew Stunnell received Royal Assent on the 16 September 2004.

This Bill creates new powers to make Building Regulations under the Building Act 1984 to address sustainability including the environmental impact on materials used. The Bill will also:

- > give new powers to improve crime resistance and security of buildings where there are at present no statutory requirements
- > give powers to require that in certain circumstances large scale repair and renovation work should comply with the same standards and sustainability in crime resistance as the equivalent new work
- > bring into the scope of the Building Regulations certain types of buildings that are currently exempted (e.g. Crown buildings). ■

PROGRAMME: CHANGES TO THE BUILDING REGULATIONS

	2004				2005				2006				2007			
Part	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
B							C				R					
F			C	C				R								
G									C				R			
L			C	C				R								
M										C	C				R	
P													R			

C is consultation, R is new/amended regulation or approved document



PART P NOTIFICATIONS TO BUILDING CONTROL

by Paul Cook

THERE IS ALWAYS and will continue to be, some uncertainty in electricians' minds as to whether the work they are carrying out is notifiable to Building Control. This may not be terribly important to a firm registered on a Competent Persons Scheme. Generally, the firm will be able to follow the rules of notifiability given by each Competent Persons Scheme operator but they may differ slightly despite the intention of the scheme operators to cooperate on this matter. The ODPM has recently given advice and made some changes in this respect. The

attached list is the current understanding of the IEE. The ODPM has specifically advised that:

Consumer units

Consumer unit replacements are notifiable, since these are not minor works and, as a consequence, a full Electrical Installation Certificate is required.

Conservatories

Conservatories are not special locations and work in them is not

notifiable unless it involves a new circuit or a new extension to an existing kitchen or bathroom circuit.

Gardens

Garden lighting and power installations are special installations.

Kitchens

As a guide only, in open plan areas, the zone of a kitchen may be considered to extend from the edge of the sink to a distance of three metres or to a nearer dividing wall.

Description of work	Other areas	Special location or kitchen
New installation	✓	✓
Rewire	✓	✓
Change consumer unit	✓	✓
Install/upgrade main equipotential bonding	✗	✓
Installing a new final circuit	✓	✓
Addition to a circuit, e.g. additional socket-outlet, lighting point, switch, flex outlet	✗	✓
Replace accessory	✗	✗
Replace damaged cable, like for like	✗	✗
Replace equipment, like power for like power e.g. immersion heater	✗	✗
Replace shower (like for like)	X	✗
Replace cooker (like for like)	NA	✗
Installing ELV e.g. telephone, information technology, security (not notifiable in kitchens)	✗	✓
Install light outdoors with outdoor switch	NA	✓
Install light outdoors on dwelling wall no outside connection (other than final connection within fitting)	NA	✗
Install socket-outlet outdoors including on dwelling wall	NA	✓
Wiring to garden	NA	✓
Caravan (any work in a caravan)	✗	✗
Periodic inspection (not building work)	✗	✗

Table 1 (Notifiable Works) Part P Notification for dwellings

Extra low voltage work in kitchens is notifiable (excluding security systems and communications [telephone and IT]).

The installation of extra-low voltage CE-marked lighting sets is not notifiable.

Outside Lighting

A luminaire installed on the outside wall of a house without a switch or connection box is not notifiable. Should the work include switches and junction boxes then it would be considered to be notifiable.

Other equipment to the outside of the house

Air conditioning units, radon fans, ventilation fans and so on, which are fixed to the outside of a house without any controls, would not be notifiable.

Socket-outlets on outside walls

The installation of a socket-outlet on an outside wall is notifiable because it is likely to be used to supply garden lighting and portable equipment outdoors. Such a socket-outlet must be protected by an RCD in accordance with Regulation 471-16-01.

Attached garages

Work in an attached garage is not notifiable unless the work involves a complete new circuit or an extension to an existing kitchen or bathroom circuit.

Detached garages

Work in a detached garage is notifiable if it involves the addition of a new circuit.

Replacement, repair and maintenance

The general advice from the ODPM is that replacement, repair, periodic inspection and maintenance work is

generally not notifiable even if carried out in a kitchen, bathroom or outdoors or is associated with a special installation.

Cookers

The replacement of a cooker is not notifiable.

Showers

The like-for-like replacement of a shower is not notifiable. Should an increased rating shower be installed, obviously it is necessary to check that the cable has sufficient rating and if it does not and work is necessary to change the protective device or the cable size then the work would become notifiable.

In summary

Notifiable work includes the addition of new circuits and extensions to circuits in kitchens, bathrooms and into the garden. ■



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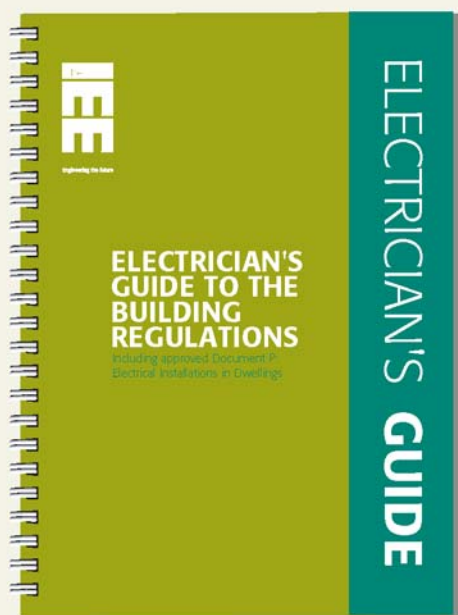
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