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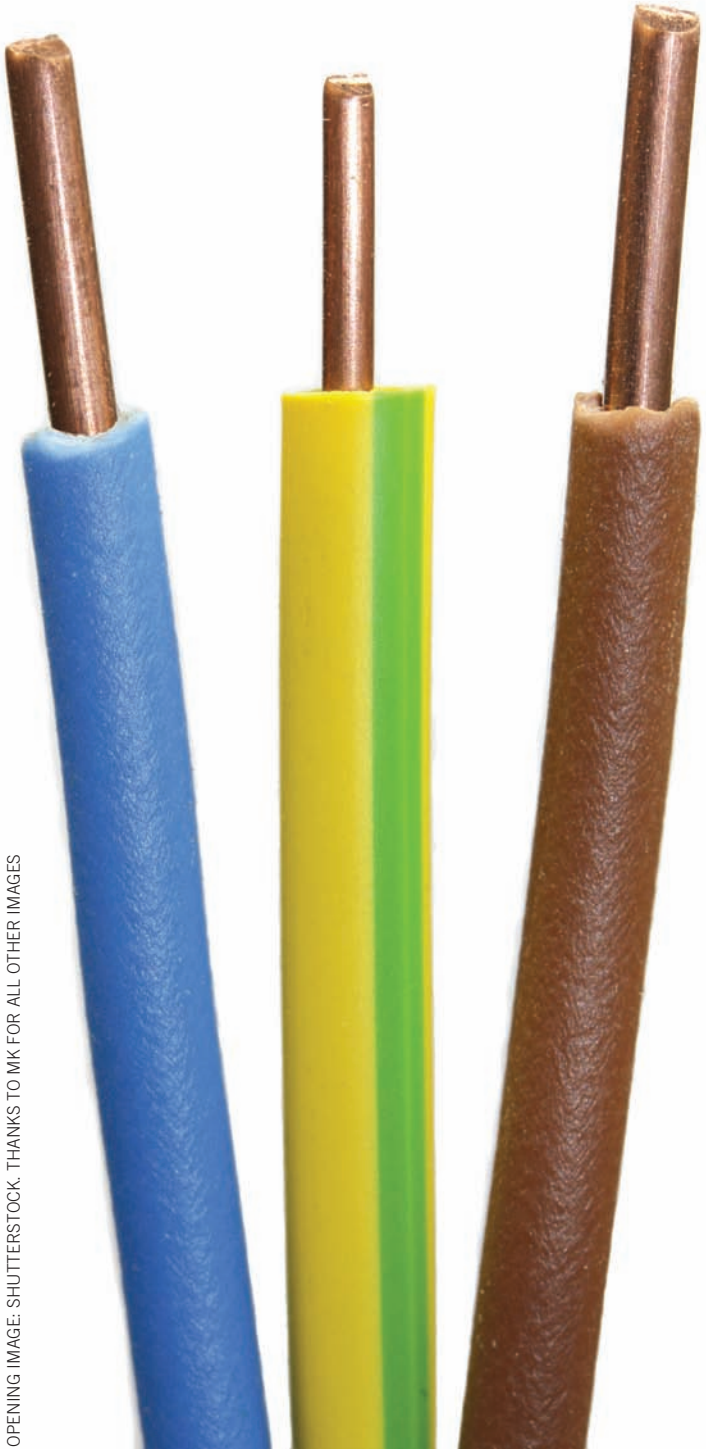
The Impact of Amendment Number 1 of the17th Edition

We look at the impact that some of the changes expected in Amendment No 1 of BS 7671:2008, the IEE Wiring Regulations (17th Edition), will have on the design, erection and verification of electrical installations.

By Geoff Cronshaw



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Please note the following are draft proposals only at this stage and may or may not be included in amendment number 1 depending on the decision of the national committee, JPEL/64. Many of the proposed changes have already been mentioned in previous articles in Wiring Matters. As advertised in the summer edition of Wiring Matters and by BSI the DPC (draft for public comment) has been available for comment from 14 June this year. Many comments have already been received from the industry which will be carefully considered by the national committee at the end of the comments period.

1. Chapter 52 Selection and erection of wiring systems. Cables concealed in a wall or partition.

Amendment number 1 now permits an exception for minor works concerning cables concealed in a wall or partition where the designer is satisfied that there would be minimal increased risk of damage to the circuit cable due to penetration by screws, nails and the like. This is a significant change from the 17th Edition. It is important to note that the designer's decision must be recorded under part 2 of the Minor Works Certificate.

In addition Amendment number 1 also includes an exception for a cable forming part of a SELV or PELV circuit.

The 17th Edition introduced regulations about cables concealed in walls

Background
The 17th Edition introduced a new series of regulations concerning cables concealed in a wall or partition (fig 1). These new Regulations introduced the concept of a skilled person and an instructed person. They also introduced the requirement for RCD protection. It is a requirement to protect cables concealed in a wall or partition (at a depth of less than 50mm) by a 30mA RCD where the installation is not intended to be under the supervision of a skilled or instructed person if the normal methods of protection including use of cables with an earthed metallic covering, earthed conduit/trunking or mechanical protection cannot be employed.

Irrespective of the depth, a cable in a partition where the construction includes metallic parts other than fixings shall be protected by a 30mA RCD.

For example, this means at present under the 17th edition (in a domestic installation) where insulated and sheathed cables are concealed in a wall at a depth of less than 50mm and have no mechanical protection, they need to be installed within the safe zones and need to be protected by a 30mA RCD (see fig 1).

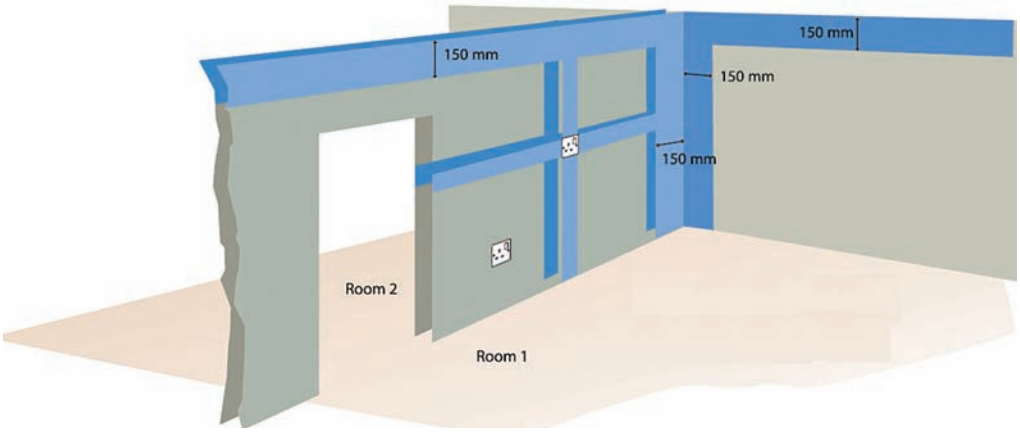

Fig 1: Permitted cable routes

2. Chapter 41 Protection against electric shock. 3.1 socket-outlets

Amendment number 1,
Regulation 411.3.3 (c) now permits an exception for minor works associated with existing socket-outlet circuits not provided with additional protection by means of an RCD where the designer is satisfied that there would be no increased risk from the installation of the addition or alteration. This is a significant change from the 17th Edition. It is important to note that the designer's decision must be recorded under part 2 of the Minor Works Certificate. Minor works are now defined in Part 2 of Amendment number 1 of BS 7671:2008.

Background
Chapter 41 of the 17th Edition requires in Regulation 411.3.3 that for the protective measure of automatic disconnection of supply for an a.c. system, additional protection by means of a 30mA RCD shall be provided for socket-outlets with a rated current not exceeding 20A that are for use by ordinary persons.

The 17th Edition defines an ordinary person as "a person who is neither a skilled person nor an instructed person". An exception is permitted for socket outlets for use under the supervision of skilled or instructed persons, The 17th Edition defines a skilled person as "a person with technical knowledge or sufficient experience to enable him/her to avoid dangers which electricity may create". An instructed person is defined as "a person adequately advised or supervised by skilled persons to enable him/her to avoid dangers which electricity may create".

Therefore this exception may apply, for example, in some commercial or industrial locations. A further exception is permitted for a specific labelled or otherwise suitably identified socket-outlet provided for connection of a particular item of equipment.

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This, for example, could be a socket outlet for a freezer in a domestic kitchen.

3. Changes to the periodic inspection report

Appendix 6, Model forms for certification and reporting, now includes a new electrical installation condition report that replaces the periodic inspection report (fig 4). The new condition report has a series of new inspection schedules, which include: an inspection schedule for a single distribution board installation for domestic and similar premises, a distribution board inspection schedule for multiple distribution board installations, a main intake and associated circuits inspection schedule, and a generic schedule of test results.

The periodic inspection report has been modified to form the new electrical installation condition report. For example, within the observations section the four codes: 1 (requires urgent attention), 2 (requires improvement), 3 (requires further investigation), 4 (does not comply with BS 7671:2008 amended to …) have been replaced by three codes: code 1 Danger present, code 2 potentially dangerous, code 3 improvement recommended.

Installation of a surge protective device

Stringent measures are necessary to ensure the safety of patients

The changes to the coding system and the series of new inspection schedules represent a major change from the 17th edition of the wiring regulations. For example, under this new coding system a summary of the condition of the installation in terms of safety should be clearly indicated in Section E of the condition report. Observations, if any, should be categorised in Section M of the condition report using the coding C1 to C3 as appropriate. Any observations given a C1 or C2 classification should result in the overall condition of the installation being reported as unsatisfactory, where as under the 17th edition only a number 1 (requires urgent attention), allocated to an observation would normally result in the overall assessment of unsatisfactory.

The new inspection schedules provide a detailed breakdown of the inspection required on each aspect of the installation to ensure that the work is carried out in an organised and efficient manor. For example, the schedule for domestic and similar premises includes over 60 check points. Each item listed on the schedule which requires checking is accompanied with the relevant regulation number for ease of reference to the wiring regulations. In addition, the form provides a facility to indicate the outcome of the inspection of each item with either a tick (acceptable condition), a code C1 or C2 (unacceptable condition), NV (not verified), Lim (limitation), or NA (not applicable); where as under the 17th edition the inspection of a general item would normally only result in a tick in a box.

4. Section 729 – Operating or maintenance gangways.

Amendment 1 now includes section 729, which applies to restricted areas. These are areas such as switchrooms with switchgear and controlgear assemblies with a need for operating or maintenance gangways for authorised persons.

This is a completely new section. The current requirements for accessibility of electrical equipment in BS 7671:2008 are contained in Fundamental Principles in Chapter 13. Regulation 132.12 states: Electrical equipment shall be arranged so as to afford as may be necessary: (i) sufficient space for the initial installation and later replacement of individual items of electrical equipment (ii) accessibility for operation, inspection, testing, fault detection, maintenance and repair.

Regulation 15 of the Electricity at work Regulations has requirements for working space, access and lighting and requires that, for the purposes of enabling injury to be prevented, adequate working space, adequate means of access and adequate lighting shall be provided at all electrical equipment on which or near which work is being done in circumstances which may give rise to danger. Regulation 14 of the Electricity at work Regulations is concerned with work on or near any live conductors.

Accessibility

Regulation 729.513.2 requires that the width of gangways and access areas shall be adequate for work, operational access, emergency access, emergency evacuation and for the movement of equipment.

In restricted access areas where basic protection is provided by barriers or enclosures Regulation 729.513.2.1 gives the

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following minimum distances:

i. Gangway width of 700mm between: barriers or enclosures and switch handles or circuit-breakers in the most onerous position, and barriers or enclosures or switch handles or circuit-breakers in the most onerous position and the wall

ii. Gangway width of 700mm between barriers or enclosures or other barriers or enclosures and the wall

iii. Height of gangway to barrier or enclosure above floor (minimum dimension 2000mm)

iv. Live parts placed out of reach, see Regulation 417.3 (minimum dimension 2500mm)

NOTE: Where additional workspace is needed e.g. for special switchgear and controlgear assemblies, larger dimensions may be required.

In restricted access areas where the protective measure of obstacles applies Regulation 729.513.2.2 gives the following minimum distances:

i. Gangway width of 700mm between: obstacles and switch handles or circuit-breakers in the most onerous position, and obstacles or switch handles or circuit-breakers in the most onerous position and the wall.

ii. Gangway width of 700mm between obstacles or other obstacles and the wall

iii. Height of gangway to obstacles, barrier or enclosure above

iv. Floor (minimum dimension 2000mm)

v. Live parts placed out of reach, see Regulation 417.3 (minimum dimension 2500mm)

Regulation 729.513.3 has requirements for access of gangways. For closed restricted access areas with a length exceeding 6m, accessibility from both ends is recommended. However, gangways longer than 10m must be accessible from both ends.

The Regulation recognises that this may be accomplished by placement of the equipment a minimum of 700mm from all walls or by providing an access door, if needed, on the wall against which the equipment is positioned. However, closed restricted access areas with a length exceeding 20m must be accessible by doors from both ends.

Finally, annex A of section 729 contains a number of additional requirements for closed restricted access areas in order to permit easy evacuation. The annex considers two cases; these include a minimum passing width of 700mm with switchgear in position and 500mm with circuit breakers completely extracted.

Persons involved in this work are advised to seek advice from the HSE.

5. 534 Devices for protection against overvoltage

Amendment 1 now includes section 534, which contains requirements for the installation of surge protective devices (SPDs) to limit transient overvoltages where required by Section 443 of BS 7671:2008 or where otherwise specified by the designer (fig 4). A risk assessment to BS EN 62305, Protection against Lightning also determines the need for SPDs. Surge protective components incorporated into appliances are not taken into account in 534. Both lightning strikes and electrical switching can inject what are called transient overvoltages into installations. Transient overvoltages are usually only a few micro seconds in duration. However their peak value can reach 6kV (fig 2).

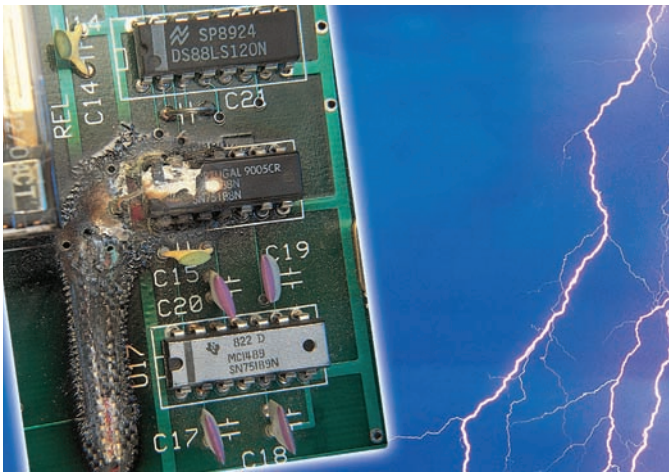


Fig 2 – Transient overvoltages can reach 6 kV

Surge Protection Devices

A surge protective device (SPD) is a device that is intended to limit transient over voltages and divert damaging surge current away from sensitive equipment. SPDs must have the necessary capability to deal with the current levels and durations involved in the surges to be expected at their point of installation. SPDs can operate in one of two ways, based on the component technologies within them. One way is as a voltage switching device where under normal conditions, the device is an open circuit. However at a certain threshold voltage the SPD conducts and diverts the current through it. It has two states, ON and OFF, hence the name of voltage switching. Air-gap technology is an example of a voltage switching device.

Another way is as a voltage limiting device. Voltage limiting type SPDs again present an open circuit under normal circuit conditions. When an overvoltage is detected the device begins to conduct, dropping its resistance dramatically such that the overvoltage is limited and the surge current is diverted away from the protected equipment (fig 3). Metal Oxide Varistors (MOVs) are a common example of voltage limiting devices. Advanced SPDs often utilise hybrid technologies combining voltage switching with voltage limiting components.

Selection of SPDs

Section 534 contains requirements for the selection of SPDs in order to ensure that the correct type of SPD is installed at the correct position within an installation. Typically, Type 1 SPDs are used at the origin of the installation, Type 2 SPDs are used at distribution

boards and Type 3 SPDs are used near terminal equipment. Combined Type SPDs are classified with more than one Type, e.g. Type 1+2, Type 2+3. Type 1 SPDs are only used where there is a risk of direct lightning current.

Section 534 advises that in selecting an SPD, the key parameter is its limiting voltage performance (protection level Up) during the expected surge event. The SPD energy withstand (e.g. Iimp) also needs to be sufficient for its location within the installation. An SPD with a low protection level will ensure adequate protection of the equipment, while an SPD with a high energy withstand may only result in a longer operating life. All SPDs are to comply with BS EN 61643.

Connection of SPDs

Section 534 contains a number of requirements for the Connection of SPDs depending on the type of supply and system earthing. Therefore, for example, Section 534 requires that SPDs at or near the origin of the installation (if there is a direct connection between the neutral conductor and the protective conductor at or near the origin) shall be connected between each line conductor and the protective conductor/ main earthing terminal which ever is the shorter distance.

SPD installation in conjunction with RCDs

Clause 534.2.6 of Section 534 is concerned with ensuring that the correct type of RCD is selected in conjunction with the correct type of SPD. Where SPDs are installed on the load side of an RCD, the operation of the SPD could potentially cause the RCD to operate unless it is of the S type.

Where SPDs are installed on the supply side of an RCD the operation of the SPD will not affect the RCD. Manufacturers should be able to provide advice on selection of devices.

SPD status indication

Section 534 requires indication to be provided by a status indicator local to the SPD itself and/or remote, that the SPD no longer provides (or provides limited) overvoltage protection.

Critical length of connecting conductors

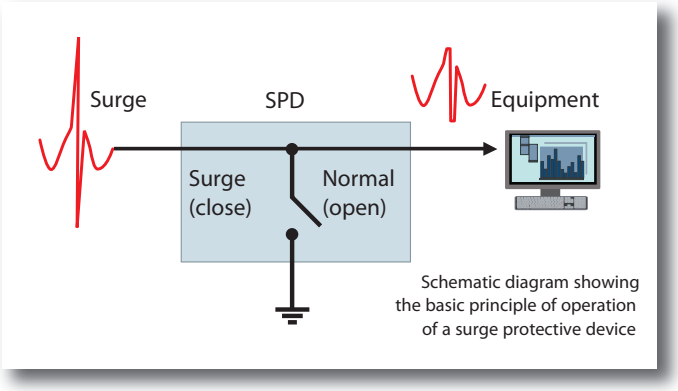
To gain maximum protection the supply connecting conductors to the SPD shall be kept as short as possible, to minimise additive inductive voltage drops across the conductors. Current loops shall be avoided. Regulation 534.2.9 has specific requirements on conductor lengths.

Cross-section of connecting conductors

Regulation 534.2.10 states: The connecting conductors of SPDs shall either: i) have a cross-sectional area of not less than 4mm^2 copper (or equivalent) if the cross-sectional area of the line conductors is greater than or equal to 4mm^2, or ii) have a cross-sectional area not less than that of the line conductors, where the line conductors have a cross-sectional area less than 4mm^2. Where there is a structural lightning protection system, the minimum cross-sectional area for Type 1 SPDs shall be 16mm^2 copper, or equivalent.

6. Section 444 – measures against electromagnetic disturbances

Amendment 1 now includes requirements for the avoidance and reduction of electromagnetic disturbances.



Schematic diagram showing the basic principle of operation of a surge protective device

Fig 3 – When an overvoltage is detected the device begins to conduct

Section 444 requires that consideration must be given to the location of the sources of electromagnetic disturbances relative to the positioning of other equipment. Potential sources of electromagnetic disturbances within an installation typically include:

i. Switching devices for inductive loads

ii. Electric motors

iii. Fluorescent lighting

iv. Welding machines

v. Rectifiers

vi. Choppers

vii. Frequency converters/ regulators including Variable Speed Drives (VSD)

viii. Lifts

ix. Transformers

x. Switchgear

xi. Power distribution busbars

Regulation group 444.4.2 contains measures to reduce EMI.

Regulation 444.4.2.1 includes the following requirements to reduce the effects of

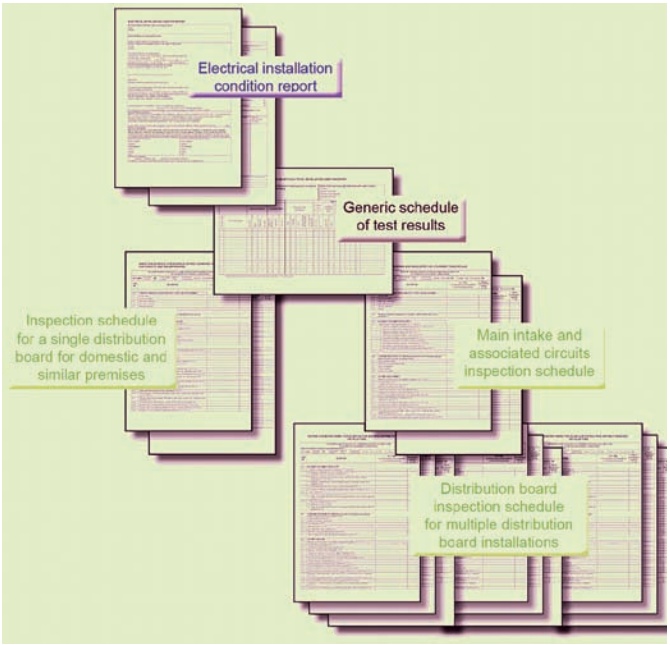


Fig 4 – the new electrical installation condition report

There are particular risks associated with medical locations

electromagnetic interference:

i. The use of additional conductors e.g. a bypass equipotential bonding conductor for screen reinforcement,

ii. The use of surge protective devices and/or filters to improve electromagnetic compatibility with regard to conducted electromagnetic phenomena for electrical equipment sensitive to electromagnetic disturbances.

iii. The selection of a common route for all the conductors (live and protective conductors) of a power circuit, to avoid inductive loops.

iv. The separation of power and signal cables.

Regulation 444.4.2.2 requires the following parts to be connected to the equipotential bonding network:

i. Metallic containment, conductive screens, conductive sheaths or armouring of data transmission cables or of information technology equipment

ii. Earthing conductors of antenna systems

iii. Earthing conductors of the earthed pole of a d.c. supply for information technology equipment

iv. Functional earthing conductors

v. Protective conductors.

Requirements for earthing and equipotential bonding are contained in Regulation group 444.5 and requirements for segregation of circuits are contained in Regulation group 444.6. Section 444 has an informative annex which gives information on:

- Structures for the network of equipotential conductors and earthing conductors
- Equipotential bonding networks in buildings with several floors
- Installations containing a high density of interconnected equipment
- Design guidelines for segregation of circuits
- Conditions for zero segregation

7. Section 710 – medical locations

Amendment 1 now includes section 710. Please note, this article is repeated from a previous edition of Wiring Matters for completeness.

The risks

There are particular risks associated with medical locations. Therefore stringent measures are necessary to ensure the safety of patients likely to be subjected to the application of medical electrical equipment.

Shock hazards, due to bodily contact with the 50Hz mains supply, are well known and documented. Currents of the order of 10mA passing through the human body can result in muscular paralysis followed by respiratory paralysis depending on skin resistances, type of contact, environmental conditions and duration. Eventual ventricular fibrillation can occur at currents just exceeding 20mA. These findings are listed in IEC/TR2 60479-1 'Effects of current on human beings and livestock – general aspects'.

The natural protection of the human body is considerably reduced when certain clinical procedures are being performed on it. Patients under treatment may have their skin resistance broken or their defensive capacity either reduced by medication or nullified while anaesthetised. These conditions increase the possible consequences of a shock under fault conditions.

In patient environments where intracardiac procedures (see note 1, below) are undertaken, the electrical safety requirements are even stricter, in order to protect the patient against 'microshock'. Patient leakage

currents from applied parts introduced directly to the heart can interfere with cardiac function at current levels which would be considered safe under other circumstances.

Patient leakage current which can flow into an earthed patient is normally greatest when the equipment earth is disconnected. A limit is set to the amount of leakage current which can flow in the patient circuit when the protective earth conductor is disconnected.

Patient leakage currents (see note 2) of the order of 10μA have a probability of 0.2 per cent for causing ventricular fibrillation or pump failure when applied through a small area of the heart. At 50μA (microshock), the probability of ventricular fibrillation increases to the order of 1 per cent (refer to BS EN 60601-1).

Note 1
"Intracardiac procedure": This is a procedure whereby an electrical conductor is placed within the heart of a patient or is likely to come into contact with the heart, such conductor being accessible outside the patient's body. In this context, an electrical conductor includes insulated wires, such as cardiac pacing electrodes or intracardiac ECG electrodes, or insulated tubes filled with conducting fluids (catheter).

Note 2
"Patient's leakage current": Current flowing from a medical electrical equipment applied part via the patient to earth.

Additional to the consideration of risk from electric shock, some electromedical equipment (life-support equipment, surgical equipment) perform such vital functions that loss of supply would pose an unacceptable risk to patients. Medical locations where such equipment is used require secure supplies. This has implications not only for the provision of safety (emergency) power supplies but also render some conventional protection measures unsuitable. Hence, for example, when protecting circuits supplying critical medical equipment, restrictions are stipulated on the use of RCDs.

Additional measures
Since the type and description of these hazards can vary according to the treatment being administered, the manner in which a medical room is used necessitates some division into different areas for differing medical procedures. Section 710 segregates medical locations into different "Groups". These are:

Group 0
medical location where no applied parts are intended to be used and where discontinuity (failure) of the supply cannot cause danger to life.

Group 1
medical location where discontinuity of the electrical supply does not represent a threat to the safety of the patient and applied parts are intended to be used as follows:
– externally – invasively to any part of the body, except where 710.3.7 applies

Group 2
Medical location where applied parts are intended to be used in applications such as intracardiac procedures, vital treatments and surgical operations where discontinuity (failure) of the supply can cause danger to life.

To protect patients from possible electrical hazards, Section 710 requires additional protective measures to be applied in medical locations.

These include: particular requirements for protection against electric shock; medical IT systems – requirements concerning supplementary equipotential bonding; additional requirements for the selection and erection of electrical equipment including switchgear and controlgear; safety services including the sources and detailed requirements for safety lighting.

Further information

Important: this article is only intended as a brief summary of possible forthcoming requirements in BS 7671. Persons involved in these areas should seek specialist advice.
Information on the installation of surge protective devices – HD 60364-5-534.

Information on medical locations – UK Health Departments.

Information on operating or maintenance gangways – HSE.

Conclusion
It is important to point out that this article is based on draft proposals only at this stage which may or may not be included in amendment number 1 depending on the decision of the national committee, JPEL/64. Amendment number 1 to the 17th edition of the IEE Wiring Regulation (BS 7671:2008) has an expected publication date of July 2011.

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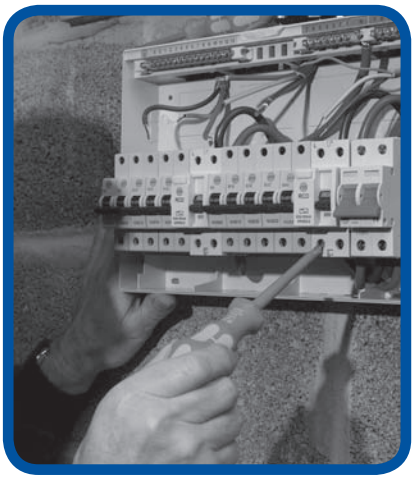

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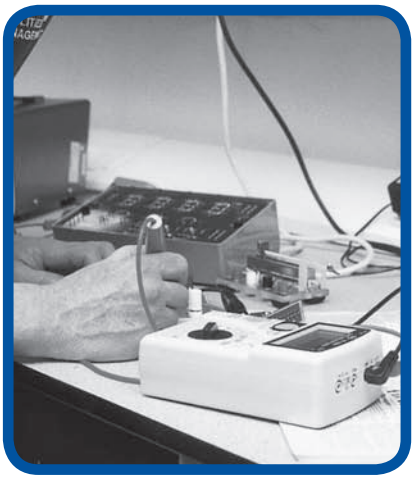

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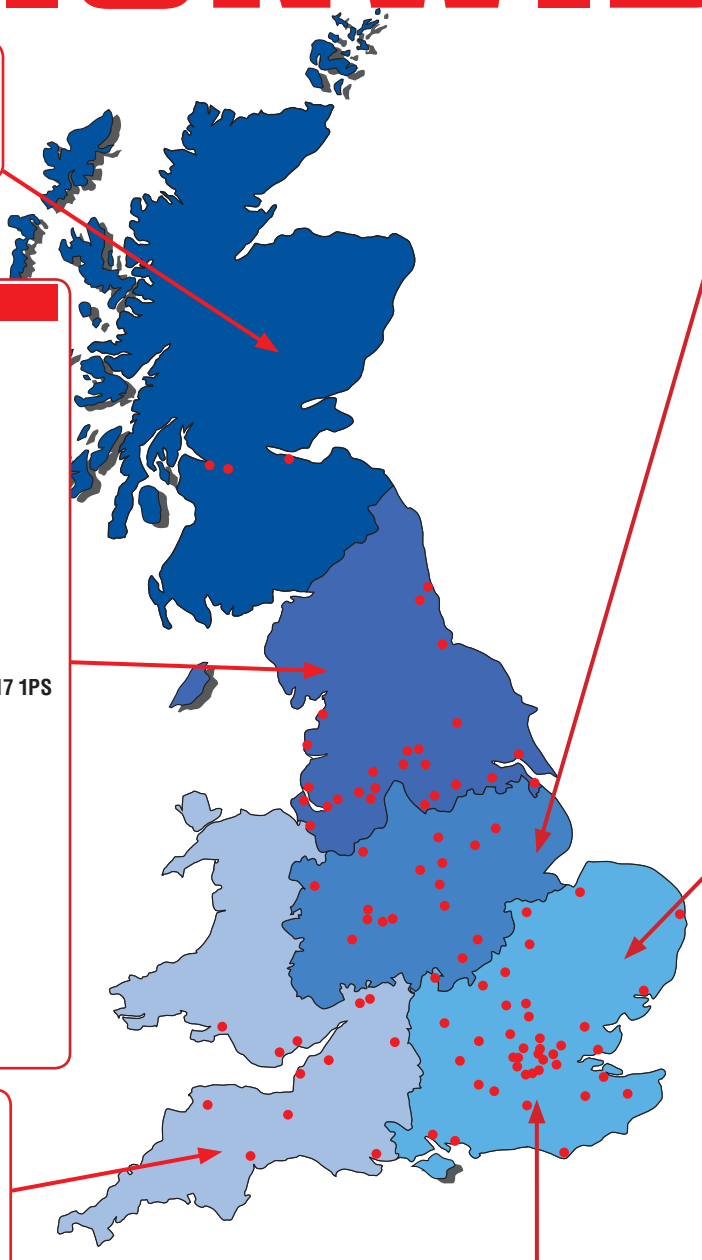

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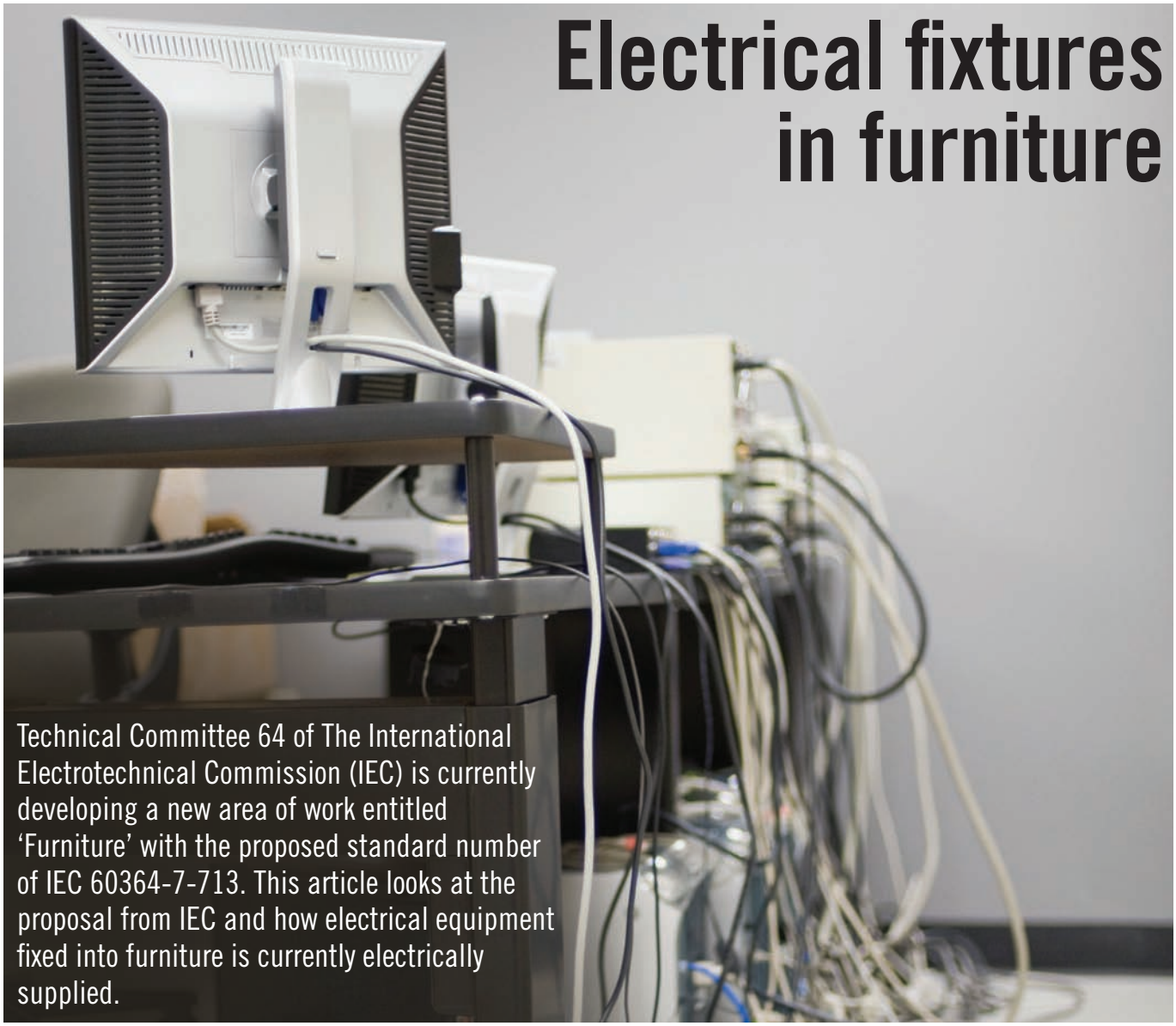


Technical Committee 64 of The International Electrotechnical Commission (IEC) is currently developing a new area of work entitled 'Furniture' with the proposed standard number of IEC 60364-7-713. This article looks at the proposal from IEC and how electrical equipment fixed into furniture is currently electrically supplied.

International standards

To begin, a short paragraph on the standard making process from the electrical industry's perspective is pertinent. BS 7671 is primarily based on harmonised documents (HD) that have been agreed by member countries of CENELEC. Due to the signing of the Treaty of Rome in 1973 and the joining of the European Economic Community, the UK is obliged to incorporate the technical intent of HDs in its national standards and withdraw any conflicting standards currently in publication. In turn, CENELEC bases its HDs on IEC standards developed at international, or world, level.

What is furniture?

From the 'Shorter Oxford English Dictionary', the definition of furniture is the movable contents of a building that make it suitable for living or use. From this definition, furniture is anything we can pick up and move around. Note that the 'Shorter Oxford English Dictionary' is used by BS 0-2:2005 A standard for standards – Part 2: Structure and drafting – Requirements and guidance uses the dictionary for spelling and general terms.

Taking into consideration kitchen or bedroom fitted furniture, for example, these items are effectively part of the building and, in some circles, cited as "landlord's fixtures and fittings".

Considering the Shorter Oxford English Dictionary's definition, clearly, permanently fixed 'furniture' cannot be considered as movable and, therefore, is not furniture! The BSI Office Furniture committee, FW0/SC3, referred this dilemma to the Health and Safety Executive (HSE) for clarification. The HSE's view was that, in relation to Office Furniture, furniture could be described as being 'transportable', i.e. an office desk may not be 'portable' when fully assembled and may be regarded as fixed by means of its weight and bulk.

The Scope of IEC 60364-7-713 - Furniture

The definition of furniture from IEC 60364-7-713 is:

Movable or immovable articles such as desks, chairs, tables and work benches, cupboards and beds which are used in domestic, commercial and industrial premises for activities associated with work or leisure.

The scope of IEC 60364-7-713 covers the wiring systems of furniture intended to connect the electrical installation to current using equipment. Examples cited are beds, cupboards, desks and shop display cases, in which electrical equipment such as luminaries, installation couplers, socket-outlets, switching devices and wiring systems are installed. The supply parameters are limited to single-phase, 230V and not exceeding 32A. The proposed requirements do not apply to electrical appliances and equipment manufactured to recognised product standards.

The Scope of IEC 60364-7-713 is a step beyond the conventional accepted boundary of BS 7671, i.e. installations connected to the supply by means of a plug and socket. Perhaps this is why this proposal from IEC is given a Part 7 or Special Location designation, similar to Section 711 (Exhibitions, Shows and Stands) or Section 721 (Caravans). Many modern commercial office installations use underfloor track systems where the connection is not by means of a 13A BS 1363 plug and, therefore, within the Scope of BS 7671.

The proposed requirements of IEC 60364-7-713

The table opposite is a breakdown of the proposed requirements of IEC 60364-7-713 showing where they currently reside in BS 7671:2008. As can be seen, much of the proposed content of IEC 60364-7-713 is already in BS 7671:2008.

Current requirements for furniture in the UK

Currently in the UK, BS 6396:2008, Electrical systems in office furniture and educational furniture –

Proposed requirement of IEC 60364-7-713	Current requirements in BS 7671:2008
713.51 Common rules **Electrical equipment and accessories for the wiring system of furniture shall be selected and erected in accordance with the environmental situation, in particular mechanical stress and fire risk.**	**512.2 External influences** **421 Protection against fire caused by external influences**
713.521.06 Methods for erection of wiring system **Cables and cords shall be suitably protected against damage. They shall be securely fixed to the furniture or located in cable ducting, cable trunking, conduit, articulated systems for cable guiding, or a channel formed during the construction of the furniture.** **Cables and cords shall be protected against tension or torsion. Strain relief devices shall be provided at points of entry into the furniture and in proximity to connections**	**522.6 Impact** **522.8 Other mechanical stresses**
713.522.016 Selection of wiring system **The wiring system for connecting the furniture to electrical installations shall be:** **– rigid cable according to IEC 60502, IEC 60227-3 or IEC 60245-1, if connected by fixed wiring;** **– rubber-insulated flexible cables and cords according to IEC 60245-4; or** **– PVC-insulated flexible cables and cords according to IEC 60227-5 if connected by means of a plug and socket-outlet, or by an installation coupler according to IEC 61535.** **Any wiring within the furniture which may be subject to movement shall be a flexible cable or cord according to IEC 60245-4 or IEC 60227-5.**	**521.9 Use of flexible cables or cords** **522 Selection and erection of wiring systems in relation to external influences** **522.8 Other mechanical stresses** **553.1.7 Plugs and socket outlets**
713.526.05 Connection between the fixed installation of buildings and furniture **The connection between the fixed installation of a building and the wiring system of furniture shall be a fixed connection or plug and socket-outlet connection, or connection by an installation coupler according to IEC 61535.**	**553.1.7 Plugs and socket outlets** **553.2 Cable couplers**
713.559 Luminaires and lighting installations **713.559.011.1 Where the power dissipated by electrical equipment is liable to produce temperatures within a closed space which may lead to a fire, a switch controlled by the closing of the door shall be installed in such manner that the equipment is reliably switched off when the door is closed. This is the case, for example, for luminaires installed in a foldaway bed.**	**421 Protection against fire caused by electrical equipment** **510.2 Common rules - General** **511 Compliance with standards**

Table 1: Proposed requirements of IEC 60364-7-713 and current requirements in BS 7671:2008

Dangers associated with ad hoc installations

Specification, covers some areas of the proposed IEC 60364-7-713 but not all. The Scope of the standard specifies requirements for the safe provision and assembly of electrical power, data and telecommunications distribution systems in office furniture, educational furniture and office screens. Requirements are specified for furniture for general use and for furniture for use with specific equipment, parts of which may be built-in during manufacture. The standard applies to single-phase electrical power distribution systems operating at rated voltages up to 250V a.c. that are connected to the fixed wiring of the permanent installation of the building by a 13 A fused plug and socket outlet arrangement conforming to BS 1363.

The standard makes provision for the routing of cables through the furniture. This standard does not apply to electrical appliances used with or within an article of office furniture or educational furniture, for which appropriate standards are available. The standard does not apply to power distribution systems that are permanently connected to the building installation.

Beyond the scope of BS 6396, installers may want to install electrical equipment in purpose made cupboards, shop displays or lecterns, for example and supply from a plug and socket arrangement; for this type of installation, no current standard exists. Taking a view of this, one could apply the practices of BS 7671.

The Scope of BS 6396 was widened in 2008 to include educational furniture at the request of the BSI Educational Furniture Committee. This was to provide an equal level of safety for schools, colleges and other educational facilities as were enjoyed by offices.

Other considerations

In the UK, BS 7671 covers the fixed electrical installation from the origin to the end of the final circuit and/or the point of connection to current using equipment. The equipment is installed and operated in accordance with manufacturer's instructions and guidance on the testing requirements for electrical equipment can be found in the IET's Code of Practice for In-service Inspection and Testing of electrical equipment. Operationally, this leaves a gap.

Looking under a desk, there's often a spaghetti-mess of cables – electrical cables supplying computer workstations, laptops, monitors, printers, personal phone chargers, lamps, data cables connecting IT equipment to the LAN and telephony equipment connecting to the telephone network. It is also likely that multi-gang extension leads are used to supply equipment as there may not be a sufficient number of conveniently located socket-outlets in the location. In addition, the flexible cables supplying electrical equipment are likely to be intertwined with data cables beneath the desk. Add to this mix the movement of chairs and the stretching of the legs and feet beneath the desk across the cabling. Often data cables are only rated for the extra-low voltage circuits they carry, i.e. up to 50V and not mains 230V a.c.

Regulation 528.1 of BS 7671:2008 requires that Band I and Band II circuits are segregated or that the cables are rated for the highest voltage present. Surprisingly, up to now, beyond the scope of BS 6396, there are no Regulations or requirements covering this issue.

The IET's COP ISITEE advises that the use of standard and multi-gang extension leads is for temporary periods and is not a long term solution. There should always be sufficient outlets available to meet the activities at the desk and employers should not allow *ad hoc* solutions to be created by the unskilled user. Where it is apparent that there is an insufficient number of socket-outlets, the advice is to install more socket-outlets to cater for all foreseen eventualities.

The Building Regulations – England and Wales

As stated earlier, BS 7671:2008 has requirements from the origin of the installation to the end of the final circuit and/or the point of connection to current using equipment and not equipment supplied from a plug and socket arrangement. Approved Document P defines an electrical installation as "fixed electrical cables or fixed electrical equipment located on the consumer's side of the electricity supply meter", and states that the installation of fixed equipment is within the Scope of Part P (Approved Document P 2006 - Additional Notes item H) even where the connection is by a 13A plug and socket arrangement.

This is a consideration for contractors and DIY installers when building-in equipment or furniture of locations in dwellings, such as kitchens, bathrooms or externally to the property.

The Building (Scotland) Regulations

Scottish Ministers are responsible for Building Standards in Scotland with the key purpose of protecting the public interest, creating Building Regulations and preparing technical guidance to ensure buildings are safe, efficient and sustainable for all.

The former Scottish Building Standards Agency was disbanded on 1 April 2008 and its functions to administer the Building Standards system in Scotland were transferred back to the Scottish Government. Technical Handbooks are provided for guidance on achieving the standards set in the Building (Scotland) Regulations 2004 and are available in two volumes, for Domestic buildings and for Non-domestic buildings. The current 2009 edition of the Technical Handbooks apply from 1 May 2009 and incorporates changes introduced 1 January 2009.

The latest editions of the Technical handbooks (both Domestic and Non-Domestic) include guidance on standard 4.5 and confirm that Building Standards apply to fixed installations in buildings and defines an installation as consisting of "the electrical wiring and associated components and fittings including all permanently secured equipment, but excluding portable equipment and appliances".

The Law

The Electricity at Work Regulations 1989 came into force on 1 April 1990. The purpose of the Regulations is to require precautions to be taken against the risk of death or personal injury from electricity in work activities.

Regulation 4 of The Electricity at Work Regulations 1989 requires that:

1. All systems shall at all times be of such construction as to prevent, so far as is reasonably practicable, danger.
2. As may be necessary to prevent danger, all systems shall be maintained to prevent, so far as is reasonably practicable, such danger.
3. Every work activity, including operation, use and maintenance of a system far as is reasonably practicable, to danger.
4. Any equipment provided under these Regulations for the purpose of protecting persons at work on or near electrical equipment shall be suitable for the use for which it is provided, be maintained in a condition suitable for that use, and be properly used.

Therefore, where parts of an installation are not covered by a British Standard, there is still a requirement to ensure that the system is safe.

From the point of view of an installation in use in a dwelling or domestic setting, the Building Regulations require that reasonable provision is made during the design stage to protect persons from injury. A duty of care exists.

Conclusion

Much of the content of the proposed IEC 60364-7-713 Furniture can already be found in BS 7671:2008 which, in turn, has its origins in IEC 60364. In the UK, BS 6396:2008 has requirements for electrical installations to and within office furniture. Where non-standard installations take place, the installer still has a responsibility to install a safe system for use by those who need it and that the law requires that users are protected against danger so far as is reasonably practicable.

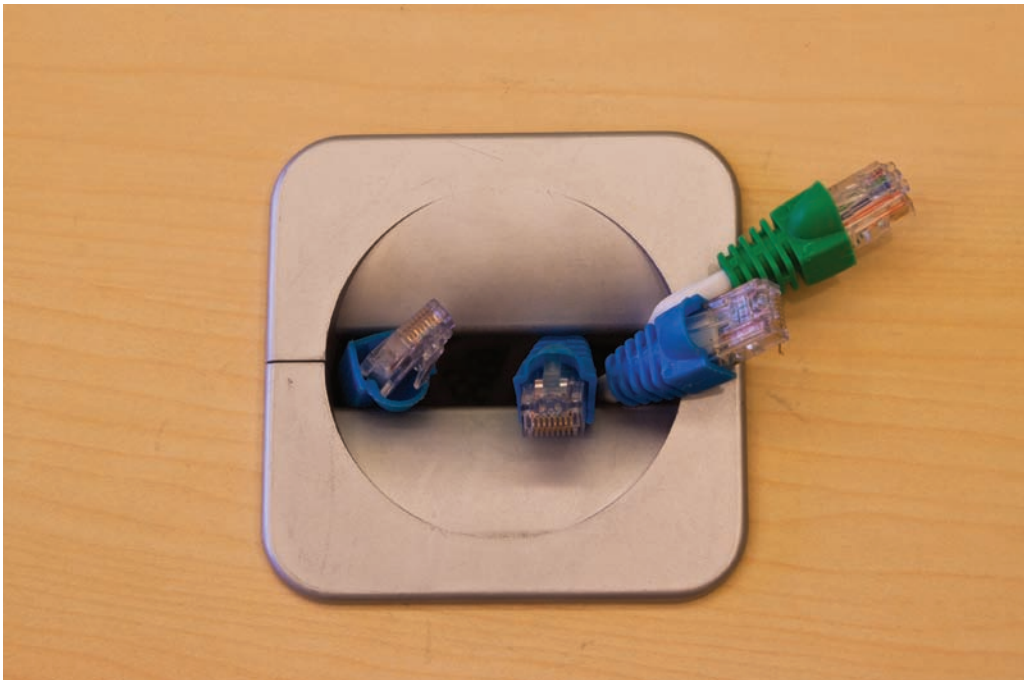
Further reading

BS 7671:2008 Requirements for Electrical Installations, 17th Edition of the IEE Wiring Regulations
BS 6396:2008 Electrical Installations in Office & Educational Furniture.
IET Guidance Note 1 – Selection and Erection
The Electricity at Work Regulations 1989 – free download www.hse.gov.uk
Electrical Equipment (Safety) Regulations 1994
CEN *(Comité Européen de Normalisation)* – www.cen.eu
CENELEC – www.cenelec.org
IEC – www.iec.ch

Building Regulations –
England and Wales – www.labc.uk.com
Scotland – www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards
Northern Ireland – no scheme currently exists

Thanks

Peter Calver, Chairman BSI Office Furniture committee, FW0/SC3
Bob Cairney, SELECT
Stuart MacConnacher, AMDEA



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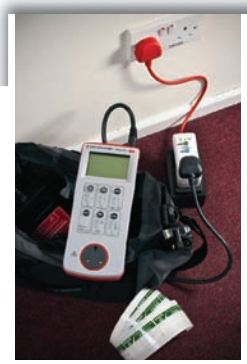

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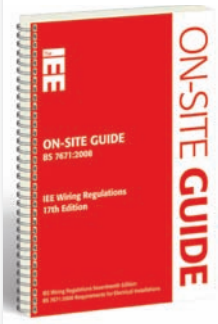

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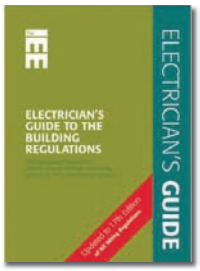

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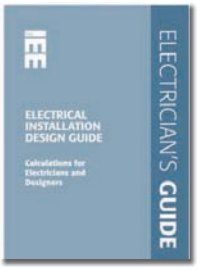

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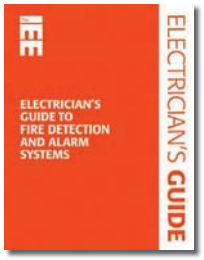

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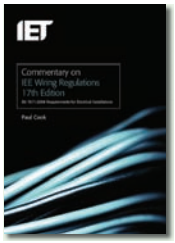

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P. Cook

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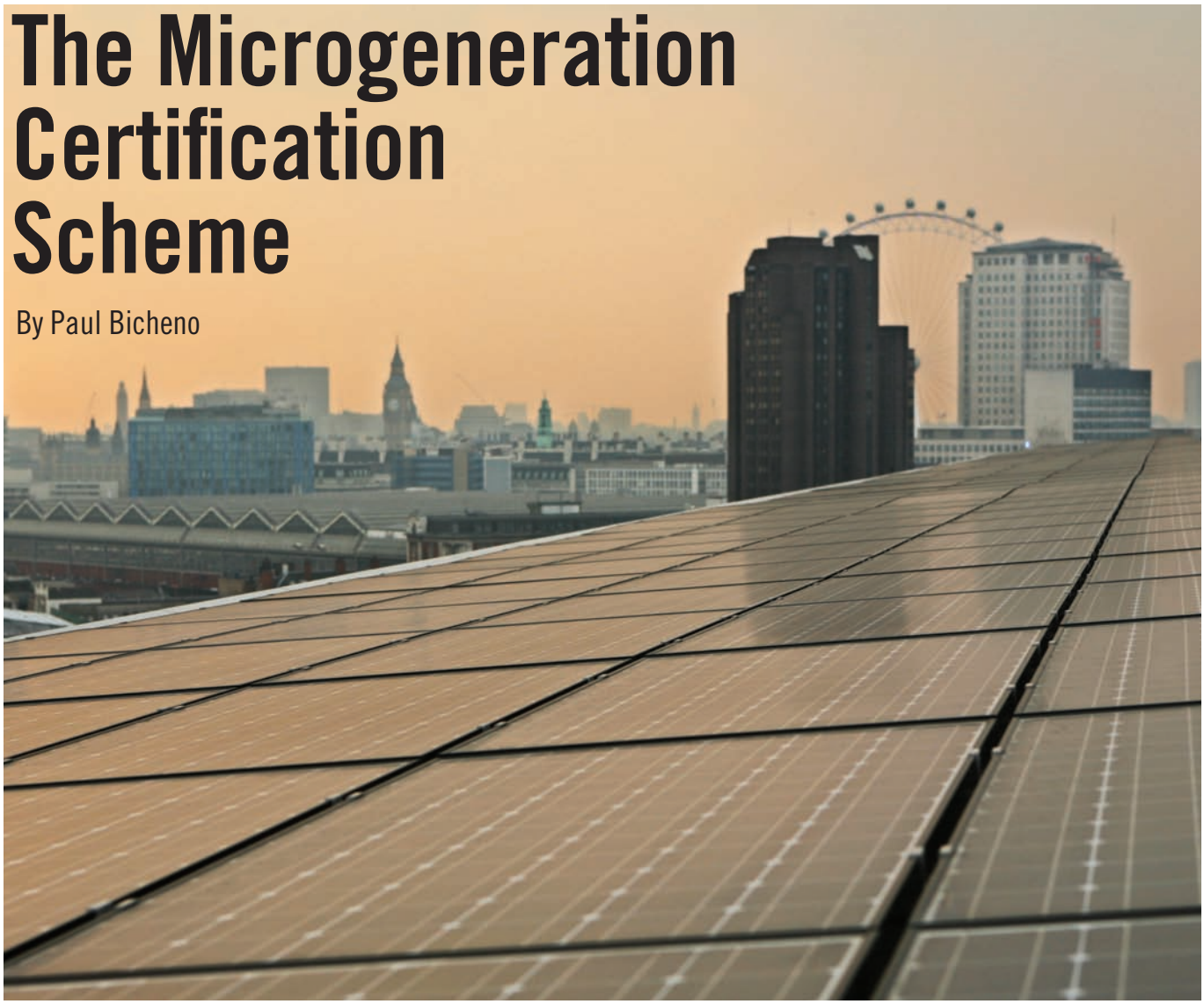
The Microgeneration Certification Scheme

By Paul Bicheno



The Microgeneration Certification Scheme (MCS) has been implemented to certify both microgeneration products and installers against a defined series of standards. This enables consumers to have better protection and confidence in what products have been used and who to use when deciding to install microgeneration.

The IET receives various queries related to microgeneration and the MCS, therefore this article looks at summarising various aspects of this subject.

An important aspect of the MCS is that it certifies both the products related to the various microgeneration technologies as well as certifying installers of the technologies. The certification process has the obvious benefit that only certain products and installers can be used to certify a particular installation. The MCS covers a number of microgeneration technologies including:

- Solar Photovoltaic
- Wind Energy
- Solar Thermal Hot Water
- Biomass
- Small Scale Hydro
- Ground-and Air-Source Heat Pumps

A particular point to note is that the MCS is not just aimed at domestic consumers, unlike the Part P of the Building Regulations 2000 self-certification scheme, since not all of the technologies listed would be applicable to a domestic premises.

The scheme itself is supported by the Department of Energy and Climate Change (DECC) and as such is regarded as one of the main ways of contributing to cutting the UK's dependency on non renewable sources of energy and carbon dioxide emissions.

Certification Bodies

Similar to the Part P scheme providers, certification bodies that meet the UKAS standards under EN 45011 can become certification bodies. However, as the scope of the MCS includes both products and installers the certification bodies would operate a scheme to certify either products, installers or both for particular or all of the microgeneration technologies. When certified, the product manufacturer or

installer will have a unique MCS certification number and will be able to use the approved MCS mark. The current certification bodies are summarised in table 1, below.

Microgeneration Products

As already highlighted there are particular products specific to microgeneration and, as such, the MCS includes certifying them to the appropriate standard. A manufacturer would aim to get its particular product certified by the relevant certification body that will assess against the appropriate standards. These are listed in table 2, below right. However, MCS 011 and MCS 010 would be applicable in all cases. When certified, a product will be given a unique certification number and the manufacturer can use the MCS mark for marketing purposes. The manufacturer will also be listed on the products area of the MCS website.

Microgeneration Installers

As already described there are particular standards related to the installation of microgeneration systems. These are listed in table 3, opposite. An installer would be certified by an appropriate body (refer to table 1) against the standards MCS 001, MCS 002 and the relevant microgeneration technology standard(s). The assessment process includes assessing an installer's office-based systems and a site assessment for each technology type leading to approval for installation of a particular type or types of technology. Clearly this would include using the relevant certified products. The installers would be listed on installer area of the MCS website.

Organisation	Certification Type
Action Renewables (Ireland and NI) www.actionrenewables.org	Installer (various)
BABT/TUV Product Service Ltd www.babt.com	Product (Solar PV)
BRE Global Ltd www.greenbooklive.com	Product (various) Installer (various)
British Board of Agrément www.bbacerts.co.uk	Product (various)
British Standards Institute (BSI) www.bsigroup.com	Product (various)
CORGI Services Ltd www.corgirenewal.co.uk	Installer (various)
EC Certification Ltd Incorporating ELECSA www.elecsa.co.uk	Installer (various)
Germanischer Lloyd Industrial Services GmbH Competence Centre Renewables www.gl-group.com	Product (Micro and Small Wind)
HETAS www.hetas.co.uk	Product (Biomass) Installer (Biomass, Solar Thermal)
NAPIT Certification Ltd www.napit.org.uk	Installer (various)
NICEIC Group and NICEIC Group Ltd trading as NQA www.niceic.com	Installer (Solar PV, Solar Thermal, Heat Pumps) Product (Solar Thermal, Heat Pumps)
TUV NEL www.tuvnel.com	Product (Micro and Small Wind)

Note: The organisations listed and what they certify can change. Unless specifically stated, 'various' denotes that the organisation certifies a number of microgeneration technologies.

Table 1 – Certification Bodies

Product Certification Standard	Description
MCS 011	Testing Acceptance Criteria
MCS 010	Factory Production Control Requirements
MCS 004	Solar Collectors
MCS 005	Solar Photovoltaic Panels
MCS 006	Micro and Small Wind Turbines
MCS 007	Heat Pumps
MCS 008	Biomass
MCS 014	Micro Combined Heat and Power (CHP)

Note: The MCS website should be checked to make sure that the latest issue or revision is being used.

Table 2 – MCS product related standards

Installer Standard	Description
MCS 001	Installer Certification Scheme Requirements
MCS 002	Information on Building Regulations and Directives
MIS 3001	Solar Thermal Standard
MIS 3002	Solar Photovoltaic Standard
MIS 3003	Micro and Small Wind Standard
MIS 3004	Biomass Standard
MIS 3005	Heat Pump Systems Standard
MIS 3007	Micro Combined Heating and Power (CHP) Standard

Note: The MCS website should be checked to make sure that the latest issue or revision is being used.

Table 3 – MCS installer related standards

Training

Questions are normally asked regarding training requirements for installing microgeneration technologies.

The first point to highlight is that, from an electrical installation perspective, the requirements of BS 7671:2008 would be applicable and, as such, the various recognised qualifications would need to be gained for an installer.

For Solar PV systems BS 7671:2008 has specific additional requirements in Section 712, therefore it is important that these a complied with. The installer would then need to consider specific training for particular products of a system offered by a manufacturer or a specialised training provider that offers training on installing specific microgeneration technology systems. Refer to additional information for a list of training providers.

Completed Installations

In addition to any commissioning and electrical installation certificates, an MCS database accessible from the MCS website is used to administer completed installations. When a customer's installation has been completed the

certified installer will use the database to register the installation and generate a MCS certificate. The database is only used by the installers to register an installation and energy suppliers to verify an installation if a consumer is looking to benefit from a renewable energy incentive scheme.

Feed-in Tariff scheme

The Feed-in Tariff scheme (FITs) has been introduced by the government to promote the uptake of small-scale renewable and low-carbon electricity generation technologies.

This effectively enables the customer to receive a generation tariff from the licensed electricity suppliers (whether or not any electricity generated is exported to the national grid) and an export tariff when electricity is exported.

The scheme is applicable to technologies up to a capacity of 5MW and as such the systems installed under the MCS are likely to be able to benefit from this. An installation commissioned on or after 15 July 2009 and certified by the MCS as described above can join the FITs. To find out more about the scheme and the particular capacity ratings for the various technologies contact Office of the Gas and Electricity Markets (Ofgem) or for more information on microgeneration, the Energy Saving Trust (EST).

Additional Information

Access to the microgeneration certification scheme website is via www.microgeneration certification.org.

For more information on microgeneration contact the Energy Saving Trust (www.energysavingtrust .org.uk)

The Energy Saving Trust also provide a link to the DTI publication 'Guide to the Installation of PV systems' via www.energysavingtrust.org.uk/business/Global-Data/Publications/Photovoltaics-in-Buildings-Guide-to-the-installation-of-PV-systems-2nd-edition

Ofgem www.ofgem.gov.uk/fits

The Low Carbon Buildings programme is closed to new applications, however useful information is still available (www.lowcarbonbuildings.org.uk)

The Department for Energy and Climate Change (www.decc.gov.uk/)

The Energy Networks Association publish Engineering Recommendation G83/1 - Recommendation for the connection of Small-Scale Embedded Generation (Up to 16 A Per Phase) in Parallel with Public Low-Voltage Distribution Networks (http://2010.energynetworks.org/)

The following organisations offer training related to microgeneration:

Centre for Alternative Technology (www2.cat.org.uk/shortcourses/)

Construction Skills / BES (www.cskills.org/uploads/bes-renewables-energy_tcm17-5558.pdf)

EcoSkies – Renewable Energy Training (www.ecoskies.com/)

Forestry commission (www.biomassenergycentre.org.uk)

National Energy Foundation (www.nef.org.uk/energytraining/index.htm)

Ppltraining (www.ppltraining.co.uk/training/renewable-energy-courses-3.htm)

The Plumbing Academy (www.solar-courses.co.uk)

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