WiringMatters

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The Impact of the 18th edition (BS 7671:2018)

In this article, Geoff Cronshaw looks at some of the proposed changes in the DPC (draft for public comment) for electrical installations, focusing on Section 704, Section 708, and Section 721.

Note: the following are draft proposals only at this stage and may or may not be included in the 18th edition (BS 7671:2018), depending on the decision of the national committee, JPEL/64. This article is based on the DPC that was available (on the BSI website) to anyone to view and to comment on.

Section 704

Construction sites are potentially dangerous in many ways. The risk of electric shock is high on a construction site because of:

(a) the possibility of damage to cables and equipment;
(b) the wide use of hand tools with trailing leads (this problem is mitigated by the increasing use of battery operated tools);
(c) the accessibility of many extraneous-conductive-parts, which cannot practically be bonded; and
(d) the works are generally open to the elements.

Section 704 prescribes particular measures to reduce the risks caused by this harsh environment. The DPC on the 18th edition (BS 7671:2018) contains a number of small changes, including requirements for external influences, and modifications to Regulation 704.410.3.6 concerning the protective measures of obstacles, placing out of reach and electrical separation.

Protection against electric shock

General requirements

BS 7671 strongly prefers the reduced low voltage system to supply portable hand lamps for general use and portable hand tools and local lighting up to 2 kW, while safety extra low voltage (SELV) is strongly preferred for portable hand lamps in confined or damp locations.

Section 704 prohibits the protective measures of obstacles and placing out of reach (Section 417), non-conducting location (Regulation 418.1), and earth-free local equipotential bonding (Regulation 418.2). In addition Section 704 now makes it clear that electrical separation for the supply of more than one item of current-using equipment (418.3) shall not be used.

Automatic disconnection of supply – PME
It is usually impracticable to comply with the bonding requirements of the Electricity Safety, Quality and Continuity Regulations on construction sites for PME. Hence the DPC of BS 7671:2018 states that a PME earthing facility shall not be used for the means of earthing for an installation falling within the scope of this Section unless all extraneous-conductive-parts are reliably connected to the main earthing terminal. See Regulation 704.411.3.1. Please note Section 704 does not apply to installations in administrative locations of construction sites (for example, offices and canteens).

Wiring systems

Cables on a construction site location should preferably not be installed across walkways or site roads as they are susceptible to mechanical damage. If cables are installed in this manner they require the appropriate level of mechanical protection.

External influences

A new regulation (705.512.2) now requires consideration to be given to the risk of damage to electrical equipment by corrosive substances, movement of structures and vehicles, wear and tear, tension, flexing, impact, abrasion, severing, and ingress of liquids or solids.

Inspection and testing

It is recommended that the maximum period between inspections of construction site installations is 3 months – as detailed in IET Guidance Note 3.

IET Guidance Note 7 gives recommendations for RCD testing on construction sites. Fixed installation RCDs should additionally be tested daily (using

the integral test button). Should RCDs be used to protect mobile equipment they must be tested by the operative before each period of use (again, using the integral test button) and by the responsible person every 3 months (using an RCD tester).

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 line and neutral conductors. If a line to earth fault develops, a portion of the line 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 ($I_{\Delta n}$).

Safety services

Section 704 now mentions in a Regulation 704.56 note that site conditions may require the provision of safety services such as escape lighting. See also the IET publication “Electricians Guide to Emergency Lighting.

Section 708 caravan/camping parks

The particular requirements of Section 708 apply to the electrical installations in caravan/camping parks and similar locations providing connection points for supplying leisure accommodation vehicles (including caravans) and tents. The scope of Section 708 has been extended to cover circuits intended to supply residential park homes in caravan parks and camping parks and similar locations. In addition, changes have been made to socket-outlet requirements, RCD protection, and external influences.

Protection against electric shock

General requirements

As you would expect, the protective measures of obstacles, placing out of reach, non-conducting location and protection by earth-free local equipotential bonding are not permitted. These measures are contained in Sections 417 and 418 of BS 7671:2008 and are not for general application. The protective measures of Section 417 provide basic protection only and are for application in installations controlled or supervised by skilled or instructed persons. The fault protective provisions of Section 418 are special and, again, subject to control and effective supervision by skilled or instructed persons.

Protective multiple earthing

As stated in Regulation 708.411.4, the Electricity

Safety, Quality and Continuity Regulations 2002 (ESQCR) prohibits the connection of a PME earthing facility to any metalwork in a leisure accommodation vehicle (including a caravan). This does not preclude the use of a PME earthing facility as the means of earthing for other purposes, such as to the installations of permanent buildings.

External influences

Any wiring system or equipment selected and installed must be suitable for its location and able to operate satisfactorily without deterioration. Suitable protection must be provided, both during construction and for the completed installation. Regarding presence of solid foreign bodies, a minimum degree of protection of IP4X is now required. Regarding presence of water, a minimum degree of protection of IPX4 is required.

Equipment must now be protected against mechanical impact IK 08 (see BS EN 62262) and/or located to avoid damage by any reasonable foreseeable impact.

Caravan pitch socket-outlets

The requirements for socket-outlets have been redrafted to prevent the socket contacts being live when accessible.

Regulation 708.55.1.1 requires that every socket-outlet or connector shall either comply with:

(a) BS EN 60309-2 and shall be interlocked and classified to Clause 6.1.5 of BS EN 60309-1:1999 to prevent the socket contacts being live when accessible; or
(b) be part of an interlocked self-contained product complying with BS EN 60309-4 and classified to Clauses 6.1.101 and 6.1.102 of BS EN 60309-4:2006 to prevent the socket contacts being live when accessible.

The current rating is to be no less than 16 A but may be greater if required. At least one socket-outlet should be provided for each caravan pitch. Where socket-outlets are grouped in pitch supply equipment, there should be one socket-outlet for each pitch limited to a group of four.

Overcurrent protection

Every socket-outlet shall be individually protected by an overcurrent protective device, in accordance with the requirements of Chapter 43 of BS 7671.

A fixed connection for a supply to a mobile home or residential park home shall be individually protected by an overcurrent protective device, in accordance with the requirements of Chapter 43.

Isolation

Regulation 708.536.2.1.1 now requires at least one means of isolation to be installed in each distribution enclosure. This device shall disconnect all live conductors.

RCD protection

Each socket-outlet must be protected individually by an RCD having the characteristics specified in Regulation 415.1.1 for additional protection. The RCD must disconnect all live conductors including the neutral.

Requirements for RCD protection have been extended to cover supplies to residential park homes. A final circuit (from the metering point) intended for the fixed connection for a supply to a mobile home or a residential park home shall be individually protected by an RCD having a rated residual operating current not exceeding 30 mA accessible to the consumer. Devices selected shall disconnect all live conductors.

PME

As mentioned previously the ESQCR prohibit the connection of a PME earthing facility to any metalwork in a leisure accommodation vehicle (caravan). If the caravan supply is derived from a permanent building that is supplied by a PME system then the caravan supply will have to be part of a TT system having a separate connection to Earth independent from the PME earthing.

The separation of the earthing can be effected at the main distribution board. IET Guidance Note 7 provides detailed information in Figure 7.1. This enables the exposed-conductive-parts connected to each system to be more readily identified and inspected periodically. An earth electrode for the TT system should be provided nearby and located so that the resistance areas of the PME supply earthing and earth electrode do not overlap.

Alternatively, the separation of the earthing can be made at the caravan pitch supply points. In this instance, earth electrodes will be required at these points. Again IET Guidance Note 7 provides detailed information in Figure 7.2.

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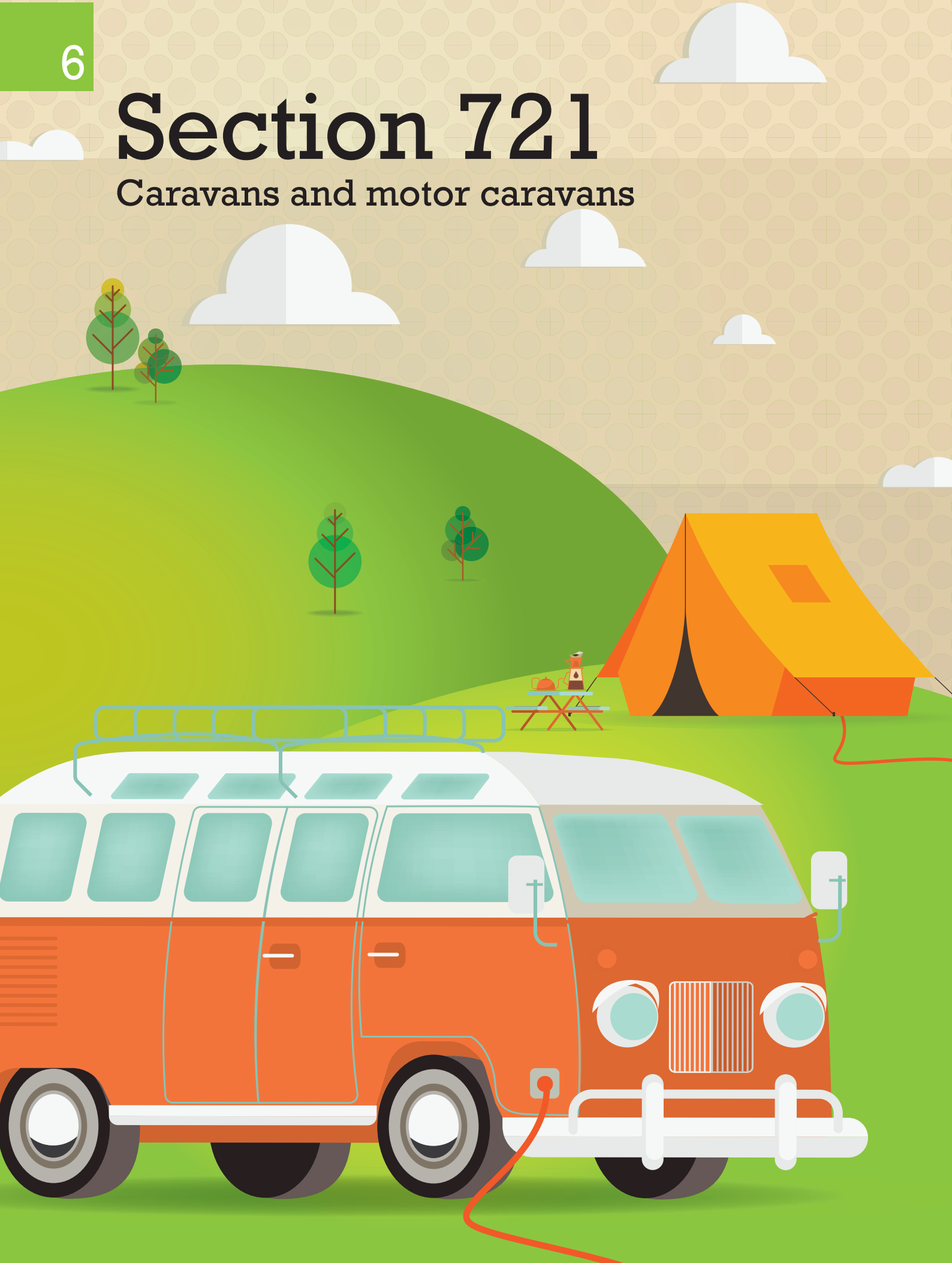
Section 721

Caravans and motor caravans



The particular requirements of Section 721 apply to the electrical installations of caravans and motor caravans at nominal voltages not exceeding 230/440 V a.c. or 48 V d.c.

Note there are some exclusions. This Section contains a number of changes including requirements for electrical separation, RCDs, proximity to non-electrical services, and protective bonding conductors.

Protective equipotential bonding

Regulation 721.411.3.1.2 requires structural metallic parts that are accessible from within the caravan to be connected through main protective bonding conductors to the main earthing terminal within the caravan.

The requirements for connections of protective bonding conductors have been clarified. Regulation 721.544.1.1 states that the terminations of protective bonding conductors connecting the conductive structure of the unit shall be accessible and protected against corrosion.

Provision of RCDs

The requirements for RCD protection have also been redrafted.

Regulation 721.415.1 states that where protection by automatic disconnection of supply is used, a residual current device with a rated residual operating current not exceeding 30 mA, complying with BS EN 60947-2 (Annex B), BS EN 61008-1, BS EN 61009-1 or BS EN 62423 breaking all live conductors, shall be provided having the characteristics specified in Regulation 415.1.1.

Each supply inlet shall be directly connected to its associated RCD.

Please note this implies that there may not be any taps or junctions in this connection.

Proximity to non-electrical services

The requirements for proximity to non-electrical services have been redrafted.

Regulation 721.528.2.1 requires that where cables have to run through a gas cylinder storage compartment, they shall pass through the compartment at a height of not less than 500 mm above the base of the cylinders and shall be protected against mechanical damage by installation within a conduit system complying with the appropriate part of the BS EN 61386 series or within a ducting system complying with the appropriate part of the BS EN 50085 series.

Switchgear and controlgear

The installation to the caravan should have a main disconnector, which will disconnect all the live conductors. This should be placed in a suitable position for ready operation within the caravan to isolate the supply. When a caravan only has one final circuit then the isolation can be afforded by the overcurrent protective device as long as it fulfils the requirements for isolation.

An indelible notice in the appropriate language(s) must be permanently fixed near the main isolation point inside the caravan to provide the user with instructions on connecting and disconnecting the supply (refer to Figure 721 of BS 7671).

The inlet to the caravan must be an appliance inlet complying with BS EN 60309-1. This should be installed not more than 1.8 m above ground level, in a readily accessible position, have a minimum degree of protection of IP44, and should not protrude significantly beyond the body of the caravan.

The connecting flexible cable

The means of connecting the caravan to the pitch socket-outlet should be provided with the caravan. This must have a plug at one end complying with BS EN 60309-2 and a flexible cable with a continuous length of 25 m (±2 m).

The connecting flexible cable must be in one length, without signs of damage, and not contain joints or other means to increase its length; and a connector if needed that is compatible with the appropriate appliance inlet. The cable should be to the harmonized code H05RN-F

(BS EN 50525-2-21) or equivalent, include a protective conductor, have cores coloured as required by Table 51 of BS 7671 and have a cross-sectional area as shown in Table 721.

Periodic inspection and testing

The purpose of periodic inspection and testing is to provide an engineering view on whether or not the installation is in a satisfactory condition where it can continue to be used safely. Periodic inspection and testing is necessary because all electrical installations deteriorate due to a number of factors such as damage, wear and tear, corrosion, excessive electrical loading, ageing and environmental influences.

IET Guidance Note 3 gives the recommended initial frequencies for inspection of electrical installations for construction sites, caravan/ camping parks, and in caravans.

Conclusion

It is important to be aware that this article only gives a brief overview of requirements for electrical installations on construction sites, caravan/ camping parks, and in caravans. Please refer to BS 7671 for more information.

This article only gives an overview of draft proposals, which may or may not be included in the 18th edition (BS 7671:2018), depending on the decision of the national committee, JPEL/64.

Electrical qualifications

For some, the electrical industry might seem like a bit of a minefield when trying to assess the skill and capability of a person who is carrying out electrical work in the UK. In this article, Steven Devine sheds some light on the qualifications (past and present) that persons may have, what they all mean.

On the IET Technical Helpline we often receive a range of enquiries relating to the common problem of identifying what is meant by electrotechnical qualifications. Perhaps you're considering embarking on a career as an electrician and wish to know the range of opportunities available to you. Perhaps you're a recruiter, baffled by the numbers, names and letters next to qualifications that bear no resemblance to the qualifications that you yourself may have completed twenty, ten or even five years ago. Or perhaps you're looking to take on an apprentice, or employ someone, but you are not entirely sure how to go about assessing qualifications.

With so many specialisms emerging within the electrical industry, it is becoming more difficult to determine relevant experience. An industrial electrician who has spent most of their career maintaining three-phase machinery may not have the desired experience to carry out maintenance on domestic properties for a housing association, despite having all the required qualifications. This situation can easily be reversed for a fully qualified electrician who is registered as a domestic installer and can certify their own work in accordance with Part P of the building regulations. However, they may have never worked a day on a construction site. A simple conversation with each applicant about their experience will likely shed a lot of light on their suitability to their job. In addition, using the information in this article and the tables that follow, you can gain a better understanding of what their qualifications mean.

The following lists the various titles you may come across and a general insight to what you can expect them to have achieved in terms of qualifications and experience. This is by no means a definitive guide as experience and qualifications may vary significantly.

Apprentice (the traditional way)

A well-known title in the construction industry, an apprenticeship is known as the traditional and most valued method of becoming an Electrician. Electrical Apprentices benefit from having on-site experience and guidance from experienced Electricians along with technical training at a college or training centre. An Electrical Apprentice will be studying to achieve a Level 3 technical certificate and an NVQ or a Level 3 Diploma. They will generally be working under the supervision of qualified Electricians and Supervisors. The qualification gained from an apprenticeship consists of two key parts: technical classroom training and vocational onsite assessments. Learners would usually be expected to have at least maths, English and Information Communication Technology (ICT) qualifications at grade C. An apprenticeship is expected to last between 3 and 4 years and on completion the learner will be a qualified Electrician.

Electrician's Mate

An Electrician's Mate is usually an unqualified (possibly qualified to Level 1 or 2) person working in the electrical industry who has some knowledge and understanding of electrical installations and is able to assist an Electrician. It would generally be expected that an Electrician's Mate would be instructed to carry out work by qualified Electricians and usually not be permitted to work unsupervised. To reduce overall cost, it is common

to find several Electrician's Mates working, under the supervision of qualified Electricians, on large industrial and commercial sites.

Possible qualifications held:

(a) Access to Building Services;
(b) Electrotechnical Craft (Level 2); or
(c) Technicals in Building Services Engineering.

Electrician (qualified)

An electrician is generally someone who has completed a 3-4 year apprenticeship and holds a Level 3 technical and vocational qualification or Level 3 Diploma. These qualifications can be obtained without going through an apprenticeship but an electrician will need to have worked in the electrical industry to have achieved the vocational qualification and is unlikely to do so without having at least 3 years' experience working in the electrical industry. An electrician may hold a Level 3 Technical Certificate and the National Electrotechnical Training (NET) AM2 certificate and, providing that they have evidence to show that they have been working in the electrical industry for a reasonable period of time, they may be regarded as an electrician by the Joint Industry Board (JIB). It would be expected that someone regarded as an electrician would have the experience and knowledge required to carry out electrical work in domestic, commercial and industrial environments although in some cases commercial and industrial environments may require some additional specialised training.

Approved Electrician

You may often hear the title 'Approved Electrician'. But what does this actually mean? Well the term is given to an electrician who has met all the required criteria to be awarded this status from the Joint Industry Board (JIB). To gain the JIB status of Approved Electrician an electrician must satisfy a number of requirements. They would, of course, be expected to have completed an apprenticeship or hold the equivalent qualifications. Further to this they will have had sufficient experience working as an electrician (in excess of two years after completion of qualifications is usually acceptable). It is usually expected that at least a Level 3 qualification in inspection, testing and initial verification has been achieved, such as:

(a) the City & Guilds 2391, 2394 and 2395 qualifications; and/or
(b) the EAL Inspection and Testing and Initial Verification qualifications.

Approved Electricians would usually be expected to have the ability to efficiently design, install and verify a wide range of electrical installations in the most efficient and economical manner. They will be capable of running projects, setting out good systems of working from drawings and specifications. They will also have an extremely good understanding of the requirements of BS 7671.

Domestic Installer (England and Wales only)

Since the introduction of Part P of the Building Regulations (Electrical Safety-Dwellings) the definition of Domestic Installer has been established. In the electrical industry Domestic Installers are not considered to be electricians; they are not required to undergo the 4 years' training an apprentice has to. However, many electricians are registered Domestic Installers. A Domestic Installer is generally expected to have at least a minimal understanding of installing new electrical installations and be familiar with the current requirements of BS 7671. The level of experience that a domestic installer may have varies very broadly. Many domestic installers are fully qualified electricians and have a wealth of experience in the electrical industry. However, there are also many who have not completed an apprenticeship or gained the equivalent qualifications and experience as an electrician. In fact, there are centres that provide training for people new to the electrical industry with no prior experience whatsoever. To register as a Domestic Installer two qualifications are generally required:

(a) Current Level 3 Award in the Requirements for Electrical Installations (17th Edition); and either
(b) Level 3 Award in the Initial Verification and Certification of Electrical Installations; or
(c) Level 3 Award in Approving Electrical Work in Dwellings in Compliance with Building Regulations.

These qualifications can be achieved relatively quickly with a recommended learning period of around 100 hours in total. That could be as little as 3 weeks depending on centre requirements and prior experience.

Domestic Installers will also be expected to provide evidence of work that they have carried out to demonstrate competence to an assessor from the scheme provider. The Domestic Installer

generally chooses an installation that he or she would like to be inspected and makes the necessary preparations for the assessment.

Notifiable or non-notifiable work?

If work is going to be carried out on a domestic property it is important to determine whether that work is classed as notifiable or non-notifiable. If it is the latter then it is not required for the person to register the work with either the local authority or scheme provider. If the work is notifiable then the person carrying out the work must use one of the three methods available detailed in the following link here.

Qualifications

The Office of Qualifications and Examinations Regulation (Ofqual) is the regulator of qualifications, examinations and assessments in England and the regulator of vocational qualifications in Northern Ireland. It is important to remember that all recognised qualifications will meet the strict requirements of what was known as the Regulated Qualification Framework (RQF), previously known as the National Qualifications Framework (NQF), more recently known as Qualifications and Credit Framework (QCF). This means that if you achieve a Level 2 qualification from one Awarding Organisation it will be substantially the same as a qualification in the same field from another Awarding Organisation.

Table A shows how qualifications are structured and comparison of the various levels.

Table B shows many of the qualifications (past and present) that you may come across in the electrical industry.

Competence

We are often asked the question: what is a competent person?. The short answer is: a competent person is somebody who is capable of completing a specific task safely and effectively. This can be very difficult to assess, especially with regards to an electrician as the work they will be doing may vary significantly. Some of the basic expected requirements are that the person carrying out electrical work has had sufficient training and experience.

This does not mean that a person who holds a Level 3 qualification in electrical installations is competent to carry out work on all electrical installations. There will likely be areas that they are unfamiliar with. However, experience and training will have given them at least the ability to work safely and assess whether or not they are in fact competent to carry out a specific task.

Older qualifications

Many people working in the electrical industry nowadays hold qualifications that are no longer available from awarding organisations. This does not mean that they are obsolete, unacceptable, inferior or superior, it simply means that they were completed at a different time. Qualifications are designed so that they reflect current industry practices and needs and you may therefore find some modern qualifications containing units on energy efficiency and micro generation that did not exist in older qualifications. On the other hand you may find that older qualifications contain some units, such as a unit on the installation of mineral insulated cable, which have not been required to be included in many qualifications for a number of years.

So how would an electrician update their qualifications? Let's say that an electrician holds an electrical qualification that they achieved in 1999 and would like to obtain the equivalent current qualification. To do this they would be required to complete the missing units from the 1999 qualification that make up the current qualification. These are normally referred to as 'bridging units'. Once these bridging units have been obtained an application can be made through the college or training provider to the relevant awarding organisation for the current qualification to be awarded. This approach must be agreed with the training provider prior to enrolling on the qualification but is supported by most awarding organisations.

	University		
Level 8	Doctorate		
Level 7	Master's Degree		
Level 6	University Degree		
Level 5		Foundation Degree	HND
Level 4			HNC

	School			F.E. College
Level 3	A-Level	A2 / AS	➡	Level 3 Diploma/Certificate
Level 2	GCSE Grades A-C		➡	Level 2 Diploma/Certificate
Level 1	GCSE Grades D-G		➡	Level 1 Diploma/Certificate

Level	Awarding organisation	Title of qualification	Experience and Understanding	Work experience required
		Level 1		
1	C&G 2000 Certificate 2000-12	Access to Building Services Certificate In Introduction To Electrical Installation Skills	Designed to deliver a good, basic understanding of the building services industry – enough to choose a career path and move on to a higher level qualification. One of the mandatory units for this qualification is 'Introduction To Electrical Installation Skills'.	No
1	EAL	Access to Building Services Engineering	Similar to the C&G building services qualification.	No
		Level 2		
2	C&G 2365	Electrotechnical Craft	This is a full time college-based qualification and is usually gained by learners that aim to progress onto an Electrotechnical Apprenticeship Programme. Those that hold this qualification do not necessarily have work experience.	No
2	236/2360 Part A/1 (old)	Electrical installations	Equivalent to the 2330 and the 2356 L2/3 completed in full.	
2	C&G 2330 (old)	Certificate in Electrotechnical Technology	This qualification is no longer available but is the equivalent to the current C&G 2365	No

2 (NVQ)	C&G 2356	Electrotechnical Services and Systems	Electrotechnical Services NVQ is for people who have achieved the 2330 (Electrotechnical Technology) Levels 2 and 3 or more and are already working as Electricians, or in a similar role.	Yes
2	C&G 8202	Technicals in Building Services Engineering	This is a full-time college-based qualification and is usually gained by learners that aim to progress onto an Electrotechnical Apprenticeship Programme. Those that hold this qualification do not necessarily have work experience.	No

Level 3

3	C&G 2365	Electrotechnical Craft	This qualification is equivalent to the college part of a Level 3 apprenticeship. At this stage learners will need to gain employment to gain vocational qualifications.	No
3	EAL	Electrical Installation	This qualification is really designed for those wishing to embark on a career in the electrical industry.	No
3	236/2360 Part B/2 (old)	Electrical installations	Equivalent to the 2330 and the 2356 Level 3.	No
3	C&G 2330 (old)	Certificate in Electrotechnical Technology	This qualification is no longer available but is the equivalent to the current C&G 2365.	No
3 (NVQ)	C&G 2356	Electrotechnical Services and Systems	Electrotechnical Services NVQ is for people who have achieved the 2330 (Electrotechnical Technology) Levels 2 and 3 or more and are already working as Electricians, or in a similar role.	Yes
3	C&G 2397	Installing, Testing and Ensuring Compliance of Electrical Installation Work in Dwellings	This qualification is primarily aimed at Electrical Installers wishing to progress further in employment. On successful completion candidates will become eligible and recognised by certification bodies as competent to undertake electrical work. This will be the minimum qualification level for Qualified Supervisors responsible for electrical work in domestic properties subject to Part P of the Building Regulations (England and Wales).	No
3	C&G 2357	Electrotechnical qualification	This qualification is designed for learners wishing to gain an apprenticeship within the electrotechnical industry. Learners will gain the skills and knowledge to carry out job roles and responsibilities associated with the installation and maintenance of electrotechnical systems. On successful completion learners will have achieved the industry desired level of competence required to carry out the specific roles.	Yes

3	C&G 5357	Electrotechnical Technology	This qualification is designed to provide new entrants and those seeking progression in their career with the opportunity to develop the necessary skills to carry out job roles and responsibilities associated with the installation and maintenance of electrotechnical systems.	Yes
3	C&G 2919	Electric Vehicle Charging (2919)	This qualification, designed for qualified Electricians, provides specialised knowledge for the installation of electric vehicle charging points.	No
3	C&G 2382	Requirements for Electrical Installations	This qualification is designed for qualified Electricians to show that they are capable of extracting information from the current version of BS 7671.	No
3	EAL	Requirements For Electrical Installations BS 7671: June 2008 (2015)	This qualification is designed for qualified Electricians to show that they are capable of extracting information from the current version of BS 7671.	No
3	EAL	Level 3 NVQ Diploma in Electrotechnical Services	This qualification is designed to provide new entrants and those seeking progression in their career with the opportunity to develop the necessary skills to carry out job roles and responsibilities associated with the installation and maintenance of electrotechnical systems.	Yes
3	C&G 2391 (Old)	Inspection and Testing	This qualification is the equivalent of C&G 2394 and the 2395. Those that hold this qualification are expected to have good knowledge of electrical installations and how to test them and to verify that installations meet the requirements of BS 7671.	No
3	C&G 2391.50 (New 2017)	Initial Verification	This qualification helps you to develop the knowledge and practical skills required to professionally install and carry out initial verification and testing on electrical installations.	No
3	C&G 2391.51 (New 2017)	Periodic Inspection or Electrical Installation Condition Report (EICR)	This qualification provides knowledge and guidance to help with carrying out inspections of existing electrical installations, also known as (EICR).	No
3	C&G 2391.52 (New 2017)	Inspection and Testing	This qualification covers both 2391.50 and 2391.51.	No
3	EAL	Inspection and Testing	Those that hold this qualification are expected to have good knowledge of electrical installations and how to test them and to verify that installations meet the requirements of BS 7671.	No

3	C&G 2394	Initial and Fundamental Inspection and Testing	This qualification helps to develop the knowledge and practical skills required to professionally install and carry out initial verification and testing on electrical installations.	No
3	C&G 2395	Periodic inspection and testing	This qualification provides knowledge and guidance to help with carrying out inspections of existing electrical installations, also known as (EICR).	No
3	EAL	Approving Electrical Installation Work in Dwellings in Compliance with Building Regulations	This qualification is usually held by persons with a reasonable level of experience in the electrical industry and focuses predominantly on domestic dwellings.	No
		Level 4		
4	C&G 4467	Building Services Engineering	Those who hold this qualification are expected to have the skills and experience to take on a project manager role in the building services engineering industry.	No
4	C&G 2396	Design, Erection and Verification	This qualification is usually held by qualified electricians who are working in a position that requires advanced knowledge and understanding of circuit design and calculations.	No
		Advanced		
N/A	NET (AM2)	Electrotechnical Assessment of Occupational Competence	This qualification is commonly held by those who have completed an apprenticeship. It is a good measure of someone's capability as the assessment is very difficult and requires a good knowledge of electrical installations to be completed successfully.	No
N/A	NET (AAC)	Advanced Assessment of Competence	This qualification is usually gained by those looking to achieve approved Electrician status. This is an advanced assessment that indicates that the Electrician has very good knowledge and understanding of electrical installations.	Yes
N/A	C&G 2372	Installing and Testing Domestic Photovoltaic Systems	This qualification is generally undertaken by qualified Electricians so that they can gain skills and knowledge for the installation and testing of photovoltaic systems in homes.	No

There are many qualifications that have been obtained from overseas training centres and awarding organisations. It can be difficult to compare many of these qualifications and there are far too many to list here. However, there is a service provided by a UK organisation called NARIC. In most circumstances NARIC will be able to provide information on overseas qualifications and their UK equivalent. Another option is to contact awarding organisations in the UK and provide information about the training and experience you have gained overseas.

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Double success for JIB Apprentice Exchange

Two electrical apprentices have been named as the lucky winners of the Joint Industry Board (JIB) Apprentice Exchange Programme and will travel to Australia later this year to spend six weeks working 'down under'. The IET would like to extend their congratulations to Joshua Horton of RB Emerson Group Ltd and George Stickings of T Clarke plc, who were chosen as the stand-out candidates following a challenging selection and interview process.

Joshua Horton, left, and George Stickings, right.

Wiring Matters caught up with Josh and George to find out a bit more.

Congratulations on winning the apprentice exchange! What are you most looking forward to?

George Stickings: I am most looking forward to meeting with other like-minded electricians and not only gaining an understanding of their working cultures but also their lifestyles as a whole. I feel a lot could be learnt by recognising the differences between Australia and the UK and ultimately making use of ideas and working practices they have to offer, while also having my own input into how they operate. I feel the most exciting part of the experience would be joining in with the electricians to bring our two countries closer regardless of our differences and with the prospect of working on a professional level together, as well as joining in with activities outside of work to understand what goes on in their spare time.

Josh Horton: I am extremely grateful to have been given the opportunity to represent my company and the JIB whilst working in a place so different from home. I am most excited to be able to gain experience in a different environment while also being able to discover a new part of the world.

How do you think that this will shape your career?

George: I feel the JIB apprentice exchange and benefit of working as an ambassador on their behalf has already given me a lot of recognition across the industry as a whole, as it certainly has already within T Clarke. I would hope that my accomplishments would be further recognised in years to come and ultimately give me the confidence to work towards a reputable role within the industry and fulfilling my potential. While I am still looking forward to the prospects of my own future, knowing the benefits of the help given to me by the industry, I know I will always be able to and willing to offer advice and help to younger individuals wanting to take the same path I took by starting an electrical apprenticeship.

Josh: I believe this will help shape my career by providing me new skills in communication and also experience working in different parts of the electrical industry.

We also caught up with Mick Tuff, Chairman of the JIB Skills Development Fund, to find out more about this Exchange Programme.

Why was this opportunity created?

The JIB Apprentice Exchange Programme was established to promote and enhance apprentices' learning though cultural exchanges. This is not only a great reward for a particularly hard working and successful apprentice, but helps to identify the leaders of the future in our industry. The selection process is rigorous for this reason. The Exchange

can also help in an apprentice's development by providing work in new situations in unfamiliar systems and improve general confidence by meeting new people and working in these different surroundings.

How does it benefit the industry?

The Exchange allows the apprentice to focus on lessons to be learnt for the industry as a whole, which is why the apprentice produces a report on their experiences upon their return. It is hoped this report can highlight areas for change in our own industry, identify what strategies or techniques work well abroad and increase productivity of companies in the UK. For instance, several years ago an apprentice described working methods on environmental technologies used in Brisbane which were of interest and benefit to the apprentice's employer in the UK. These reports are published by the JIB and are publicly available.

How do people get involved next year?

The best way to keep informed about the JIB Apprentice Exchange is to follow the JIB and the JIB Skills Development Fund on Twitter at @JIBElectrical and @JIB_Skills_Fund, or to download the JIB's Apprentice App. This App contains the Essential Guide to an Apprenticeship detailing the work of the JIB Skills Fund, the industry rates of pay, where help is available and discounts for apprentices. The JIB Skills Development Fund is continually seeking to improve the Exchange and this may involve other organisations becoming involved in the future; both home and abroad.

Past winner, Thomas Hyland travelled to Australia in 2013 and is currently a Project Engineer for Balfour Beatty Kilpatrick:

"The Apprentice Exchange trip benefitted my career enormously. I truly believe the knowledge and understanding gained on that trip has helped me to secure the position I am in today. In my current role I am heavily involved with the apprentices. During my Australian visit I was able to see the state-of-the-art training facilities the apprentices had access to, combined with extra support and guidance. I have since worked with Balfour Beatty in support of offering similar support here in the UK. As part of this work, I have met with government to try and secure funding and have used my experience in Australia to drive this."

Congratulations to all winners, past and present!

Background

Usually the Apprentice Exchange can only select one winner per trip but, thanks to a new partnership arrangement, the Electrical Industries Charity is funding a second placement to allow two students to benefit from this once-in-a-lifetime experience.

Josh and George, both JTL apprentices, begin their programme in October when they will travel to Brisbane and begin a comprehensive schedule of work. During the trip they will learn how the electrical contracting industry operates abroad and act as ambassadors for the industry, communicating with the UK via blogs and videos to describe their experiences.

The 2017 Exchange is a tripartite programme that will also see two American apprentices visit England later this year and two apprentices from Australia travel to New York. The scheme is being run by the JIB in conjunction with training provider JTL, the Electrical Contractors' Association, Unite the Union and the Electrical Industries Charity.

The Charity is not only sponsoring the second apprentice slot for Joshua and George's exchange this year, but will also support the second apprentice arriving in the UK from the USA later in 2017.

For more information on the JIB Apprentice Exchange visit www.jib.org.uk/apprentice-exchange.aspx

Statutory and non-statutory

documents applicable to the electrical industry

Do you have any responsibility for the installation, maintenance and/or upkeep of the fixed wiring or portable appliances at work? If so, a time will come – if it hasn't already – when you will need to know how to stay on the right side of the law. So, do you know the difference between which legislation has to be complied with and which documentation you can rely on to help comply with it? If not, Gary Gundry, electrical safety specialist, trainer and technical consultant, is here to help.

What to comply with and where to reach for guidance are two questions that are often asked of candidates who have taken (or are considering taking) the industry recognised exam that covers 'initial' or 'periodic' inspection and testing of electrical installations, or the in-service inspection and testing of electrical equipment. So, if you have ever wondered if you got the question right – or you need to know now which documents are 'statutory' or 'non-statutory' – this article is sure to help save you some research time and/or headaches!

Statutory documentation

In Great Britain, the 'law' is the generic term for any legal rule or regulation enforced by government to regulate behaviour or activities in society, and is made up of either 'primary' or 'secondary' legislation.

Primary legislation is the general term that embraces main laws passed by government, and includes Acts of Parliament, Acts of pre-UK Parliaments, and Acts of the Scottish Parliament etc. The aforementioned are usually used to create new laws or to introduce changes to existing ones. However, the actual process of passing an Act through Parliament can be complex and is often timely because each proposed 'law' starts life as a 'Bill', which, irrespective of its type (as in 'public' or 'private' Bill etc.) has to be debated and approved in both the House of Commons and the House of Lords. Then, once agreed in both Houses, it has to be formally agreed to by the reigning monarch (known as Royal Assent). When it comes into force, as an Act, either immediately, on a specific future date, or in stages, it is then enforceable in all areas of Great Britain, where applicable.

An example of the above is how the Housing and Planning Bill, proposed in 2015, eventually became the Housing and Planning Act in 2016. This Act, for instance, includes a small section on electrical safety that includes a provision for the Secretary of State, should he or she so wish, to impose certain duties on private landlords of residential premises in England. In consequence, such duties may include having to have a qualified person check that the electrical safety standards of the rented dwelling are met on an ongoing basis and the landlord to obtain the appropriate documentation (i.e. an Electrical Installation Certificate or an Electrical Installation Condition Report, as applicable) from the qualified person. The landlord may also be required to give a copy of that certificate or report to the tenant or prospective tenant.

Important Bills for the electrical industry

Over the next few years, a number of Bills are planned to be put before government, the first of which will be the Repeal Bill, the central piece of Brexit legislation. Two others worthy of mention, associated to the electrical industry, are:

(a) the Automated and Electric Vehicles Bill, which will allow, amongst other things, government to install electric vehicle charging points at motorway service areas and large fuel retailers, and to require a set of common technical and operational standards, all of which will ensure charging points are convenient to access and work seamlessly up and down the country, as these provisions will apply to England, Wales and Scotland.
(b) the Smart Meter Bill, announced in the Queen's speech in June 2017, will see the smart meter rollout program be softened by means of a five-year extension, to allow for changes to regulations to ensure it is delivered effectively. In addition, every household and business is likely to be 'offered' such a device by 2020, instead of actually having one installed.

As you can see, a considerable amount of time and effort has to go into the creation and/or amendment of an Act of Parliament. So, to ensure longevity and prevent any rework in the form of amendments etc., each Act essentially contains only a broad framework of what is required in law. Therein, within the main body of each Act, powers are often bestowed on ministers to make more detailed 'Orders', 'Rules' or 'Regulations', to include all of the necessary detail that is considered too complex to include in the body of an Act. These documents, known as Statutory Instruments (SIs), are sometimes referred to as secondary level legislation (or 'delegated' or 'subordinate' legislation). They allow for the provisions of an Act of Parliament to be subsequently brought into force or altered without Parliament having to pass a new Act (i.e. primary legislation).

Examples of statutory documents

The statutory documents considered most applicable to electrical installations and/or the in-service inspection and testing of electrical equipment include:

(a) The Health and Safety at Work etc. Act 1974 (HASAWA)
(b) The Management of Health and Safety at Work Regulations 1999
(c) The Electricity at Work Regulations (EWR) 1989
(d) The Provision and Use of Work Equipment Regulations 1998 (PUWER)

The Health and Safety at Work etc. Act 1974

The *Health and Safety at Work etc. Act 1974* (sometimes referred to as HSW Act or HASAWA) is a primary piece of legislation that covers occupational health and safety in Great Britain, and is enforced by the Health and Safety Executive (HSE), local authorities, and other enforcing authorities relevant to the working environment.

It sets out the general duties that employers have towards employees and members of the public, and employees have to themselves and to each other. However, these duties are often qualified in the HASAWA by the phrase 'so far as is reasonably practicable'. So, this means that (safety) measures do not have to be taken to avoid or reduce a risk if it is technically impossible to do or the time, effort and/or cost of a protective measure would be grossly disproportionate to the risk. Good management and a common sense approach, to look at what the risks might be and taking sensible measures to address them, will go a long way to meeting this requirement.

Essentially, the HASAWA places responsibility on those who create any risk to manage that risk, and this applies whether the risk-maker is an employer, self-employed or a supplier or manufacturer of items or substances for use at work. And, depending on their status, each risk-maker may have a range of duties that he or she can (and sometimes will have to) implement in order to manage the risk(s). Without doubt, workforce involvement and, in particular, the help of health and safety representatives will often make a valid contribution to raising standards of health, safety and welfare in the workplace.

The full text of this Act can be viewed or downloaded free of charge from legislation.gov.uk.

The Management of Health and Safety at Work Regulations 1999

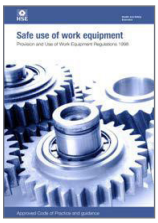
The intention of the *Management of Health and Safety at Work Regulations 1999* is to make more explicit what employers are required to do in order to manage health and safety under the *Health and Safety at Work Act*. Like the HASAWA, these Regulations apply to every work activity.

The main requirement of these regulations is on employers to carry out a risk assessment. And, where employers have five or more employees, there is a need to record the significant findings of the risk assessment.

The HSE would ideally like risk assessments in simple workplaces, such as a typical office, to be as straightforward as possible and only be complicated where they have to deal with serious hazards such as those in a chemical plant, laboratory or in something as large as a nuclear power station.

The full text of these regulations can be viewed or downloaded free of charge from http://www.legislation.gov.uk/.

The Provision and Use af Work Equipment Regulations 1998



These regulations, often abbreviated to PUWER, require work equipment to be constructed in such a way that it is suitable for the purpose for which it is to be used. Once again, the employer (which can also be a self-employed person) is responsible for these arrangements.

The regulations deal with the work equipment and machinery used every day in workplaces and aims to keep people safe wherever such equipment and machinery is used at work.

Put simply, the aim of the PUWER is to make safer the working lives of everyone who operates, uses or comes into contact with machinery and equipment. This includes employers, employees, contractors, suppliers, and anyone else who might use or have access to machinery and equipment within the workplace. To summarise, the aim of the regulations is to ensure that all equipment is:

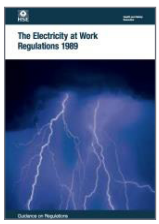
(a) suitable for its intended use.
(b) safe for use, maintained in a safe condition and inspected regularly to ensure that it is correctly installed and does not subsequently deteriorate.
(c) used only by people who have received adequate information, instruction and training to do so.
(d) accompanied by suitable health and safety measures, such as protective devices and controls. These will normally include emergency stop devices, adequate means of isolation from sources of energy, clearly visible markings and warning devices.
(e) used in accordance with specific requirements for mobile work equipment and power presses.

These regulations do not only apply to large businesses. If you operate or control work equipment, or you're self-employed operating for profit or not, then you have a legal obligation to follow them as well.

Some work equipment is subject to other health and safety legislation in addition to PUWER. For example, lifting equipment must also meet the requirements of *Lifting Operations and Lifting Equipment Regulations 1998* (LOLER), and personal protective equipment must meet the PPE Regulations 1992.

PUWER applies to all workplaces and work situations where HASAWA applies and covers the whole of Great Britain, and beyond to specified offshore areas and activities (such as those covering oil rigs and gas supply platforms). The full text of these regulations can be viewed or downloaded free of charge from http://www.legislation.gov.uk/.

The Electricity at Work Regulations (EWR) 1989



The purpose of these regulations is for precautions to be taken against the risk of death or personal injury from electricity in work activities.

Whilst these regulations cover many aspects of electrical safety, duties in some of the regulations are subject to the

qualifying term ‘reasonably practicable’ and where this qualifying term is absent from a regulation it is said to be ‘absolute’. In the case of the latter, this essentially means that no matter how much time, cost and effort is involved, the requirement of that regulation has to be met. This applies to, for example, ‘electrical connections’, which have to be mechanically and electrically sound – all of the time. All other regulations have a relaxation on the aforementioned requirement as they contain the phrase ‘so far as is reasonably practicable’. This generally means everything ‘reasonably practicable’ has to be done to protect people from harm, which means balancing the level of risk against the measures needed to control the real risk in terms of money, time or trouble (similar to the HASAWA). However, no action need be taken if it would be grossly disproportionate to the level of risk.

The full text of these regulations can be viewed or downloaded free of charge from http://www.legislation.gov.uk/.

Non-statutory documents associated with the electrical industry

The term ‘non-statutory’ was originally associated with common law and/or based on customs, precedents or previous court decisions. But, in the world of electrical installations it has become common practice to use this term to describe the most reliable and informative industry reference material, such as Codes of Practice (COP), British Standards (such as BS 7671) and even Best Practice Guides, to name but a few. Here are some of the main ones, together with a brief description:

BS 7671: 2008+A3:2015

Despite having the word ‘regulations’ printed on the front cover, its full and proper title is *BS 7671 Requirements for electrical installations*.

This British Standard sets the standards for electrical installations in the UK and many other countries, and is the authority on electrical installation. So, all those concerned with the design, installation and maintenance of electrical wiring in buildings, including electricians, electrical contractors, consultants, local authorities, surveyors and architects, should have a good understanding of its contents and intentions.

As well as being essential for professional engineers and the like, this publication is also a must-have for students at university and further education colleges.

It is co-published by the Institution of Engineering and Technology (IET) and British Standards Institution (BSI).

Following the guidance set out in BS 7671 is likely to ensure that electrical installation work meets the requirements of the *Electricity at Work Regulations 1989*.

IET’s On-Site Guide

The On-Site Guide is one of a number of publications offered by the IET to provide guidance on certain aspects of BS 7671.

Its scope generally follows that of BS 7671 and also includes some material that is not included in BS

7671. It provides the background to the intentions of BS 7671 and gives other sources of information as well. It does not, however, ensure compliance with BS 7671, as it is a simple guide to the requirements of BS 7671. So, electrical installers and/or designer should therefore always consult BS 7671 to satisfy themselves of compliance.

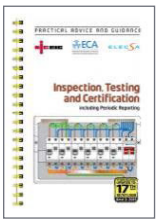
It cannot be guaranteed that BS 7671 complies with all relevant statutory regulations. It is, therefore, essential to establish which statutory and other appropriate regulations apply and to install accordingly. For example, an installation in licensed premises may have requirements that differ from, or are additional to, BS 7671 and these must take precedence.

IET's Guidance Notes (1-8)

These eight publications are designed to provide more detailed guidance about specific areas on BS 7671. In order, each publication covers:

Guidance Note 1: Selection and erection
Guidance Note 2: Isolation and switching
Guidance Note 3: Inspection and testing
Guidance Note 4: Protection against fire
Guidance Note 5: Protection against electric shock
Guidance Note 6: Protection against overcurrent
Guidance Note 7: Special locations
Guidance Note 8: Earthing and bonding

NICEIC's guidance – Inspection, Testing and Certification

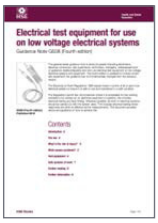


The aim of this publication is to promote best practice by providing electrical contractors and others with practical advice, guidance and answers to a number of questions that commonly arise during the inspection and testing of electrical installation work, or during the preparation of the associated certificates and reports.

It essentially complements Part 7 *Inspection and testing* of BS 7671 and the information and advice provided in other authoritative publications such as IET's Guidance Note 3. It covers the general requirements relating to the inspection and testing of electrical installations forming part of TN-C-S, TN-S and TT systems in the UK, but not specialised electrical installations such as fire alarm and emergency lighting systems, or installations in hazardous areas.

The book also assumes that all persons undertaking such work already have acquired the necessary knowledge, understanding and skill, and are properly equipped, to undertake such work without putting themselves and others at risk. It is therefore not intended to be an instruction booklet for untrained and inexperienced persons.

GS 38 (Fourth edition) 2015 – HSE guidance document



This guidance document made available by the HSE is aimed at people who use electrical test equipment on low voltage electrical systems and equipment, and is principally aimed at electricians, electrical contractors, test supervisors, technicians, managers or appliance retailers/repairers, and to trades where electrical testing is not their primary activity (such as plumbers and gas engineers).

The guidance within GS 38 focuses on the correct selection and use of:

(a) test probes, leads, lamps, voltage detecting devices, and
(b) measuring equipment

for circuits with rated voltages not exceeding 1000 V AC.

In line with the E*lectricity at Work Regulations 1989,* those in control of all or part of an electrical system are required to ensure that it is safe to use and it is maintained in a safe condition.

The full text of GS38 can be viewed or downloaded free of charge from www.hse.gov.uk.

The store-age:

the start of smarter energy consumption

Dr Andrew Crossland MIET discusses changes in the installation notification process for energy storage systems and how flexibility-technologies, including energy storage, are fast impacting how we consume energy.

It seems that every few weeks there is major news about Britain's fast-changing electricity sector. This year we saw the first full day without coal power, we saw solar briefly provide more than 30 % of British electricity and we briefly saw over 80 % of our power come from low carbon sources [Source: MyGridGB.co.uk]. Besides the revolution in the way we generate electricity, a potentially more exciting one is coming in the way that we respond to that power. That is all thanks to the growth of 'flexibility'-technologies, which help us to respond to the changing nature of supply and demand.

One of the primary technologies driving this is energy storage, be that stationary storage connected in homes or to the utility grid or batteries in electric vehicles. A rapid drop in cost has made battery and thermal storage economical enough for hundreds of megawatts to be under deployment. You may (or may not) think that this is the first sign of a fundamental change in the way we think about energy. However, most will conclude that new regulations, standards and working practices need to be developed in response to the rapid growth in energy storage deployments.

One way that working practices are changing is in the connection process for domestic energy storage. Under previous regulation, connections with generation exceeding 16 A per phase required a lengthy application process for DNO approval. The rules meant that a domestic property with a generation capacity of 16 A of solar PV alongside any form of AC-connected energy storage (see Figure 1 below) would require a lengthy connection process. This made little sense, given that the battery (if designed for self-consumption) should never discharge into the grid – it should only discharge to meet the local load of the homeowner.

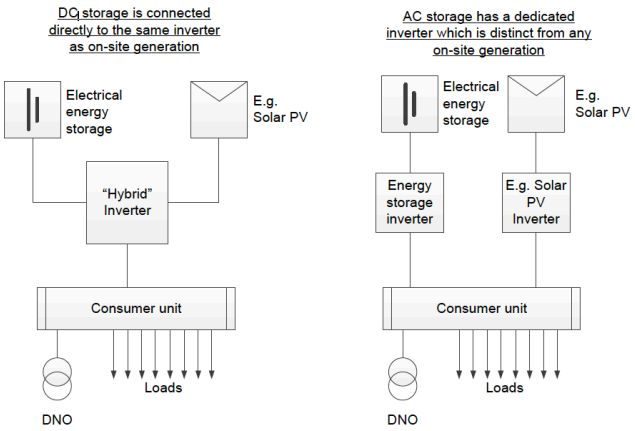


Figure 1: DC- and AC-connected energy storage

Intuitively, the regulation made little sense. For businesses, it was a barrier to market. Practically, it risked some storage being installed without grid applications where someone felt that "the DNO would not notice anyway". The latter is a critical problem not just for DNOs but also for the country as a whole understanding the amount of energy storage and flexibility in the electricity system.

To mitigate that risk, DNOs are beginning to release a series of 'fast-track' applications for energy storage under guidance from the Electricity Networks Association. UK Power Networks released one of the first application

processes, which allows for a ‘fast-track’ application for energy storage connections. The application process is fairly easy to follow and can be found at this link.

This fast-track process is of course covered in the recently published IET Code of Practice for Electrical Energy Storage Systems. This Code of Practice is somewhat of a landmark document as it is the first consolidated effort by industry and engineers to lay practical guidelines for storage. The success of energy storage depends on safe, well designed and long-lasting installations that benefit consumers. Storage is a peculiar asset, and this guidance is invaluable.

One final practical example is the provision of backup power. As outlined in the Code of Practice, there are particular earthing arrangements for batteries that must be followed for installations to be safe. Further, if a battery is capable of backup then isolation arrangements need to be carefully considered. You can never assume that a battery isn’t live and providing power to a site.

There is no doubt that energy storage presents peculiarities to our industry. The IET Code of Practice is a starting point for all of our learning and the development of standards heralds the start of an interesting time for all of us. Welcome to the ‘store-age’!

Dr Andrew Crossland earned his PhD by modelling the technical and financial impact of energy storage on 9,000 distribution networks in North West England. His work showed how storage can reduce reinforcement costs dramatically if deployed correctly and as part of a smart grid. Andrew now works as an Energy Storage Engineer at Solarcentury, he runs the electricity tracking website MyGridGB.co.uk and is an Associate Fellow at the Durham Energy Institute. He also co-chairs the Behind the Meter Storage Group within the Solar Trade Association. In 2017, he was awarded the ‘Rising Star’ award by Energy UK for his work on storage in the UK and East Africa.

Electrical energy storage: video

We’ve published a new video about electrical energy storage systems.

The *Code of Practice for Electrical Energy Storage Systems* published in August. Find out more about how it was developed here, and more about notifying DNOs here.

Graphic design and illustration by Cleverly Creative
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