External consumer units for electric vehicles in a domestic environment

By: **Craig O'Neill**

The pressure is on to achieve net zero. The roll out of electric vehicles, solar photovoltaic (PV) and heat pumps is set to be a big part of reaching that target, so it comes as no surprise that new challenges have been coming thick and fast for the designers and installers of electrical installations to accommodate new technologies into homes.

Renewable technologies require specific protection in order to be safe for use in line with BS 7671:2018+A2:2022. These protective devices are sometimes difficult to retrofit into existing consumer units due to the age of the existing unit or space constraints, so installers sometimes need to either replace with a larger consumer unit or install a separate consumer unit to supply electric vehicle charging equipment. If there is space inside the property adjacent to the existing consumer unit, then this is fairly straightforward and simple. However, if there is no space, then installers need to find other solutions. Some properties have external meter boxes which might be tempting to use as the location of one of these consumer units. However, the Energy Networks Association issued a statement regarding using these enclosures for this purpose:

While the meter cabinet is the customer's, it is a space designed for the use of electricity industry apparatus only and no allowance is made for additional equipment. For safety reasons, we would not recommend that any internal wiring, including a consumer unit is installed within the cabinet.

One option which has been growing in popularity is to use an external consumer unit fitted externally adjacent to the meter cabinet.

This article looks at some of the main design considerations for such an install in a domestic environment.

What should a designer and installer consider?

External consumer units in domestic premises will need to conform to BS EN 61439 series and in particular BS EN 61439-3 Low-voltage switchgear and controlgear assemblies. Distribution boards intended to be operated by ordinary persons (DBO).

All electrical installations need to consider the general requirements of BS 7671:2018+A2:2022 and mitigate any potential hazards at the design stage. For an external electric vehicle consumer unit, there are some specific considerations:

- Weather.
- Temperature variances.
- Exposure to the sun.
- Corrosive or pollutive substances which would include coastal air with a high salt content.
- Condensation.
- Impact protection.
- Protective multiple earthing (PME) supplies.
- Tampering.
- Rated current of circuits within the consumer unit.

Weather, temperature variances, sun exposure, and corrosive or pollutive substances

Weather, temperature variances, sun exposure, and corrosive or pollutive substances can all have a detrimental effect on electrical equipment. Electrical equipment is designed to operate within certain parameters, so any venture outside of these parameters means their reliability and/or safety cannot be assured.

Traditionally, an external consumer unit was cited in locations away from the weather such as under soffits of roofs of summer houses and out buildings, or housed in additional enclosures. This provides additional protection against the weather and prevents the user having to operate any protective devices in direct rain or snow which could be hazardous.

The weather in the UK can vary greatly and it is important for an installer to understand what that means. Driving wind and rain can penetrate even the best of seals so, using the correct entry method is essential. If attempting a rear entry from inside the property into an enclosure, ingress of moisture will almost be inevitable at some point in the future. Driving wind and rain will get past tiny gaps between any silicon used and brickwork, and then track inside either the enclosure or into the house along the cables. The temperature in the UK also varies and although these assemblies and devices are tested to the extremes (-25° C/+40° C with an average daily max of 35° C), it is important to remember that as temperatures change, so do the electrical resistances of conductors and thermally operated protective devices. In the cold they will operate slower and as temperature increases they will operate faster.

The enclosure selected will need to have suitable protection from the effects of the sun.

According to PD IEC TR 61439-0:2022 *Low-voltage switchgear and controlgear assemblies – Guidance to specifying assemblies:*

Solar radiation can have two impacts on assemblies and enclosures exposed to it.

1. *Heating effect caused by the complete spectrum of sunlight, usually referred to as solar irradiance, and*
2. *UV radiation which has a shorter wavelength than that of visible light and can degrade synthetic material such as plastics.*

These effects could make some plastics become brittle. Some plastics are formulated to be more UV stable than others.

PD IEC TR 61439-0:2022 8.5.2 mentions that the heating effect caused by the complete spectrum of sunlight is not addressed in the BS EN 61439 *Low-voltage switchgear and controlgear assemblies* series, except for assemblies for PV applications. Outdoor assemblies are required by the BS EN 61439 series of standards to be UV stable in temperate climates and mentions that if exposed to intense sunlight, the specifier should consult with the manufacturers on ways to increase the UV resistance.

A metallic enclosure is more susceptible to corrosion from the rain and coastal air due to higher salt content. In order to demonstrate resistance to corrosion, design verification tests are carried out in accordance with the BS EN 61439 series on representative samples or parts of the assembly to recognized standards. The tests are accelerated life tests, which use chemicals and processes to stimulate in a short time exposure of the assembly to normal atmosphere for its intended life. All assemblies are required to be resistant to a basic level of corrosion. Two levels are included for ferrous metallic parts which are severity A and severity B. Severity A is indoor equipment and the internal parts of outdoor equipment and severity B is external parts of outdoor equipment located in normal environments. PD IEC TR 61439-0:2022 mentions:

For outdoor equipment where exceptionally long service without maintenance is required, or where particularly onerous conditions prevail (for example exposure to sea spray), additional protection and/or measures can be necessary.

What is pollution degree?

According to PD IEC TR 61439-0:2022 *Low-voltage switchgear and controlgear assemblies – Guidance to specifying assemblies:*:

It is expected that, depending on the place of installation, the air surrounding and within the assembly will contain a level of pollution. Environmental conditions at the place of installation are regarded as "macro-environment", whereas the "micro-environment" refers to conditions within the assembly. The specifier shall state the pollution degree outside the assembly at the place where it will be installed. Depending on the protection offered by the assembly enclosure, the assembly manufacturer will then derive the pollution degree in the micro-environment inside the assembly.

The pollution degree is a classification system that relates to the amount of dry pollution and condensation present in an environment. It's important because it affects the creepage and clearance distances required to ensure the safety of a product. Here's what the pollution degrees represent:

Pollution degree 1:
No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.

Pollution degree 2:
Only non-conductive pollution occurs, except that occasionally a temporary conductivity caused by condensation is to be expected.

Pollution degree 3:
Conductive pollution occurs or dry, non-conductive pollution occurs which is expected to become conductive due to condensation.

Pollution degree 4:
Continuous conductivity occurs due to conductive dust, rain or other wet conditions.

The relationship between IP rating and pollution degree is that they both provide a measure of protection for electrical equipment, but they focus on different aspects. While the IP rating system provides a measure of protection against intrusion from foreign bodies (such as dust or water) and accidental contact, the pollution degree rating focuses on the amount of dry pollution and condensation present in the environment.

In other words, the IP rating can help protect against the physical ingress of pollutants (to a certain degree), while the pollution degree rating, along with expected voltages and required voltage withstand levels, helps determine the necessary design considerations (like creepage and clearance distances) to ensure safe operation of the equipment in environments with varying levels of pollution.

However, it's important to note that neither system guarantees complete protection against all types of environmental conditions or pollutants. Therefore, both ratings should be considered when designing, selecting and using electrical equipment. It's always important to consider the specific environmental conditions that the equipment will be exposed to and ensure that it is appropriately rated or protected for those conditions.

What is creepage and clearance distances?

When discussing pollution degree, creepage and clearance are two important concepts related to the safety and function of electrical equipment.

BS EN IEC 60664-1:2020 *Insulation coordination for equipment within low-voltage supply systems – Principles, requirements and tests*, defines these as the following:

3.1.4 - Clearance - shortest distance in air between two conductive parts
3.1.5 - Creepage distance - shortest distance along the surface of a solid insulating material between two conductive parts.

Enclosures for outdoor and indoor installation, intended for use in locations with high humidity and temperatures varying within wide limits, shall be provided with suitable arrangements (natural ventilation, forced ventilation, internal heating, drain holes etc.) to prevent harmful condensation within the enclosure.

Degrees of protection provided by enclosures (IP code), according to the classes specified in IEC 60529, do not necessarily improve the micro-environment with regard to pollution. Different insulative materials have different effects on creepage distances.

The pollution degree of an environment affects the required creepage and clearance distances to ensure the safety of a product. For example, in some cases, the creepage distance for pollution degree 2 is 2 to 4 times longer than for pollution degree 1. This is because a higher pollution degree means a harsher environment with more dry pollution and condensation, which can affect the conductivity between conductive parts.

Condensation

Condensation is the reverse process of evaporation and occurs either when warm, moist air is cooled to its dew point, or the air becomes so saturated with moisture it can no longer hold any more moisture.

Anyone who has lived in a bedroom with single glazed windows will understand what this means. The warmer moist air on the inside of the window was cooled to its dew point when in contact with the cold surface of the glass, the glass was cooled by the colder air outside overnight and condensation formed on the inside and created a puddle on the window sill each morning.

In an electrical enclosure outside, this could be problematic. Not only would it potentially reduce the creepage and clearance distances of the devices and assembly, but, in the worst case, could pose a shock risk. If the protection of these types of external enclosure is likely to be the supplier's overcurrent protective device, it is important to remember this type of fuse will offer very little protection from shock and is unlikely to react unless the supply conductors to the external enclosure directly make contact with each other. Designers and installers are reminded of the fundamental principles set out in chapter 13 of BS 7671:2018+A2:2022

Eventually, any condensation forming like this inside an enclosure would increase corrosion of any metallic parts.

It is important to note that the electrical installer should not modify a consumer unit/distribution board to make it suitable for outdoors unless they intend to take on the responsibility for the conformity of the product. An appropriate product classified for use outdoors with appropriate manufacturer's verification and declaration should be selected. The manufacturer will typically select and verify a suitable solution for the size and application of the consumer unit/distribution board with respect to condensation and pollution degree for example:

1. Test the outdoor consumer unit for the external macro-environment of pollution degree 4 (for example, by thermal cycling tests, climatic durability tests) to validate that the micro-environment inside the assembly is suitable for the pollution degree and level of condensation in relation to the incorporated devices.
2. Avoid fluctuations in temperature, for example, pressure relief glands validated by test as part of the consumer unit.
3. Ventilate (for example, by air gland technology, vents) validated by test as part of the consumer unit.
4. Install air conditioning.
5. Decrease humidity.
6. Keep the temperature above dew point.

PD IEC TR 61439-0:2022 explains:

Specifiers are cautioned against over-specifying their requirements; it may not lead to a more appropriate assembly for their application. More onerous requirements for one criterion usually have a negative impact on others. For example, an outdoor assembly being specified to comply with IP66 of IEC 60529, when a lower IP degree, for example IP33, will suffice, can:

– increase temperatures within the assembly due to the lack of ventilation with the effect that the insulation ages more quickly;
– increase the risk of condensation causing tracking due to there being no ventilation and therefore no air exchange with the environment outside of the assembly; and
– make the assembly larger and more expensive due to the need to manage the lack of ventilation. If special and exceptionally onerous conditions are likely to exist, these conditions should be identified by the specifier. Examples of these onerous conditions include high ultraviolet (UV) radiation applications, conditions of high particulates/pollutants, more stringent short-circuit conditions, special fault protection, special protection due to risk of fire, internal arc-faults, explosions, burns, etc.

Figure 1 shows IP codes second numeral from PD IEC TR 61439-0:2022.

Figure 1 IP codes second numeral from PD IEC TR 61439-0:2022

Table 2 – IP codes, second numeral

Second numeral				
IP	**Requirements for protection against ingress of water**	**Representative illustration**	**Protection from water**	**Example**
0	No protection.		Non-protected	Dry indoor environment.
1	Protected against vertically falling drops of water.		Vertical dripping	Room with condensation.
2	Protected against vertically falling drops of water with the enclosure tilted 15° from the vertical. Limited ingress permitted.		Vertical dripping	Assembly on a ship or a switchboard installed on slight angle (not vertical). IPX2 does not provide protection against water from fire sprinklers.
3	Protected against sprays to 60° from the vertical. Limited ingress permitted.		Limited spraying	Protection against rain[a].
4	Protected against splashing from all directions. Limited ingress permitted.		Splashing from all directions	Rain and splashing from all directions[a]. Installation including low pressure water pipes that can 'burst'.
5	Protected against jets of water. Limited ingress permitted.		Hosing jets from all directions	Assembly in an area that is washed down, for example food processing plant.
6	Protected against strong jets of water. Limited ingress permitted.		Strong hosing jets from all directions	Assembly in an area that is pressure washed down, for example abattoir.
7	Protected against the effects of immersion between 15 cm and 1 m.		Temporary immersion	Potential flood area.

These can be linked with external influence codes from BS 7671:2018+A2:2022, as seen below in Figure 2, which shows external influences and equivalent IP code from BS EN 60529.

Figure 2 External influence codes from BS 7671:2018+A2:2022

BS 7671 Rating	IEC 60529 Equivalent	Protection Against
AD1	IPX0	Negligible protection
AD2	IPX1 or IPX2	Free falling water drops
AD3	IPX3	Spraying water from limited angles
AD4	IPX4	Splashing or spraying water from any direction
AD5	IPX5	Water jets from any direction
AD6	IPX6	Water waves
AD7	IPX7	Intermittent immersion
AD8	IPX8	Complete submersion

Figure 3 Example of condensation in external CU mounted directly onto a wall

Figure 4 More extreme examples of condensation in an enclosure that had protection by an additional GRP enclosure but no additional measures in place. The condensation here caused a fault (bottom right)

Figure 5 More examples of condensation building up into corrosive puddles at the bottom of the enclosure

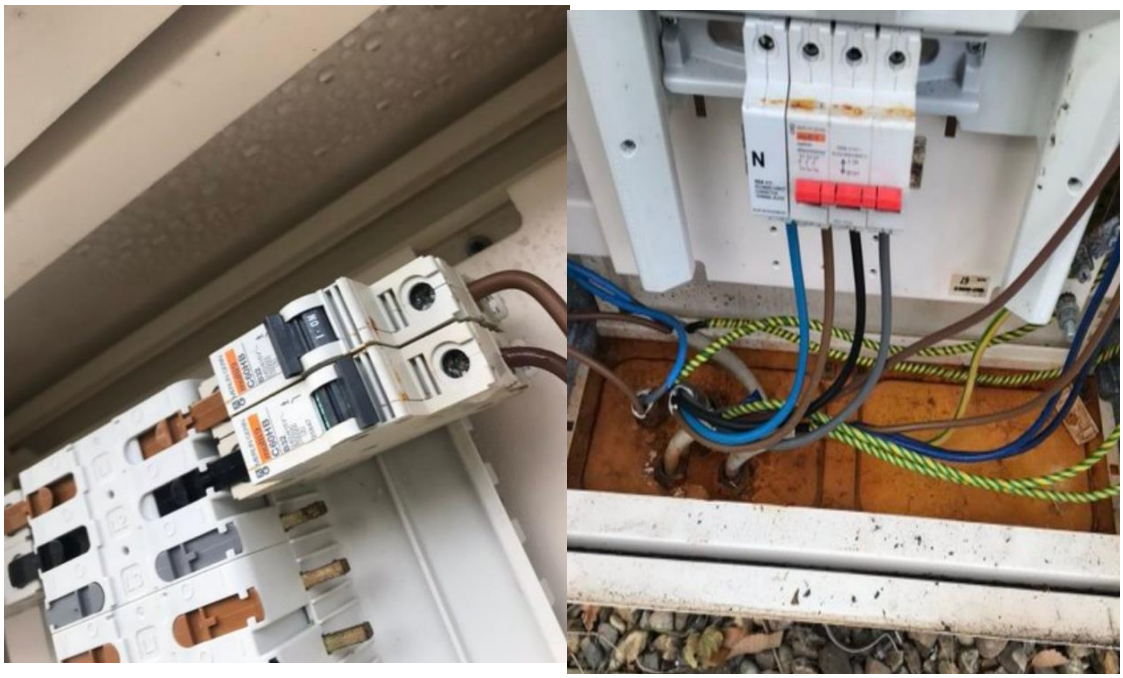
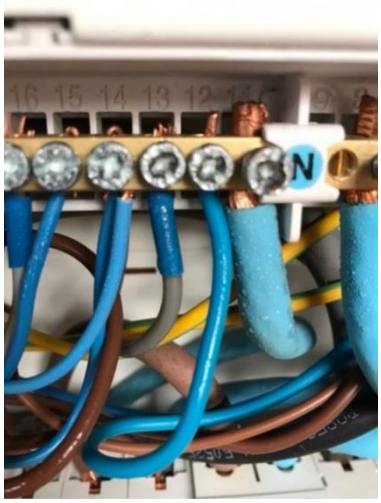


Figure 6 Metallic board forming condensation inside



The BEAMA IP guide states:

Consideration should also be given to the possible effects of condensation, which can be caused by occasional temperature changes. This may be solved by ventilation, use of anticondensation heaters, climate controls or by ensuring any condensation created does not cause harm and may be allowed to drain away. Generally, an air temperature inside the enclosure, of 5 degrees above external ambient, will prevent condensation within the enclosure. Drainage holes may be sufficient to disperse the condensate, but these apertures may reduce the IP rating. However, if correctly designed, drainage holes can enhance the weatherproof capabilities of an enclosure. See sections 7 & 10.

The BEAMA IP guide can be found here.

Impact protection

Avoiding any impact of an enclosure is the best way to protect the enclosure. Therefore, choosing the best location for the enclosure is critical. Low level in a high traffic location is almost certainly going to be impacted at some point. If the installation is connected via the suppliers fuse then any exposed live parts resulting from an impact could present significant shock risk. An additional enclosure to house the consumer unit would increase protection from impact.

The requirements of impact protection can be found in IEC 61439-3:2024 and BS EN 61439-3:2012 *Low-voltage switchgear and controlgear assemblies - Distribution boards intended to be operated by ordinary persons (DBO).*

BS EN 61439-3:2012, clause 8.2.1 Protection against mechanical impact states:

The DBO shall comply with the following IK codes according to IEC 62262:

– IK05 for a DBO for indoor use;
– IK07 for a DBO for outdoor use.

Rated current of circuits within the consumer unit

PD IEC TR 61439-0 highlights that as the IP rating increases, this can create higher temperature rises within the assembly due to the lack of ventilation. This could result in the marked/labelled rated current of protection devices being derated and these rated currents should be supplied with the consumer documentation. This is highlighted in BS 7671:2018+A2:2022 Regulation 536.4.2022:

The current rating(s) of an assembly circuit may be lower than the rated current(s) of the device(s) according to their respective device standard, when installed in the assembly; therefore, the assembly manufacturer's ratings and instructions shall be taken into account.

It is therefore critical that the electrical installation designer ensures the consumer unit specified is supplied with the required rated current information.

PME supplies and metallic enclosures

When exporting any circuit connected to a PME supply to the outside of a property, the issue of protective earthed neutral (PEN) faults and the dangers of using a PME earthing system gets discussed. These faults are usually associated with an ageing network, but accidental damage could also cause the same outcome. At the time of writing this article, there is very little available data to decide how frequent these types of faults could occur, but the theory behind how they could occur is widely accepted throughout the industry.

The design of a PME earthing system means that there can always be a small potential difference between true earth and any exposed-conductive-parts of an exported circuit and/or extraneous-conductive-parts connected to the main earthing terminal (MET). Generally, the further away from the supply source transformer you go, the more the potential difference increases due to an increased resistance between true earth and the MET. It is therefore always a consideration for any designer to be aware of any simultaneous touch points of both exposed and extraneous-conductive-parts and true earth and, where possible, design them out to remove any hazards as IET *Guidance Note 5: Protection Against Electric Shock* (GN5) suggests in Section 14.4.

Figure 7 Guidance Note 5 extract regarding touch voltage potentials outside

14.4 Potential difference outside buildings

Contact with Earth is always possible outside a building and, if exposed-conductive-parts and/or extraneous-conductive-parts connected to the PME earthing terminal are accessible outside the building, people may be subjected to a voltage difference appearing between these parts and Earth.

The potential difference between true earth and any exported Circuit Protective Conductor (CPC) can be of importance when body contact resistance is low (in wet conditions or minimal clothing) and when there is good contact with true earth.

BS 7671:2018+A2:2022 Regulation 411.4.2 recommends that an additional connection to earth, by means of an electrode in accordance with chapter 54 BS 7671:2018+A2:2022, is made to the main earthing terminal. This would ensure any small potential rises between the two during normal use would become less significant, but a single electrode is unlikely to maintain safe touch voltages during an open PEN fault scenario or fault currents.

Figure 8 Table 14.1 from Guidance Note 5

▼ **Table 14.1** Additional electrode maximum resistance to Earth, R_A, necessary to reduce the touch voltage to 50 V, 70 V and 100 V for single-phase supplies, ignoring diverted neutral currents

Installation demand I_{inst} (A)	Equivalent rating plate load (kW)	Maximum earth electrode resistance R_A (Ω) (NOTE 1)		
		U_p=50 V	U_p=70 V (NOTE 2)	U_p=100 V
100	23.0	0.6	1.0	1.7
80	18.4	0.8	1.2	2.1
60	13.8	1.0	1.6	2.8
50	11.5	1.2	1.9	3.3
45	10.4	1.4	2.2	3.7
32	7.4	1.9	3.0	5.2
16	3.7	3.9	6.0	10.3
10	2.3	6.2	9.7	16.5
5	1.2	12.5	19.4	33.1

Regulation 411.4.1 of BS 7671:2018+A2:2022 reminds us that the integrity of the earthing is the responsibility of the distributor.

It is theoretically possible to use an open PEN detection device (OPDD) inside an external metallic enclosure to protect the enclosure itself, There is currently no requirement within BS 7671:2018+A2:2022 to do so as Regulation 722.411.4.1 refers to the charging point and not any supply equipment. The risks however, are similar.

If a PEN fault occurred, some charging equipment may not operate. The user is likely to inspect the consumer unit which, if metallic, during a PEN fault could be live and pose a significant shock risk.

An OPDD device would involve switching the distribution circuit cpc before it connects to the casing and would need to meet the requirements of Regulation 543.3.3.101 of BS 7671:2018+A2:2022.

These devices do not currently have a product standard so the equipment would need to meet The Electrical Equipment (Safety) Regulations 2016 (as amended), The Electromagnetic Compatibility Regulations 2016 (as amended) and other relevant legislation, along with a CE, UKCA or UKNI mark and a Declaration of Conformity appended to the Electrical Installation Certificate (EIC). See Section 511 of BS 7671:2018+A2:2022 and Regulation 722.411.4.1 Note 1. It could also affect the rated current of assembly and therefore would also need to be verified by the enclosure manufacturer and work in coordination with any protective devices inside the charging equipment.

Figure 9 An open PEN detection device which operates in accordance with Regulation 543.3.3.101 of BS 7671:2018+A2:2022 and has also been third party tested by BSI labs

The most obvious method of avoiding any danger from a metallic enclosure and a PME supply would be to simply use an insulated enclosure. This would remove any contact point during normal use. BS 7671:2018+A2:2022 Regulation 421.1.201 applies *within* domestic premises, not external, so an insulated enclosure could be suitable. For fire considerations, it would be prudent to locate an insulated external consumer unit enclosure away from windows where people sleep, escape routes and avoid fixing to some cladding systems.

Tampering and continuity of service

All outdoor, accessible switchgear is vulnerable to tampering. If the enclosure is for an electric vehicle charger and someone decided to turn it off for you, then you may wake up to a flat battery. This could be significant for times of emergency or important call outs such as lifeguards, fire service etc.

Other considerations

As time moves on, electricians will be conducting Electrical Installation Condition Reports (EICRs) and coming across enclosures like this and it is important to know which ones have been verified by the manufacturer and which ones someone have just been put together themselves from an empty enclosure and devices. This is important as the rated current of assembly verified by the manufacturer may be less than the device marked ratings. Different devices may have different heating effects. It is important that a manufacturer has verified the assembly to BS EN 61439-3.

Summary

Key points:

- Domestic external consumer units need to conform to BS EN 61439-3 and other relevant parts.
- Direct sunlight will heat the enclosure and may not have been verified by the manufacturer for that environment.
- It is the responsibility of the manufacturer to interpret appropriate product standards and important to consult the manufacturer regarding any modifications required of the enclosure.
- Remember the installation basics of maintaining the declared IP rating, such as bottom entry appropriate glands, level and flat to surface fixing, secure fixings etc.
- A supplier’s cutout offers little protection against electric shock, so condensation and impact are important considerations.

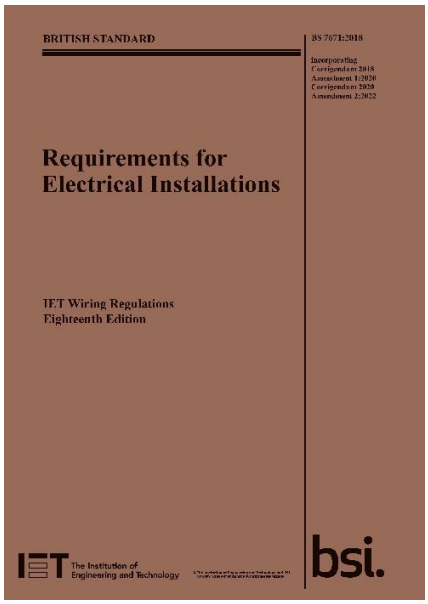
- Regulation 421.1.201 of BS 7671:2018+A2:2022 applies within a dwelling not externally, so there is no requirement for the enclosure to be metallic.
- An additional enclosure would help protect against impact, direct weather and provide a higher degree of safety for users to operate protective devices in wet conditions.
- Many engineers would regard this method of installation as a 'last resort' design option.

Thank you to the following people for their invaluable comments and advice when writing this article:

- BEAMA
- Gary Parker
- Michael Peace
- Leon Markwell

Special thank you to Susannah Girt

Have your say on Amendment 4:2026 to BS 7671:2018 IET Wiring Regulations



By: **Steven Devine**

Once again, our national technical committee (JPEL/64), BSI and the IET have worked tirelessly to revise and amend BS 7671 to address the need for essential industry requirements for electrical installations, to keep pace with rapidly emerging technologies coming on to the market.

There is now the opportunity for you to make a difference. Committee members do their utmost to draft requirements for the benefit of the industry. However, like they say, two heads are better than one and we want to encourage as many people as possible who work directly with the IET Wiring Regulations to share their views during the Draft for Public Consultation (DPC) that will end on 3 November 2024.

It is extremely important for all of those who work in the electrical industry to review and comment on the draft. There might be proposed changes that will affect your business and it is the only way to catch a glimpse of future UK requirements for electrical installations.

Commenting on the IET Wiring Regulations (BS 7671) has never been easier. You simply need to access the BSI portal, register, search for BS 7671 and you will see the available documents.

A handy video which demonstrates the whole process from start to proposal can be found here.

In addition, written instructions outlining the process can be found as follows…

How to make sure your comments are considered

As you can imagine, it is not uncommon to receive thousands of comments on British Standards, especially one as widely used as BS 7671. In order for your comments to be reviewed by the

technical committees, they should be written in a way that provides a clear description of the opinion or concern you have, with a technical justification. This is to be written in the comment section.

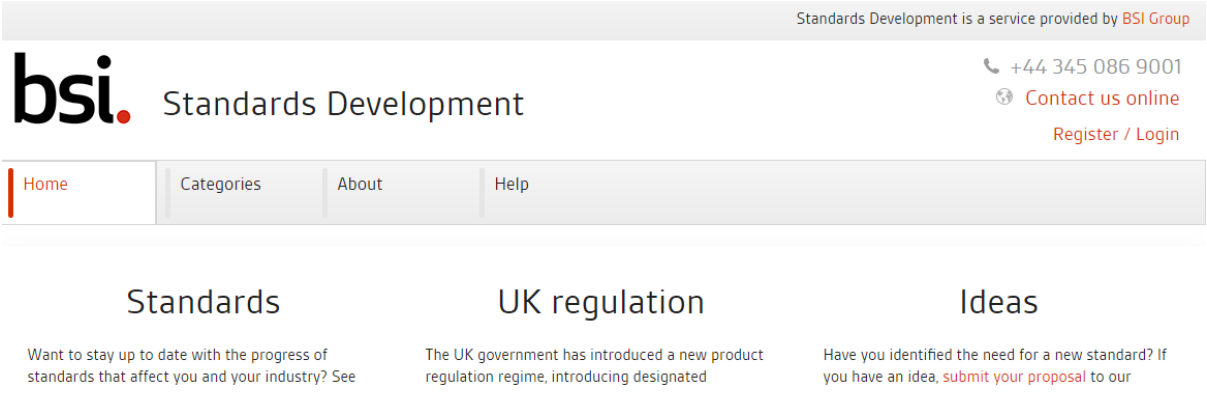
It is extremely important that you provide a clear explanation of what you would like the committee to do. It is more likely that your comment will be taken into consideration if a proposal has been provided in the proposal section of the commenting form.

All comments are reviewed and, if necessary, are discussed at the technical committee, JPEL/64. Your input is extremely valuable and helps to shape the future of your industry.

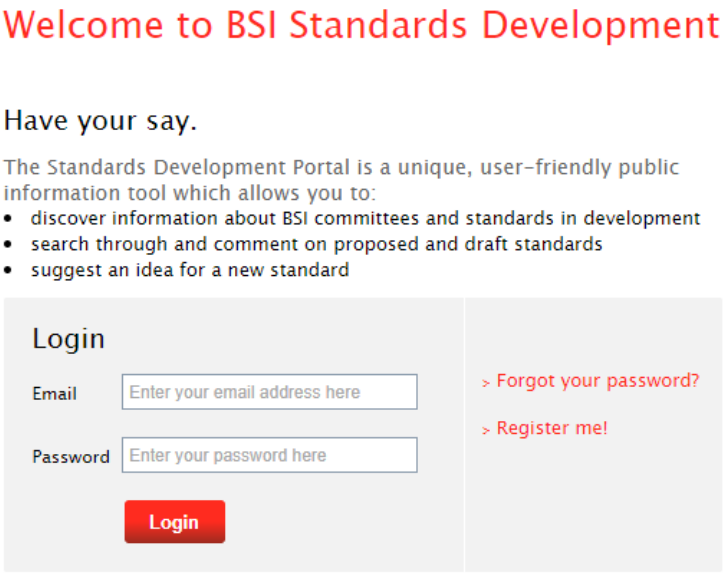
Instructions for registering and adding your comments

Registration

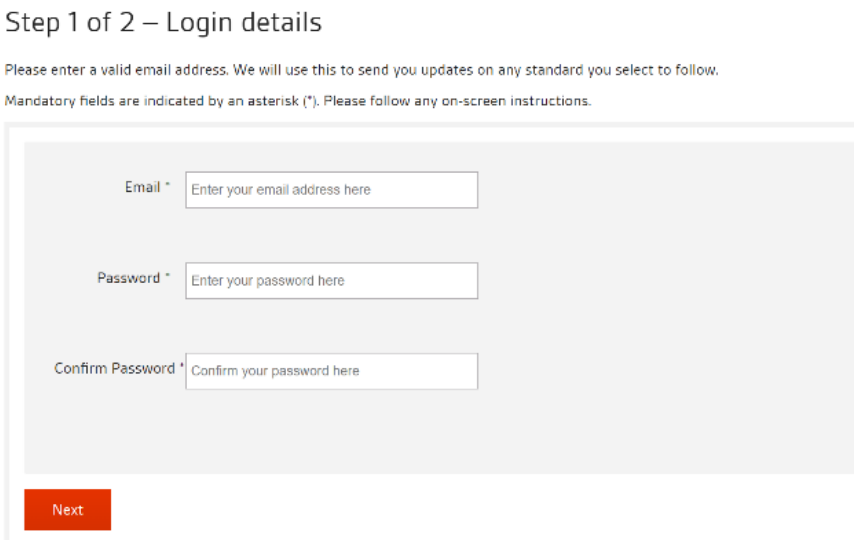
1. Start by entering the following address https://standardsdevelopment.bsigroup.com into your internet browser or type “BSI Standards Development” into Google and click the search link with the above address.
2. Once the BSI Standards Development page has loaded, at the top right of the page, below the telephone number and “Contact us online”, you will see the option to “Register / Login”. Click on this link.



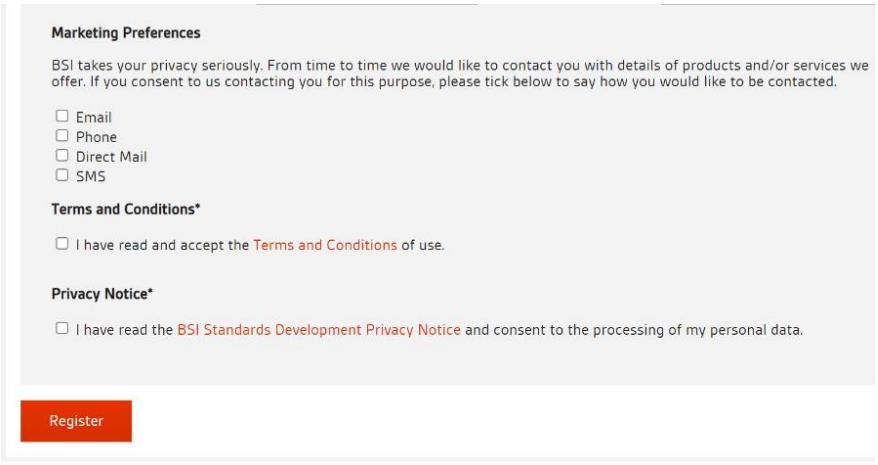
3. When the login option appears, you will see a link to the right that says “Register me!”. Click on this link.



4. Next you will be prompted to enter your email address and choose a password to enter, then confirm that password again. Enter these details and click “Next”.

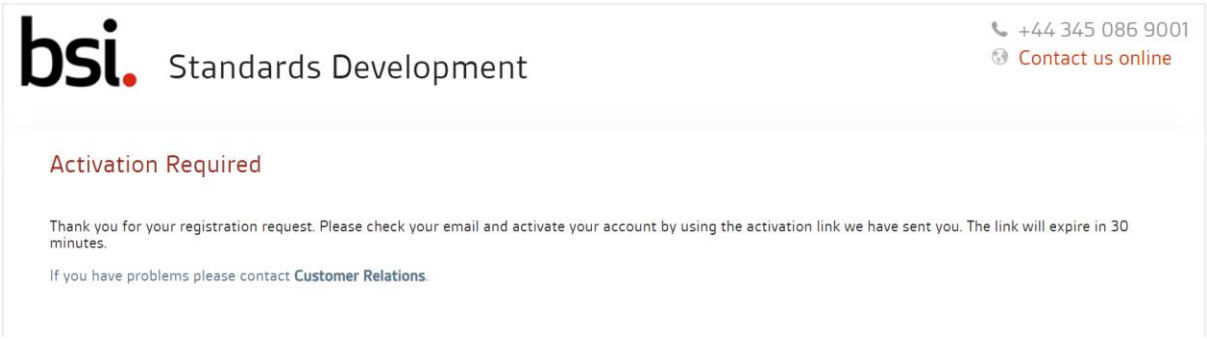


5. You will then be asked to provide some personal information:
   - Title
   - First and last names
   - Phone number
   - Country of residence
6. Further information requested is whether your view is personal or from an organization, and your job title. Complete these fields.
7. Other information that is optional to fill in includes sector, organization name, organization size and organization type.
8. And then you have the usual tick boxes for marketing preferences should you wish to receive any marketing material.
9. Tick the boxes to confirm you have read the terms and conditions (always worth a read) and privacy notice.

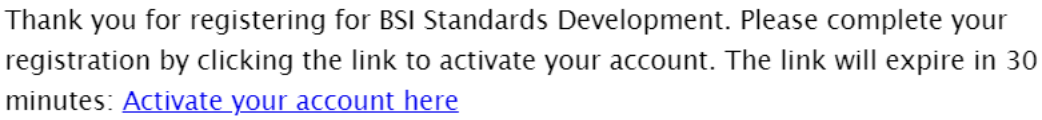


10. Click “Register” at the bottom of the page.

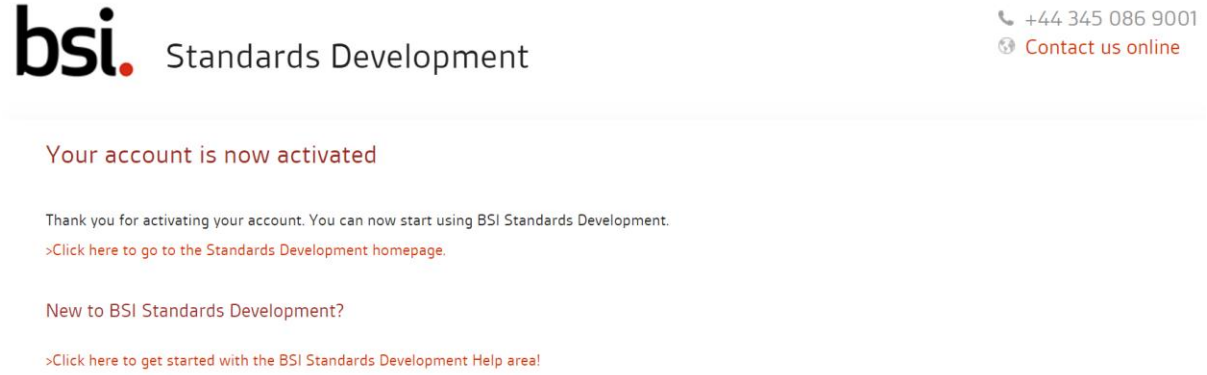
11. A page will then load, displaying a message saying “Activation Required”. You will have been sent an email from BSonlineSupport-Confirmation-noreply@bsigroup.com with a link to activate your account.



12. Go to your email account, find this email and click on the link within it that says “Activate your account here”.



13. This will take you to a page on the BSI website that says “Your account is now activated”.
14. Click on the link that says “>Click here to go to the Standards Development Homepage”.



15. You are now ready to comment on British Standards.

Finding the IET Wiring Regulations and commenting

Now you have registered, you will need to log in to your account.

1. Go back to the page https://standardsdevelopment.bsigroup.com and click on the link at the top right of the page that says “Register / Login”.
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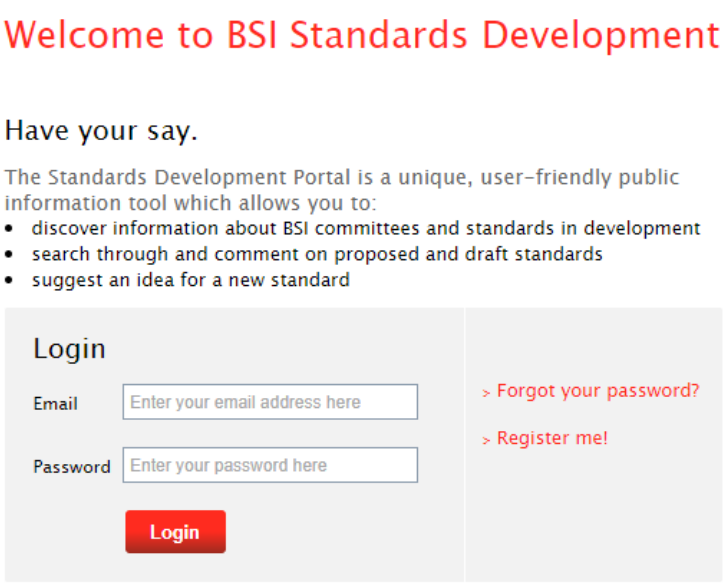
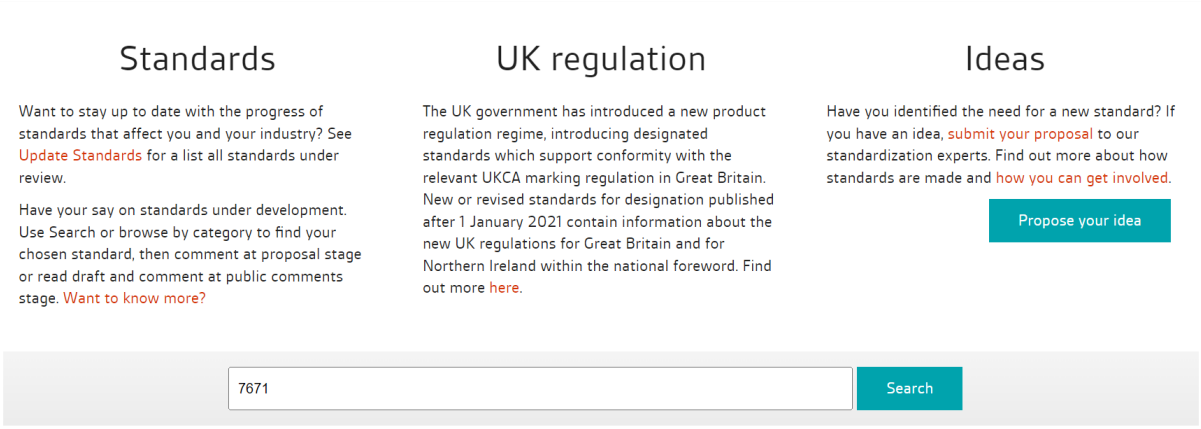


3. Once you have logged in and are back on the homepage, https://standardsdevelopment.bsigroup.com, you will see a search box with the text "Search for standards, committees and keywords". Simply enter into this box, "7671".



4. The top 4 search results are *Requirements for Electrical Installations, IET Wiring Regulations Eighteenth Edition, Amendment 4* Draft for Public Consultation. The document has been divided into 4 section for ease of access.
5. Click on the links to any of these 4 sections in the "Reference" column.

Search for "7671" returned 22 standards result(s)

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Reference	Standards description	Committee	Status
BS 7671 (Section 2)	Requirements for Electrical Installations IET Wiring Regulations Eighteenth Edition Amendment 4 Categories: Unclassified documents	Unknown	Public comment
BS 7671 (Section 3)	Requirements for Electrical Installations IET Wiring Regulations Eighteenth Edition Amendment 4 Categories: Unclassified documents	Unknown	Public comment
BS 7671 (Section 1)	Requirements for Electrical Installations IET Wiring Regulations Eighteenth Edition Amendment 4 Categories: Unclassified documents	Unknown	Public comment
BS 7671 (Section 4)	Requirements for Electrical Installations IET Wiring Regulations Eighteenth Edition Amendment 4 Categories: Unclassified documents	Unknown	Public comment

6. Once you have done this, click on the red box at the bottom of the screen that says “Read draft and comment”.

Supporting Documents:

Filename	Description	Size	
BS 7671+Amendment 4_Part2.pdf	BS 7671+Amendment 4_Part2.pdf	16.14 MB	Download
BS 7671+Amendment 4_Part1.pdf	BS 7671+Amendment 4_Part1.pdf	14.31 MB	Download
BS 7671+Amendment 3.pdf	BS 7671+Amendment 3.pdf	470.29 KB	Download

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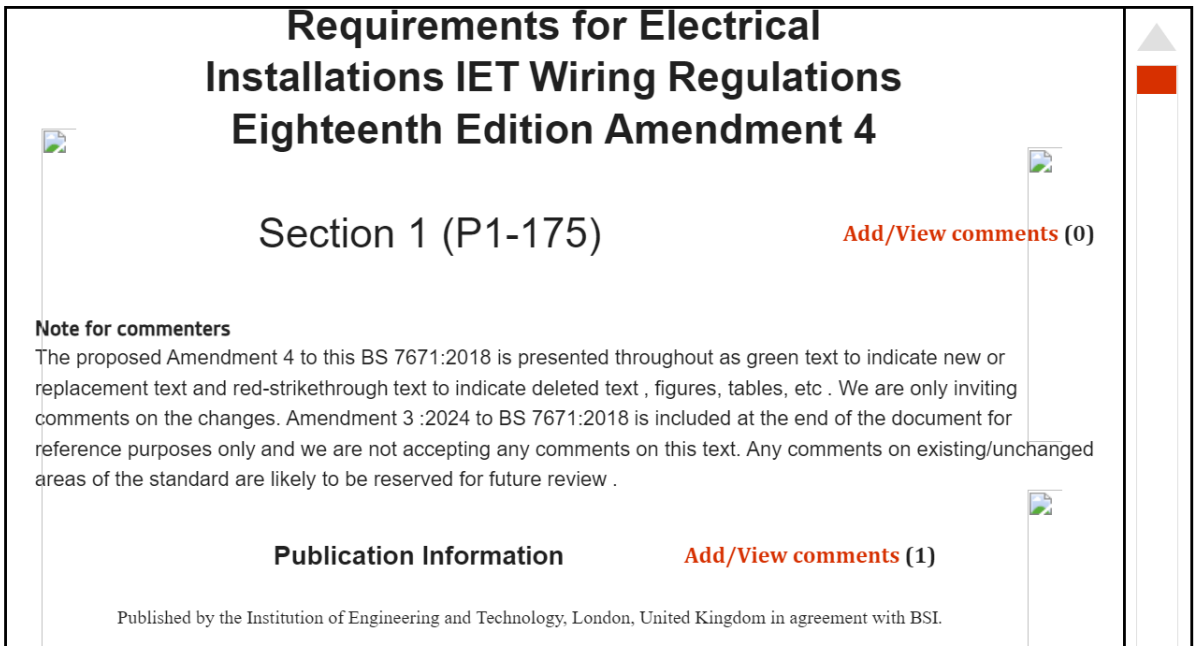
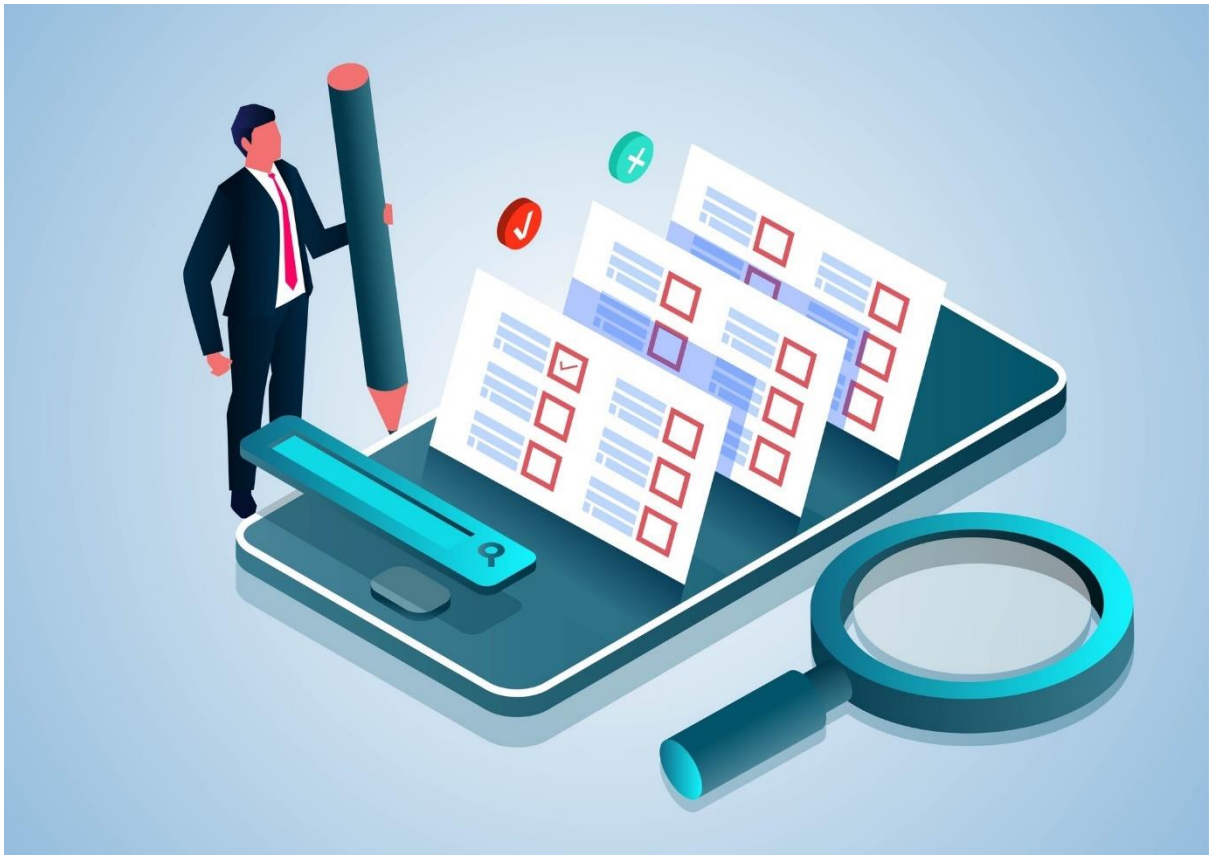
7. The commenting options are simple. As you scroll through the document, you will see prompts to “Add/View comments”. By clicking on these links, you are free to write comments and, very importantly, provide a proposal.



Remember, your comments can make a difference. The technical committee needs your views to develop standards that work for our industry.



The ‘C’ word (competency in the electrical installation industry)

By: **Leon Markwell**

Introduction

It’s quite surprising how many words relevant to electrical installation and electrical safety begin with the letter C. There are ‘cable’, ‘current’, ‘contractor’, ‘cost’, ‘construction’, ‘certification’, ‘compliance’, and of course the big one, ‘competence’!

Since the tragic Grenfell Tower fire incident, a light has been shining on competence and it has been looked at in a way it perhaps never has been before. We are seeing new proposals for competence and competence management, but what really is competence or being competent? It is a specific requirement of Regulation 16 of the Electricity at Work Regulations 1989, which requires persons to be competent to prevent danger and injury, but there is no specific legal definition of ‘competent’ or ‘competence’. Various non-legal attempts at defining it have been made, but in every case that goes to law, a court will decide the circumstances and competence (or a lack of it!).

A definition of ‘competent person’ was introduced in Part 2 of BS 7671:2008:

Competent person. *A person who possesses sufficient technical knowledge, relevant practical skills and*

experience for the nature of the electrical work undertaken and is able at all times to prevent danger and, where appropriate, injury to him/herself and others.

but this was removed from BS 7671:2008+A3:2015 and replaced by the definition 'Skilled person (electrically)':

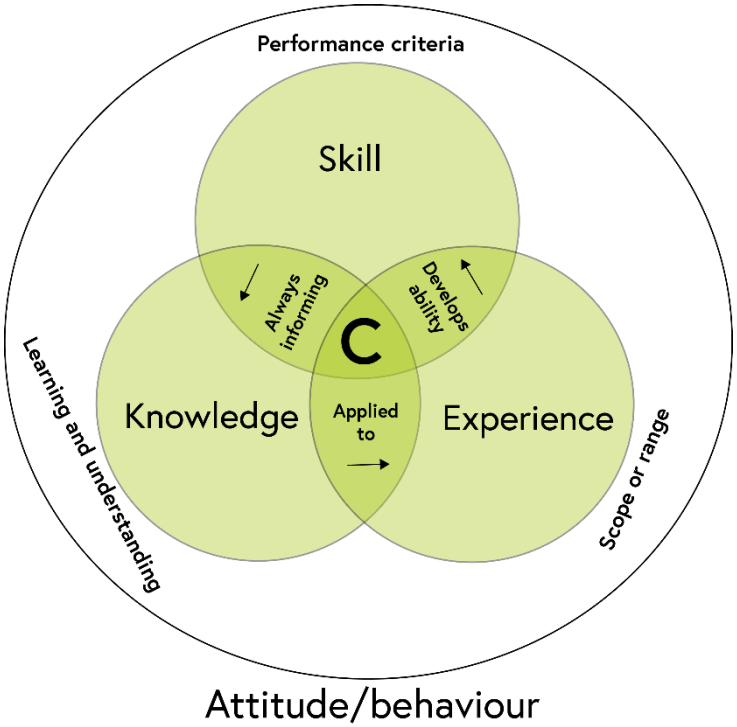
Skilled person (electrically). *Person who possesses, as appropriate to the nature of the electrical work to be*
undertaken, adequate education, training and practical skills, and who is able to perceive risks and avoid hazards which electricity can create.

(This is understood not to require a person to be qualified with electrical craft skills, only to have knowledge to avoid danger.)

and 'Instructed person (electrically)':

Instructed person (electrically). *Person adequately advised or supervised by a skilled person (as defined) to enable that person to perceive risks and to avoid hazards which electricity can create.*

Unfortunately, this just provided further definitions on the same competence theme for people to understand. The 'instructed person' definition also has the 'circular' note that Regulation 16 of the Electricity at Work Regulations 1989 requires persons to be 'competent' to prevent danger and injury. However, nowhere is there any mention of experience, attitude or management processes to confirm that the required work has been correctly completed and documented.



What is competence?

The term ‘competency’ was believed to have been created in 1973 by the American psychologist, David McClelland, to indicate the human factors by which competence depends. Initially, competencies were related to effective performance and were task and organization specific. Nowadays in education, vocational training and career guidance, the term competency indicates each personal characteristic generally utilizable in the workplace, in school or in ordinary life, regardless of the nature of the work or level of performance achievable through its use.

Almost 50 years ago, McClelland (1973) wrote his seminal article on competencies, beginning the competency movement. Competencies have since grown into a useful input for human resource (HR) tools. *Input* is the key word in the last sentence. A competency model in and of itself is not useful – it is just a bunch of words. Only when it is incorporated into HR practices does the model become useful, and a consequence of being used is that it becomes part of an employment decision. If that HR practice is later questioned, then the underlying competency model that serves as a foundation is open to detailed scrutiny [1].

Whatever the requirement, to be ‘competent’ is not new, and on the 11 May 1882, the Society of Telegraph Engineers and of Electricians (now the IET) decided to appoint a committee to consider rules for the prevention of fire risks from electricity. Those first rules are sound general advice rather than a wiring specification. They differ in intent, as well as in content, from the 18th Edition of BS 7671. The first rules were expressly “for the guidance and instruction of those who have...electric lighting apparatus installed in their premises”. The preamble to the rules makes the point that the chief dangers of electricity arise from ignorance and the chief element of safety is the employment of skilled and experienced electricians to supervise the work. (I don’t believe that this advice has changed since then!)

In *How competent are you?*, a blog post on the Construction Industry Council website posted on 27 October 2020, Construction Industry Council Chief Executive Officer, Graham Watts OBE, writes:

Much more recently, evidence that was given to the Grenfell Tower Inquiry has revealed an industry that was complacent and seemingly unaware of crucial safety issues. It has also typified the industry’s broken business model, which has encouraged a careless race to the bottom in terms of winning work and one that has gone unchecked by a building regulatory regime that stops well short of control. The Grenfell Tower fire has brought all of this into the sharpest focus.

While the industry must take responsibility for its own failings, recent governments are also culpable. The rampant pursuit of deregulation has progressively emasculated the building control profession. In my dealings with the Ministry of Housing, Communities and Local Government prior to the Grenfell Tower fire, the officials responsible for building regulations were metaphorically side-lined to a broom cupboard somewhere in the basement. Building safety was never discussed in meetings. Complacency ruled everywhere.

The Department for Levelling Up, Housing and Communities (DLUHC) operates the Building Regulation’s ‘competent person scheme’ under which, companies (enterprises) deemed suitable through initial and regular third-party assessment are able to self-certify that their own completed work complies with the requirements of the Building Regulations (where these apply to the work being done) rather than receive an independent Local Authority Building Control inspection and approval. Unfortunately, the self-certification is usually carried out by supervisors who may not have actually carried out the specific work.

Since 2002, on behalf of the electrical installation industry, the IET has accommodated and supported the Electrotechnical Assessment Specification Management Committee (an independent industry committee and not a part of the IET) which publishes the Electrotechnical Assessment Specification document, the base document covering the minimum requirements necessary to determine the competence of a company (enterprise) undertaking electrical work to carry out electrical design, construction, maintenance, and/or inspection and testing work in compliance with BS 7671 and self-certify their work.

Competence now

The Building Safety Act was introduced in 2022, coming into effect in parts in 2022 and 2023, and has considerably changed the way building regulations requirements and the competence to apply them correctly and safely are reviewed. It is not in the scope of this article to discuss the Building Safety Act requirements, but perhaps that is worth a separate article (or more…!).

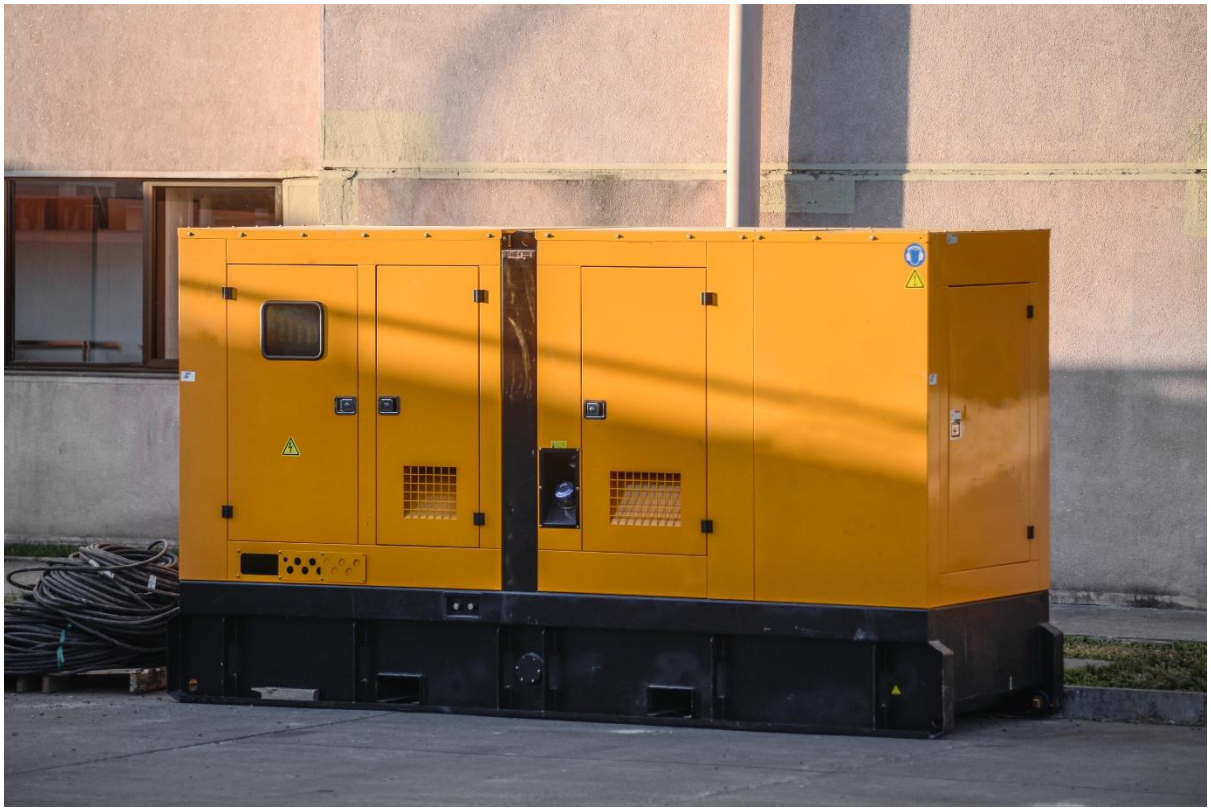
There are specific competence requirements built into the Act (such as the requirement for architects to undertake continuing professional development (CPD)), specific requirements to present a design at certain 'gateways' and the requirement to provide a completed building with documentation for inspection before occupation handover (no more "the operation and maintenance manuals are to follow"!).

BSI have now published BS 8670-1:2024. This is a set of core competence criteria covering the knowledge, skills, experience and behaviours required to work on buildings of all types and scales. The goal is to help raise levels of individual professional competence across the built environment in support of the new Building Safety Regime. Based on experiential feedback from the industry, BS 8670-1:2024 provides a benchmark framework that will help professional institutions and other organizations develop sector-specific competence frameworks for technical and non-technical roles, raising professional competency across the sector.

Conclusion

So, what has gone wrong with our industry when we already have many competence, training and skills requirements to work to and with? Perhaps construction time pressures, competitive tendering and required profitability etc. should be reconsidered?

It's not possible to discuss competence in detail in these shorter Wiring Matters articles, so I'll continue this in another article in the future. The IET certainly supports individual competence for any work being carried out, relevant training and continuing professional development.



The impact of Amendment 4:2026 on the 18th Edition of the IET Wiring Regulations

By: **Geoff Cronshaw**

We look at the impact that the main changes expected in Amendment 4 of BS 7671:2018+A2:2022+A3:2024 (the IET Wiring Regulations, 18th Edition) will have on the design, erection and verification of electrical installations.

Please note, the following are draft proposals only at this stage and may or may not be included in Amendment 4 depending on the decision of the national committee, JPEL/64. The DPC (Draft for Public Consultation) is open from 7 August 2024 to 3 November 2024. Comments on the DPC for Amendment 4 can be submitted through BSI's Standards Development portal during this consultation period. Amendment 4 is expected to be published in 2026.

Why issue another amendment?

The IET Wiring Regulations (BS 7671) is based on European standards, which in turn, are generally based on international standards. Standard development is an ongoing process to take account of new technology and product development. As the UK are members of CENELEC (the European

standards body), we must take account of new harmonized documents in our national standard (BS 7671). Also, the national standard must take account of UK legislation (e.g. the Building Safety Act).

What's included?

Proposals include a new:

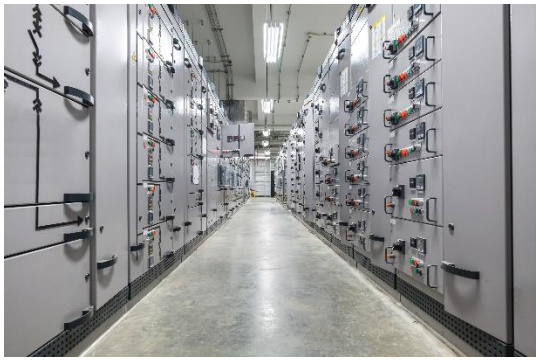
- Section 545, Functional earthing and functional-equipotential- bonding for information communication technology equipment and systems (ICT), such as broadcast, communication technology and computer network systems.
- Chapter 57, Stationary secondary battery installations.
- Section 716, Distribution of ELV DC power using balanced, information technology cables and accessories primarily designed for data transmission. Detailed requirements on low voltage generating sets.

In addition, there are updates throughout BS 7671, including changes to:

- Requirements for medical locations
- Requirements for firefighter's switches
- Chapter 65 concerning periodic inspection and testing, etc.

This article aims to cover most of the main changes. Please refer to the DPC for all the changes.

Chapter 52 Selection and erection of wiring systems



Regulation 521.5.1 concerns ferromagnetic enclosures and electromagnetic effectsequ
The current regulation states that "The conductors of an AC circuit installed in a ferromagnetic enclosure shall be arranged so that all line conductors and the neutral conductor, if any, and the appropriate protective conductor are contained within the same enclosure." The regulation goes on to say that "Where such conductors enter a ferrous enclosure, they shall be arranged such that the conductors are only collectively surrounded by ferromagnetic material." The reason is that an alternating current induces an alternating magnetic field, which is increased if the conductor is surrounded by a ferrous metal enclosure, and this may result in eddy currents being circulated in the enclosure causing a rise in temperature.

This regulation has now been redrafted and a note has been added to clarify the requirements (extract below):

NOTE: *For low voltage switchgear and controlgear assemblies to the BS EN IEC 61439 series, conductors in AC circuits with a current rating not exceeding 200 A can pass through separate holes etc. in ferromagnetic enclosures, sections, or plates. Currents above 200 A where conductors pass through separate holes in ferromagnetic material, need to have been verified by temperature-rise test(s).*

Regulation 521.10 deals with installation of cables
Regulation 521.10.202 states that "Wiring systems should be supported such that they will not be liable to premature collapse". This regulation was introduced to prevent wiring systems from hanging, which may hinder evacuation or obstruct firefighting activities in the event of a fire. The key words are "premature collapse". Since its introduction, the regulation has raised several questions and therefore it has been decided to introduce a note explaining the intent of this regulation and to clarify that it is not the intent of this regulation to provide support to maintain circuit integrity of life safety and firefighting applications under fire conditions (which are addressed in Chapter 56 and BS 5839, BS 5266, and BS 8519).

Regulation 522.6 deals with impact
It is important that wiring systems are selected and erected to minimize the damage arising from mechanical stress, for example, by impact, abrasion, penetration, tension or compression during installation, use or maintenance.

The requirements of Regulation 522.6 (a cable installed in a wall or partition) have been reorganized into a table for improved clarity, but it is understood that the requirements have not been changed.

Section 536 Coordination of electrical equipment for protection, isolation, switching and control

Regulation 536.4.202 has been redrafted and now covers the coordination between low voltage switchgear and controlgear assembly and the overload protective device. The regulation now contains load curtailment as one of the conditions to be satisfied.

Section 537 Isolation and switching

Regulation 537.4.2 has been redrafted and firefighter's switches are now required in locations specified by the fire engineer to support the building's overall fire strategy. The regulation now gives examples where these are required, including outdoor lighting operating at high voltage and indoor discharge lighting operating at high voltage. In addition, Regulation 537.4.2.1 has been deleted. Also 537.4.4 has been modified slightly.

Section 545 Functional earthing and functional-equipotential-bonding for information and communication technology equipment and systems (ICT)

A new section 545 has been introduced, giving additional requirements for functional earthing and functional-equipotential-bonding for information communication technology equipment and systems (ICT), such as broadcast, communication technology and computer network systems. A clear distinction between functional earthing and protective earthing is made in this section as it is important that any interruption of the functional earthing does not impair the protective earthing. Section 545 includes requirements for minimum cross-sectional area, identification, electrical continuity of functional bonding conductors, combined protective and functional bonding conductors, main functional earthing terminal, and equipotential bonding ring conductors.

Section 551 Low voltage generating sets

Section 551 covers generators with several supply arrangements. Regulation group 551.7 sets out additional requirements for installations where the generating set may operate in parallel with other sources, including systems for distribution of electricity to the public. In this situation, it is very important that where energy flow is bidirectional, the correct type of protective device is installed.

Good workmanship and proper materials should always be used. To comply with this requirement, the installation of electrical equipment must take account of the manufacturer's instructions as stated in both Regulation 134.1.1 and Regulation 510.3.

To clarify the requirements in this situation, Regulation 551.7.1 has been redrafted. An indent (c) has been added, which requires a suitable protective device where energy flow is bidirectional.

In addition, an indent (d) has been added which prohibits the connection of a source to the load side of an RCD under certain conditions.

Regulation 551.7.2 has been redrafted to form two regulations. Regulation 551.7.2.1 requires the generating set to be installed on the supply side of all the protective devices and requires stationary batteries (Chapter 57) to be considered a generating set and not a load.

Regulation 551.7.2.2 sets out the requirements for the low voltage switchgear and controlgear assembly when a generating set is used as an additional source of supply in parallel with another source and the generating set is connected via low voltage switchgear.

Regulation group 551.8 deals with the requirements for installations incorporating stationary batteries. The requirements for stationary batteries have been transferred to a new Chapter 57 and therefore this group of regulations have been deleted as part of Amendment 4.

Chapter 56 Safety services

Chapter 56 covers general requirements for safety services, selection and erection of electrical supply systems for safety services and electrical safety sources. Standby electrical supply systems are outside the scope. Regulation group 560.6 sets out the requirements for electrical sources. This section has been modified extensively as a result of the new Chapter 57 (Secondary batteries) being introduced.

Chapter 57 Stationary secondary batteries

A new Chapter 57 has been introduced. This deals with requirements for stationary secondary battery installations where the designed purpose is for storage and supply of electrical installations. The chapter does not apply to ones incorporated into products covered by product safety standards and within systems, such as pluggable uninterruptable power supplies, fire and emergency lighting systems, and central safety power supply systems conforming to the appropriate standards.

The chapter sets out the main characteristics of secondary batteries, including the battery type and capacity to be selected, considering such issues as nature of demand, battery voltage, load profiles etc. Also, requirements for selection and erection of electrical equipment, including protective earthing, protection against electric shock, protection against thermal effects and other hazards, together with identification and notices.

In particular, Regulation 570.6.7.203 states that stationary secondary batteries in dwellings are to be installed in accordance with PAS 63100. In other buildings, the location of storage batteries and fire protection requirements shall be selected taking into account the fire safety risk assessment of the premises.

Chapter 65 Periodic inspection and testing

Regulation 653.1 now requires the notes for the person producing the report (provided in Appendix 6) to be taken into account on the Condition Report.

Regulation 653.2 now requires the report to include guidance for the recipient(s) based on the model in Appendix 6. A note has also been added pointing out that photographic and/or thermographic images can be appended to the report.

Section 716 Power over ethernet

A new Section 716 has been introduced. This deals with requirements for the distribution of ELV DC power using balanced information technology cables and accessories primarily designed for data transmission, as specified in BS EN 50173-1 using power feeding sourcing equipment in accordance with BS EN 62368-3. Requirements are included for the design, erection and verification of telecommunications infrastructure for the purpose of both telecommunications and distribution of ELV DC power feeding. In addition, requirements are included for use of existing telecommunications infrastructure for distribution of ELV DC power.

Section 710 Medical locations

Requirements throughout Section 710 have been substantially expanded to provide more clarity.

The regulations concerning power supplies in medical locations of group 2 have been redrafted to avoid loss of power due to a single fault.

The requirements for medical insulation monitoring devices have been extended and modified. In addition, requirements concerning supplementary equipotential bonding have been modified and extended. Furthermore, a new Annex B710 model form to record supplementary bonding connection resistances.

Chapter 81 Low-voltage electrical installations Part 8-1: Functional aspects – Energy efficiency

A new Chapter 81 concerning energy efficiency has been introduced. This chapter refers the reader to the Building Regulations for England and Wales, Scotland and Northern Ireland for guidance on

the requirements. The chapter also refers the reader to BS HD 60364-8-1:2019 Low-voltage electrical installations Part 8-1: Functional aspects – Energy efficiency.

Appendices

There are several changes in the appendices, and I have highlighted Appendix 4, 6, 13 and 17 below.

Appendix 4
There have been some additions to Appendix 4 concerning data for buried cables in ducts.

Appendix 6
The notes for the person producing the condition report have been redrafted. Items have been rearranged for clarity. Several changes have been made, including confirmation that the signatures on the report are those of the person(s) executing the work of inspection and testing and authorizing the report for issue. Also, for the EICR, it is clarified that issuing an FI code for further investigation should not result in an unsatisfactory outcome.

Appendix 13
The guidance in the first part of Appendix 13 (Cables in protected escape routes) has been redrafted to take account of Approved Document B Volumes 1 and 2, BS 9991 and BS 9999, and a fire safety strategy to be prepared by the fire engineer based on appropriate guidance.

Appendix 17
This has been deleted. A new Chapter 81 concerning energy efficiency has been introduced instead.

Conclusion

Please note this article is just a brief overview of some of the changes expected in Amendment 4 of the 18th Edition of the IET Wiring Regulations (BS 7671). For more information, see the DPC which is available to view through BSI's Standards Development portal.