









My background

- Electrical industry for many years
- Installing within residential, commercial, agricultural and industrial environments
- Marketing & Product management covering Motor Control Gear and Automated Systems
- Marketing & Product management covering Electrical Distribution Systems
- Designing and testing Three-Phase and Single-Phase assemblies

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Designing, selecting, installing, verifying, inspecting, testing and certifying

Seven words that just about cover the process of all household electrical installations





Designing and selecting materials devices and assemblies for a residential property

It is at this stage of our thought process we make the fundamental decision to:

Install surge or not?





Install surge or not

- This begins with choosing the right surge protection device (SPD), although,
- While many people still discuss this in terms of the need to install,
- The questions that should be asked are what to install and where?
- Additionally, attention should be taken as to understanding what we are protecting against as stated in BS7671.



BS7671 Chapter 13 Fundamental Principles: 131 Protection for Safety

- 131.1 The requirements are intended to provide for the safety of persons, livestock and property against dangers and damage which may arise in the reasonable use of electrical installations.
- In electrical installations, risk of injury may result from:



• (iv) Undervoltages, overvoltages and electromagnetic disturbances likely to cause or result in injury or damage.



BS7671 Chapter 13 Fundamental Principles: 131.6.2

 131.6.2 Persons and livestock <u>shall</u> be protected against injury, <u>and property, shall</u> be protected against damage as a result of overvoltages, such as those originating from atmospheric events or from switching in accordance with section 443





I don't need to install surge?

Or do I?



443.4 Overvoltage control

- All other cases, risk assessment according to 443.5 SHALL be performed.
 If not performed, surge SHALL be provided.
- Except for single dwelling units where the total value the installation and equipment therein does not justify such protection



- Fundamental principles provide an overview of the main objectives for an electrician.
- As the Duty Holder for the installation, we must ensure safety of persons and property, by using the regulations that guide us, as well our judgment to ensure we provide the best possible installation to achieve this.
- This begins with choosing the right surge protection device (SPD), although, while many people still discuss this in terms of questioning the need to install an SPD.
- The questions that should be asked are what to install and where?
- To understand why, we need to understand what we are protecting against as stated in BS7671.





443, which states that you should protect against

transient overvoltages of atmospheric origin and due to switching

What does this mean?





The scope and object characterises this in 443.1.1 of BS7671

1. Potential direct strokes to the supply system, 'overhead cables' as well as lightning strokes passing close to cables and inducing a **transient voltage** into the supply system.

2. Switching overvoltages generated by the equipment within the installation; power supply generators turning on and off is one such **switching transient.**

This section does not look at direct, or nearby lightning strokes to the building, this is covered in BS EN 62305-2.



Requirements for Electrical Installation





To prevent this

Use this standard

BS EN 62305-2.









Installation: So what exactly are we installing and where?

534.4.1.1 tells us we need to install Type 1 and Type 2 SPDs at the origin of the installation.

In all cases you will fit T2, in some case you may add T1 as well.

All consumer units when fitted with SPDs, will be a T2 SPD.







- **534.4.1.1** goes on to state, Type 1 SPDs are specifically designed to protect against dangerous sparking that could lead to a fire.
- They do not protect against failure of sensitive electrical and electronic systems.



 Type 2 and Type 3 are designed to protect against these transient voltages that damage sensitive and critical equipment and those that are part of the fixed system, smoke alarms and USBs, as well as any future connected loads like TVs and Hi-Fis.



443.4. Provides mandatory guidance for protection of human life, public services, commercial and industrial installations, as well as large numbers of co-located people.

Single dwelling units consider the cost of the installation of SPDs to decide if they are required.

- Transient voltages arrive along the supply network.
- They can damage, if not instantly, then over time, sensitive electronic equipment.
- The cost of installing an SPD is modest.
- Protecting safety elements in the home, like smoke and heat alarms.





Even more to consider with changes as of 1st April 2021

- Electrical Safety Standards in the private sector from 1st April 2021, require all existing tenancies to be tested by a person who is 'qualified and competent', at least every five years.
- As a result, many landlords will need to consider the effects of voltage surges within their properties and consider installing SPDs in order to protect occupants.
- As well as fire alarm systems, the sensitive electronics of smoke and heat alarms, and the expensive equipment that may be connected by residents.
- Older rental buildings may also have electrical installations where no RCDs are installed or only partially installed, and cables in walls would not be protected from the occasional nail being introduced to the circuit.







- **443.5.** Provides guidance for the risk assessment method to determine if an SPD is required to be installed due to lightning strokes?
- If you do not want to do the risk assessment, just install an SPD.
- Residential properties... BS7671 clearly states we do not have to install an SPD if the installation value isn't worth doing it.
- Lets think? Smoke alarm, fixed wiring, value, persons and equipment.
- Fundamental principles? Minimal cost for protection... Fit SPDs





Cable connections within a surge protection system: 534.4.8 & 534.4.5.1 According to 534.4.8:

- Connection of SPDs tells us that all conductors and interconnections are to be protected, as well as the connections between SPD and any external Overcurrent Protection Device (OCPD) and shall be kept as short as possible.
- That consideration shall be given to limit the total wiring length of conductor between connection points of the SPD assembly – and should preferably not exceed half a metre and in no case exceed one metre.





- **534.4.5.**1 says, SPD installations shall be protected against overcurrent with respect to short circuit current.
- This protection may be internal and/or external to the SPD, according to the manufacturer's instructions. Many manufacturers/suppliers install an external protection MCB within the enclosure close to the SPD it is protecting.
- By doing this we meet regulations **534.4.8** and **534.4.5.1**.
- For any other configuration contact your supplier for advice.





BG Electrical supplies assembled and loose and fitted T2 surge protection devices. Complete with MCB

Positioning of SPDs within the enclosure







Erecting (Installing): Inspection and testing

- 641.1 notes that every installation shall, during erection and on completion, be inspected and tested for verification, so far as is reasonably practicable, to ensure the requirements of the regulations have been met.
- So, performing an insulation test on cables after the first fix could prevent issues later.
- At every stage of our design, selection and erection process, as designers and installers, we must ensure 511.1 compliance with standards and every item of equipment shall comply with applicable British or harmonised standards, appropriate to its intended use.
- **133.5** states that any departure shall not be less than obtained by compliance to regulation.



Initial verification & Testing

- Inspection 642.1 shall precede testing and safe isolation must be observed.
- See BS7671 part 6 and GN3.
- A 500VDC insulation resistance test may activate the SPD.
- Regulation **643.3.2** states it is okay to test at 250VDC where it is not reasonable to disconnect the equipment.
- However, if the SPD is within the consumer unit, it can be disconnected for these tests.



Testing

- 250VDC where it is not reasonable to disconnect the equipment.
- Disconnection may be a viable option where there are a limited number of 'at risk' equipment, USB socket-outlets to be tested are an example.
- However, it becomes less of an option as the number of these socket-outlets increases, because disconnection and reconnection takes time and introduces the possibility of the socket-outlets being incorrectly reconnected.
- In such instances, the tester can decide that it is not reasonably practicable to disconnect the socket-outlets.



Testing

- This is true for any part of the fixed wiring system, where vulnerable equipment could be damaged by a test voltage of 500VDC.
- Examples of equipment installed that this could apply to are socket outlets containing SPDs, USBs, RCDs, smoke and heat alarms.
- SPDs installed within the enclosure can be easily disconnected and the circuit tested at 500VDC. So long as the rest of the circuit(s) can be tested at 500VDC as well.



Safety of persons and property

- I am not advocating testing all circuits at 250VDC, 500VDC stress tests the circuit beyond normal operational voltage and adds a degree of safety margin for the nominal 230VAC used within domestic buildings.
- Part of the reason I have include inspection and testing into a presentation on surge protection, is to indicate how vulnerable electronics embedded within the fixed wiring system are becoming,
- And how they can be damaged by testing at 500VDC.
- What will transient voltages of potentially 6kV do to any of these accessories, devices and equipment if not protected by a surge protection device?
- Never mind the smoke alarms, what about my TV?



ELECTRICAL INSTALLATION CERTIFICATE (REQUIREMENTS FOR ELECTRICAL INSTALLATIONS - BS 7671 [IET WIRING REGULATIONS])

DETAILS OF THE CLIENT		
INSTALLATION ADDRESS		
DESCRIPTION AND EXTENT OF THE INSTALLATION Description of installation:	New installation	
Extent of installation covered by this Certificate:		
,,	Addition to an existing installation	
	Alteration to an existing installation	
FOR DESIGN		
Whe being the persons(s) responsible for the dealan of the electrical installation (as indicated by my/our sizentance black), particulars of which are dealarbed above, having exercised resonable will and care when carrying out the dealay and additionally where this certificate applies to an addition or afteration, the safety of the existing installation is not impaired, hereby CERTIFY that the dealay work for which live have been responsible is to the best of my/our knowledge and belief in accordance with BS 7671-2016, smended to ammended to ammended to the deartures, if any, detailed as follows: Details of departures from BS 7671 (Regulations 120.3, 133.1.3 and 133.5):		
Details of permitted exceptions (Regulation 411.3.3). Where applicable, a suitable risk assessment(s) must be attached to the	Certificate	
	Risk assessment attached	
The extent of liability of the signatory or signatories is limited to the work described above as the subj	ect of this Certificate.	
For the DESIGN of the installation: ""(Where there is mutual responsibility for the design)		
Signature:		
Signature: Date: Name (IV BLOCK LETTERS):	Designer No 2**	
FOR CONSTRUCTION		
I being the person responsible for the construction of the electrical installation (as indicated by my signature below), particulars of which are described above, having exercised reasonable skill and care when carrying out the construction hereby CERTIFY that the construction work for which I have been responsible is to the best of my showledge and belief in accordance with BS 7671:2018, amended to(data) except for the departures. If any, detailed as follows:		
Details of departures from BS 7671 (Regulations 120.3 and 133.5):		
The extent of liability of the signatory is limited to the work described above as the subject of this Certificate.		
For CONSTRUCTION of the installation:		
Gigneture: Date: Name (IN DLOCK LETTERS):		
I being the person responsible for the inspection & testing of the electrical installation (as indicated by of which are described above, having exercised reasonable skill and care when carrying out the inspe that the work to which I have been responsible to the best of my knowledge and belief in accordan amended to(date) except for the departures, if any, detailed as follows:	my signature below), particulars ction & testing hereby CERTIFY ce with BIS 7671:2018,	
Details of departures from BS 7671 (Regulations 120.3 and 133.5):		
The extent of liability of the signatory is limited to the work described above as the subject of this Certificate.		
For INSPECTION AND TESTING of the installation:		
Signature: Date: Name (IN BLOCK LETTERS):	Inspector	
IWe have the designer(s), recommend that this installation is further inspected and tasted after an interval of not more than		

Certification

Electrical Installation Certificates (EICs)

&

Minor Electrical Installation Works Certificates (MEIWCs) MINOR ELECTRICAL INSTALLATION WORKS CERTIFICATE (REQUIREMENTS FOR ELECTRICAL INSTALLATIONS - BS 7871 (IET WIRING REGULATIONS)) To be used only for minor electrical work which does not include the provision of a new circuit

PART 1: Description of the minor works		
1. Details of the Client		
2. Installation location/address		
3. Description of the minor works		
 Details of departures, if any, from BS 7671:2018 for the o Where applicable, a suitable risk assessment(a) must be attached 	incuit altered or extended (Regulation 120.3, 133.1.3 and 133.5) to the Cardificate	
Risk assessment attached		
Comments on (including any defects observed in) the existing installation (Regulation 644.1.2):		
PART 2: Presence and adequacy of installation earthing and bonding arrangements (Regulation 132.16)		
1. System earthing arrangement: TN-S C TN-C-S C TT C		
 Earth fault loop impedance at distribution board (Z_a) supplying the final circuitΩ 		
3. Presence of adequate main protective conductors:		
Earthing conductor		
Main protective bonding conductor(s) to: Water Gas Oil Structural steel Other		
PART 3: Circuit details		
DB Reference No.:		
Circuit No.: Circuit description:		
Circuit overcurrent protective device: BS(EN) Type		
Conductor sizes: Live		
PART 4: Test results for the circuit altered or extended (where relevant and practicable)		
Protective conductor continuity: R ₁ + R ₂ Ω or R ₂ Ω		
Continuity of ring final circuit conductors: LAL	Ω Ν/ΝΩ cpc/cpcΩ	
Insulation resistance: Live - Live	insulation resistance: Live - Live	
Polarity satisfactory: Maximum neasured earth fault loop impedance: Z,Ω		
RCD operation: Rated residual operating current (1,,,)mA		
Disconnection time ms		
Satisfactory test button operation		
PART 5: Declaration		
I certify that the work covered by this certificate does not im been designed, constructed, inspected and tested in accord amended to	pair the safety of the existing installation and the work has ance with BS 7871:2018 (IET Wiring Regulations) owledge and befief, at the time of my inspection,	
Name:		
For and on behalf of:		
Address:	Signaturo:	
	Position:	

Date:



Surge Protection CPD

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TRAINING AND CPD COURSE

18TH EDITION

Visit www.luceco-academy.com



Any questions



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