BS 7671: 2018

+ A2 2022
Hello

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Trenitalia c2c – Asset Manager (M&E)

Chairman – ESR Workplace Safety

IET Volunteer

e5 group  (Instagram YouTube)
In the beginning...

FIRST WIRING RULES

Society of Telegraph Engineers and of Electricians

RULES and REGULATIONS for the prevention of Fire Risks arising from Electric Lighting, recommended by the Council in accordance with the Report of the Committee appointed by them on May 11, 1882, to consider the subject.

MEMBERS OF THE COMMITTEE

Professor W. G. Adams, F.R.S., Vice-President.
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Alexander Siemens.
C. E. Spagnoletti, Vice-President.
James N. Shoolbred.
Augustus Stroh.
Sir William Thomson, F.R.S., Past President.
Lieut.-Colonel C. E. Webber, R.E., President.

These rules and regulations are drawn up not only for the guidance and instruction of those who have Electric Lighting Apparatus installed on their premises, but for the reduction to a minimum of those risks of fire which are inherent to every system of artificial illumination.
Over time, rules and regulations...
The road began with rules and regulations...

1st Edition
1882
4 Parts
4 Pages

BS 7671:2018+A2
2022
8 Parts
608 Pages

Society of Telegraph-Engineers and Electricians.

RULES AND REGULATIONS
FOR THE PREVENTION OF FIRE RISKS ARISING FROM ELECTRIC LIGHTING.

Revised and Reprinted from the Rules issued by the Society in 1880, and
from other sources of information, both home and foreign, and
recommended by the Council in accordance with the Report of the
Committee appointed by them to consider the subject.

MEMBERS OF THE COMMITTEE.
Professor W. G. Adams, F.R.S.,
Pres. President.
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Vice-President.
Sir Charles T. Bright,
Past-President.
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R. E. Crookes, F.R.S.,
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Dr. J. A. Fleming, M.A.
Professor G. Forbes, F.R.S.
(L. & E.).
Professor G. C. Foster, F.R.S.,
Past-President.
Edward Grau, President.
J. E. H. Gordon, R.A.

These General Rules are drawn up with the object of reducing to a minimum, in the case of the electric light, these rules of
as are inherent to every system of artificial illumination,
Released 28th March 2022

Can implement immediately.
but post 28th March 2023 installations expected to comply

Support for BS 7671 +A1: 2020
Withdrawn 27th Sept 2022
Some important changes...

<table>
<thead>
<tr>
<th>Implication</th>
<th>Requirement</th>
<th>Typical Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirement</td>
<td>Shall</td>
<td>Normative element</td>
</tr>
<tr>
<td>Recommendation</td>
<td>Should</td>
<td>Informative element</td>
</tr>
<tr>
<td>Permission</td>
<td>May</td>
<td>Informative element</td>
</tr>
<tr>
<td>Possibility and Capability</td>
<td>Can</td>
<td>Informative element</td>
</tr>
<tr>
<td>Possibility</td>
<td>Might</td>
<td>Informative element</td>
</tr>
<tr>
<td>Description</td>
<td>Is</td>
<td>Informative element</td>
</tr>
</tbody>
</table>

The content of this table is based on Rules for the structure and drafting of UK standards, second edition published April 2017, published by BSI Standards Ltd.
Part 1

Requirements for Electrical Installations
110.1.2 (iv) ‘prosumers low voltage electrical installations (PEI) including those located to external buildings’
Part 2
Part 2: New Terms and Definitions

- Arc fault detection device (AFDD)
- Connected mode
- Direct feeding mode
- Direct lightning strike
- Indirect lightning stroke
- Efficiency measures (EM)
- Emergency switching off
- Electrical Energy Management System (EEMS)
- Generating set
- Island mode
- Load shedding
- Metering
- Open-circuit maximum voltage
- Operating mode
- Producer (of electricity)
- **Prosumers** Electrical Installations (PEI)
- Protected escape route
- Reverse feeding mode
- Rural Environment
- Suburban Environment
- Zdb (first time on certificates)
Prosumer
Island Mode
DNO / DSO
Distribution Network Operator / Distribution System Operator
Old World

- Small number of large generators connected on the transmission network
- Coal-fired and gas power stations
- One-way power flows
- Limited customer engagement
Large number of generators connected on the distribution network, including behind-the-meter
Inclusion of renewables (such as, solar PV, wind turbines and biomass) and grid scale battery storage
Two-way power flows
Proactive and active customer engagement
Part 4
411.1.2 Protective equipotential Bonding
411.1.2 Protective equipotential Bonding

In each consumer’s installation within a building, extraneous-conductive-parts liable to introduce a dangerous potential difference shall be connected to the main earthing terminal by protective bonding conductors complying with Chapter 54. Examples of extraneous-conductive-parts may include:

i. metallic water installation pipes
ii. metallic gas installation pipes
iii. other metallic installation pipework and ducting
iv. central heating and air conditioning systems
v. exposed metallic structural parts of the building.
Where an incoming telecommunication cable has a metallic sheath, equipotential bonding shall be applied. However, the consent of the owner or operator of the cable shall be obtained. Where consent is not granted, and as a consequence this requirement is not met, details shall be recorded in the description section of the appropriate electrical certification specified in Part 6.
Careful consideration
411.3.3 Additional Requirements

In AC systems, additional protection by means of an RCD with a rated residual operating current not exceeding 30 mA shall be provided for:

(i) socket-outlets with a rated current not exceeding 32 A in locations where they are liable to be used by persons of capability BA1, BA3 or children (BA2, BA3),

(ii) socket-outlets with a rated current not exceeding 32 A in other locations, and

(iii) mobile equipment with a rated current not exceeding 32 A for use outdoors.

<table>
<thead>
<tr>
<th>B</th>
<th>BA</th>
<th>Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BA1</td>
<td>Ordinary</td>
</tr>
<tr>
<td></td>
<td>BA2</td>
<td>Children</td>
</tr>
<tr>
<td></td>
<td>BA3</td>
<td>Disabled</td>
</tr>
<tr>
<td></td>
<td>BA4</td>
<td>Instructed</td>
</tr>
<tr>
<td></td>
<td>BA5</td>
<td>Skilled</td>
</tr>
</tbody>
</table>
411.3.3 Additional Requirements

An exception to (ii) but not (i) or (iii) is permitted where a suitably documented risk assessment undertaken with the involvement of a skilled person (electrically) determines that RCD protection is not necessary.

NOTE 1: For the purpose of this exception, an ordinary person (BA1) instructed in the use of the installation does not become an instructed person (electrically) or cease to be an ordinary person.

The documented risk assessment shall be provided with the appropriate electrical installation certificate.
It is **recommended** that an additional connection to Earth, by means of an earth electrode in accordance with Chapter 54, is made to the main earthing terminal. This recommendation does not apply to outbuildings of dwellings served by the installation.
421.1.7 Protection against fire - AFDD
421.1.7 Protection against fire - AFDD

- MCB
  - Overloading
  - Short-circuits

- RCD
  - Earth tracking currents

- AFDD
  - Arcing

- SPD
  - Overvoltages
Figure 37 – Example of arc voltage and current waveform obtained with cable specimen
421.1.7 Protection against Fire - AFDD
421.1.7 Protection against Fire - AFDD

Arc fault detection devices (AFDD) conforming to BS EN 62606 shall be provided for single-phase AC final circuits supplying socket-outlets with a rated current not exceeding 32A in:

- Higher Risk Residential Buildings (HRRB)
- Houses in Multiple Occupation (HMO)
- Purpose-built student accommodation
- Care homes

NOTE 1: Higher Risk Residential Buildings are assumed to be residential buildings over 18 m in height or in excess of six storeys, whichever is met first. It is anticipated that in many areas higher risk residential buildings will be defined in legislation which can be subject to change over time, as well as in risk management procedures adopted by fire and rescue services. Current legislation should be applied.
421.1.7 Protection against ire - AFDD

For all other premises, the use of AFDDs conforming to BS EN 62606 is recommended for single-phase AC final circuits supplying socket-outlets not exceeding 32 A.

Where used, AFDDs shall be placed at the origin of the circuit to be protected. The use of AFDDs does not obviate the need to apply one or more measures provided in other clauses in BS 7671.

NOTE 2: For busbar systems conforming to BS EN 61439-6 and Powertrack systems to BS EN 61534, the AFDD may be placed at a location other than the origin of the circuit.
421.1.7 Protection against Fire - AFDD

5.3.7.1 Limit values of operating criteria for AFDDs at low arc currents up to 63 A

Table 1 – Limit values of break time for $U_n = 230$ V AFDDs

<table>
<thead>
<tr>
<th>Test arc current (r.m.s. values)</th>
<th>2.5 A</th>
<th>5 A</th>
<th>10 A</th>
<th>16 A</th>
<th>32 A</th>
<th>63 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum break time</td>
<td>1 s</td>
<td>0.5 s</td>
<td>0.25 s</td>
<td>0.15 s</td>
<td>0.12 s</td>
<td>0.12 s</td>
</tr>
</tbody>
</table>

Minimum Level of arc energy tested under product standard
422 Precautions where particular risk of fire exist
422 Precautions where particular risk of fire exist

Harrow Court
For such locations the fire safety design of the building(s) should be documented. This information should be included in a fire safety manual produced by or for the person responsible for the building (the 'responsible person') as detailed in local and/or national fire safety legislation or guidance, including, for example BS 9999
It is recommended that the electrical system designer/installer provides the person responsible for the building with details of the electrical system, setting out the basis of the design with respect to fire safety including routine maintenance requirements.
Where it is determined that cables should have an improved fire performance but are not covered by Regulations 422.2 to 422.6, this may be achieved by using cables with a minimum light transmittance of 60% when tested in accordance with BS EN 61034-2 and,

(i) limited flame propagation according to the minimum requirements of the relevant part of BS EN 60332-3 series or

(ii) where cable management systems according to 422.2.1 (iii) or (iv) are used, cables shall conform to the minimum requirements of BS EN 60332-1-2.
422.2 Protected escape routes
422.2.1 Protected escape routes

Light Transmittance Test
BS EN 61034-2
422.2.1 Protected escape routes

Light Transmittance Test
BS EN 61034-2
443.4.1 Overvoltage Control

\[ \text{CRL} = \frac{F_{\text{env}}}{(L_{\text{PCH}} \times N_{\text{g}})} \]
Protection against transient overvoltages shall be provided where the consequence caused by the overvoltage could result in:

(i) serious injury to, or loss of, human life  
(ii) failure of a safety service, as defined in Part 2  
(iii) significant financial or data loss.

For all other cases, protection against transient overvoltages shall be provided unless the owner of the installation declares it is not required due to any loss or damage being tolerable and they accept the risk of damage to equipment and any consequential loss.
Type 3
Overvoltage SPD
Terminal equipment

Type 2
Overvoltage SPD
Distribution board or consumer unit

Type 1
Equipotential bonding or lightning protection/current SPD
Origin
Part 5
514.14 Diagrams and documentation
Residual current protective devices shall be selected and erected such as to limit the risk of unwanted tripping. The following shall be considered:

(i) subdivision of circuits with individual associated RCDs. RCDs shall be selected and the circuits subdivided in such a way that any earth leakage current likely to occur during normal operation of the connected load will not cause unwanted tripping of the device. See also Section 314.
Residual current protective devices shall be selected and erected such as to limit the risk of unwanted tripping. The following shall be considered:

(ii) the use of RCBOs for individual final circuits in domestic installations. See also Section 314.
531.3.3 Types of RCD

Different ‘types’ of protective RCD devices.

- Type AC – General AC circuits
- Type A – up to 6mA DC protection
- Type F – up to 10mA DC protection
- Type B – up to 10mA DC protection
531.3.3 Types of RCD

Fig 2

VSD: Connect to Type B RCCB protected outlet (Reference EN50178)
Type AC Banned

Austria
Belgium
Denmark
Germany
Switzerland
RCD Type AC shall only be used to serve fixed equipment, where it is known that the load current contains no DC components.

NOTE 1: Examples of fixed equipment with a load current containing no DC components can include but not be limited to electric heating appliances and/or simple filament lighting, neither containing electronic components.

NOTE 2: For guidance on the correct use of RCDs for household and similar use, see PD IEC/TR 62350.
531.3.3 Types of RCD

Table 1
Approximate Leakage current calculation for domestic installations:
(Source IEC/TR 62350)
Leakage current per circuit = Sum of the connected appliances x 0.75

<table>
<thead>
<tr>
<th>Appliance (Connection 3 pin plug)</th>
<th>Leakage current (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC / Laptop</td>
<td>1 &lt; 2</td>
</tr>
<tr>
<td>Printer</td>
<td>0.5 &lt; 1</td>
</tr>
<tr>
<td>Mobile devices</td>
<td>0.5 &lt; 0.75</td>
</tr>
<tr>
<td>Other appliances</td>
<td>&lt; 3.5</td>
</tr>
</tbody>
</table>
53.204 Earthing arrangements
Part 6
643.1.1 Insulation resistance testing

The insulation resistance shall be measured between:

(i) live conductors, and

(ii) live conductors and the protective conductor connected to the earthing arrangement. During this measurement, line and neutral conductors may be connected together.
643.3.3 Insulation resistance testing

SMART-touch LED dimmers that might be damaged during insulation resistance test.

Main switch off, secured by safety locking device.
General lighting service (GLS) Lamps Removed. Switches “on”.
When originally installed, cables of circuit tested prior to connection in accordance with Table 64 of BS 7671.

>999 MΩ

Means of earthing and main bonding connected.
Where connected equipment is likely to influence the measurement or result of the test, or be damaged, the test shall be applied prior to the connection of such equipment, in accordance with Table 64.

Following connection of the equipment, a test at 250V DC shall be applied between live conductors and the protective conductor connected to the earthing arrangement. The insulation resistance shall have a value of at least 1 MΩ.

NOTE: Manufacturer’s instructions may recommend some equipment to be disconnected during 250 V DC insulation resistance tests as it may influence the results of the test.
643.8 Additional protection (RCD)
FIRST WIRING RULES

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The chief dangers of every new application of electricity arise mainly from ignorance and inexperienced on the part of those who supply and fit up the requisite plant.

The difficulties that beset the electrical engineer are chiefly internal and invisible, and they can only be effectually guarded against by "testing" or probing with electric currents. They depend chiefly on leakage, undue resistance in the conductor, and bad joints, which lead to waste of energy and the production of heat. These defects can only be detected by measuring, by means of special apparatus, the currents that are either ordinary or for the purpose of testing, passed through the circuit. Bare or exposed conductors should always be within visual inspection, since the accidental falling on to, or the thoughtless placing of other conducting bodies upon such conductors might lead to "short circuiting" or the sudden generation of heat due to a powerful current of electricity in conductors too small to carry it.

It cannot be too strongly urged that amongst the chief enemies to be guarded against are the presence of moisture and the use of "earth" as part of the circuit. Moisture leads to loss of current and to the destruction of the conductor by electrolytic corrosion, and the injudicious use of "earth" as a part of the circuit tends to magnify every other source of difficulty and danger.

The chief element of safety is the employment of skilled and experienced electricians to supervise the work.

N.B.—The value of frequently testing the wires cannot be too strongly urged. It is an operation, skill in which is easily acquired and applied. The escape of electricity cannot be detected by the sense of smell as can gas, but it can be detected by apparatus far more certain and delicate. Leakage not only means waste, but in the presence of moisture it means destruction of the conductor and its insulating covering, by electric action.
Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs)
Part 1: General rules (IEC 61008-1:2010, modified)
The effectiveness of automatic disconnection of supply by RCDs shall be verified using suitable test equipment according to BS EN 61557-6 to confirm the relevant requirements of Chapter 41 are met, taking into account the operating characteristic of the device.
NOTE: Regardless of RCD Type, effectiveness is deemed to have been verified where an RCD disconnects within the time stated below with an alternating current test at rated residual operating current (IΔn):

- For general non-delay type, 300ms maximum.
- *For delay ‘S’ type RCD, between 130 ms minimum and 500 ms maximum.*
### TABLE 3A – Time/current criteria for RCDs under BS EN 61009-1 and BS EN 61009-1

<table>
<thead>
<tr>
<th>RCD type</th>
<th>Ra. oper. time (ms)</th>
<th>( i_{MT} ) max. (mA)</th>
<th>Residual current (mA)</th>
<th>Trip time (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay ‘S’</td>
<td></td>
<td></td>
<td>50</td>
<td>40 min.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>40 min.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>40 min.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>40 min.</td>
</tr>
<tr>
<td>General Non-delay</td>
<td>100</td>
<td>500</td>
<td></td>
<td>40 min.</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>500</td>
<td></td>
<td>40 min.</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>500</td>
<td></td>
<td>40 min.</td>
</tr>
<tr>
<td></td>
<td>700</td>
<td>500</td>
<td></td>
<td>40 min.</td>
</tr>
</tbody>
</table>

RCD Trip times from Appendix 3
Type A testing issue
1 x 30 = 30 mA within 150ms

5 x 30 = 150 mA within 40ms
Table 2 – Maximum values of break time for half-wave pulsating residual currents (r.m.s. values) for type A RCCB

<table>
<thead>
<tr>
<th>Type</th>
<th>$I_n$ A</th>
<th>$I_{\Delta n}$ A</th>
<th>1,4 $I_{\Delta n}$</th>
<th>2 $I_{\Delta n}$</th>
<th>2,8 $I_{\Delta n}$</th>
<th>4 $I_{\Delta n}$</th>
<th>7 $I_{\Delta n}$</th>
<th>0,35 A</th>
<th>0,5 A</th>
<th>350 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Any</td>
<td>&lt; 0,03</td>
<td>0,3</td>
<td>0,15</td>
<td></td>
<td></td>
<td></td>
<td>0,04</td>
<td>0,04</td>
<td>0,04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0,03</td>
<td>0,3</td>
<td>0,15</td>
<td></td>
<td></td>
<td></td>
<td>0,04</td>
<td>0,04</td>
<td>0,04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 0,03</td>
<td>0,3</td>
<td>0,15</td>
<td></td>
<td></td>
<td></td>
<td>0,04</td>
<td>0,04</td>
<td>0,04</td>
</tr>
<tr>
<td>S</td>
<td>&gt; 25</td>
<td>&gt; 0,03</td>
<td>0,5</td>
<td>0,2</td>
<td>0,15</td>
<td></td>
<td></td>
<td>0,15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 x 30 x 1.4$I_{\Delta n}$ = 42 mA within 300ms

5 x 30 x 1.4$I_{\Delta n}$ = 210 mA within ??
IMO
Follow GN 3
And
Manufacturer Data
<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Outcome ✓ / N/A</th>
<th>Item No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Condition of consumer's intake equipment (Visual inspection only)</td>
<td></td>
<td>8.0</td>
<td>Circuits (Distribution and Final)</td>
</tr>
<tr>
<td>2.0</td>
<td>Parallel or switched alternative sources of supply</td>
<td></td>
<td>9.0</td>
<td>Isolation and switching</td>
</tr>
<tr>
<td>3.0</td>
<td>Protective measure: Automatic Disconnection of Supply (ADS)</td>
<td></td>
<td>10.0</td>
<td>Current-using equipment (permanently connected)</td>
</tr>
<tr>
<td>4.0</td>
<td>Basic protection</td>
<td></td>
<td>11.0</td>
<td>Identification and notices</td>
</tr>
<tr>
<td>5.0</td>
<td>Protective measures other than ADS</td>
<td></td>
<td>12.0</td>
<td>Location(s) containing a bath or shower</td>
</tr>
<tr>
<td>6.0</td>
<td>Additional protection</td>
<td></td>
<td>13.0</td>
<td>Other special installations or locations</td>
</tr>
<tr>
<td>7.0</td>
<td>Distribution equipment</td>
<td></td>
<td>14.0</td>
<td>Prosumer’s low voltage electrical installation(s)</td>
</tr>
</tbody>
</table>
## GENERIC SCHEDULE OF CIRCUIT DETAILS

**Distribution board details**
- **DB reference:** 
- **Location:** 
- **Supplied from:** 
- **Distribution circuit OCPD:** BS (EN):  
- **Type:**  
- **Rating/Setting:**  

**SPD Details:**
- Type(s): T1 □  
- T2 □  
- T3 □ □  
- N/A □

### CIRCUIT DETAILS

<table>
<thead>
<tr>
<th>Circuit number</th>
<th>Circuit description</th>
<th>Conductor details</th>
<th>Overcurrent protective device</th>
<th>RCD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Type of wiring</td>
<td>Number &amp; size</td>
<td>Rating (A)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reference method</td>
<td>Number of points served</td>
<td>Live (mm)</td>
</tr>
</tbody>
</table>

### CODES FOR TYPES OF WIRING

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermoplastic insulated/ sheathed cables</td>
<td>Thermoplastic cables in metallic conduit</td>
<td>Thermoplastic cables in non-metallic conduit</td>
<td>Thermoplastic cables in metallic trunking</td>
<td>Thermoplastic cables in non-metallic trunking</td>
<td>Thermoplastic SWA cables</td>
<td>Thermosetting SWA cables</td>
<td>Mineral insulated cables</td>
<td>Other - please state</td>
</tr>
</tbody>
</table>

* SPD Type. Where a combined T1 + T2 or T2 + T3 device is installed, indicate by ticking both Type boxes.  
† Where a T3 SPD is installed to protect sensitive equipment, enter details in 'Remarks', column 31, of the Schedule of Test Results. (See Section 534 of BS 7671:2018+A2:2022.)  
§ See Table 4A2 of Appendix 4 of BS 7671:2018+A2:2022.  
∥ Where the maximum permitted earth fault loop impedance value stated in column 12 is taken from a source other than the tabulated values given in Chapter 41 of BS 7671:2018+A2:2022, state the source of the data in the appropriate cell for the circuit in the 'Remarks', column 31, of the Schedule of Test Results.
## MINOR ELECTRICAL INSTALLATION WORKS CERTIFICATE

(REQUIREMENTS FOR ELECTRICAL INSTALLATIONS - BS 7671)

To be used only for minor electrical work which does not include the provision of a new circuit

<table>
<thead>
<tr>
<th>PART 1: Description of the minor works</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Details of the Client:</td>
</tr>
<tr>
<td>2. Installation location/address:</td>
</tr>
<tr>
<td>3. Description of the minor works:</td>
</tr>
<tr>
<td>4. Details of any departures from BS 7671:2018 as amended to:</td>
</tr>
<tr>
<td>Details of permitted exceptions (Regulation 411.3.d): Where applicable, a suitable risk assessment(s) must be attached to this Certificate.</td>
</tr>
<tr>
<td>5. Comments on (including any defects observed in) the existing installation (Regulation 444.1.b):</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART 2: Presence and adequacy of installation earthing and bonding arrangements (Regulation 132.1.e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. System earthing arrangement: TN-C ✗</td>
</tr>
<tr>
<td>2. Earth fault loop impedance at distribution board (Z_e) supplying the final circuit:</td>
</tr>
<tr>
<td>3. Presence of adequate main protective conductors:</td>
</tr>
<tr>
<td>Earthing conductor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART 3: Circuit details</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB Reference No.:</td>
</tr>
<tr>
<td>Circuit No.:</td>
</tr>
<tr>
<td>Number &amp; size of conductors: Live:</td>
</tr>
<tr>
<td>Contact impedance:</td>
</tr>
<tr>
<td>RCD:</td>
</tr>
<tr>
<td>AFDD:</td>
</tr>
<tr>
<td>SPD:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART 4: Test results for the altered or extended circuit (where relevant and practicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protective conductor continuity:</td>
</tr>
<tr>
<td>Insulation resistance:</td>
</tr>
<tr>
<td>RCD disconnection time at rated residual operating current (Iᵣ)</td>
</tr>
<tr>
<td>Satisfactory test button operation:</td>
</tr>
<tr>
<td>SPD functionality confirmed:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART 5: Declaration</th>
</tr>
</thead>
</table>
| I certify that the work covered by this certificate does not impair the safety of the existing installation and the work has been designed, constructed, inspected and tested in accordance with BS 7671:2018 amended to: (date) and that to the best of my knowledge and belief, at the time of my inspection, complied with BS 7671 except as detailed in Part 1 above.

Name: | For and on behalf of: |
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Signature:</td>
</tr>
</tbody>
</table>

---

MINOR ELECTRICAL INSTALLATION WORKS CERTIFICATE

Notes for the person producing the Certificate:

The Minor Electrical Installation Works Certificate is intended to be used for additions and alterations to an installation that do not extend to the provision of a new circuit. Examples include the addition of sockets, cutouts or lighting points to an existing circuit, the relocation of a light switch etc. This Certificate may also be used for the replacement of equipment such as accessories or luminaires, but not for the replacement of distribution boards or similar items. Appropriate inspection and testing, however, should always be carried out irrespective of the extent of the work undertaken.

GUIDANCE FOR RECIPIENTS (to be appended to the Certificate)

This Certificate has been issued to confirm that the electrical installation work to which it relates has been designed, constructed, inspected and tested in accordance with BS 7671.

You should have received an 'original' Certificate and the person that issued the Certificate should have retained a duplicate. If you were the person ordering the work, but not the owner of the installation, you should pass this Certificate, or a copy of it, to the owner. A separate Certificate should have been received for each existing circuit on which minor works have been carried out. This Certificate is not appropriate if you requested the person that issued the Certificate to undertake more extensive installation work, for which you should have received an Electrical Installation Certificate.

The Certificate should be retained in a safe place and be shown to any person inspecting or undertaking further work on the electrical installation in the future. If you later vacate the property, this Certificate will demonstrate to the new owner that the minor electrical installation work carried out complied with the requirements of BS 7671 at the time the Certificate was issued.

For safety reasons, the electrical installation will need to be inspected at appropriate intervals by a skilled person or persons, competent in such work.

Where the installation includes a residual current device (RCD) it should be tested six-monthly by pressing the button marked “T” or “Test”. The device should switch off the supply and should then be switched on to restore the supply. If the device does not switch off the supply when the button is pressed, seek expert advice. For safety reasons it is important that this instruction is followed.

Where the installation includes an arc fault detection device (AFDD) having a manual test facility it should be tested six-monthly by pressing the test button. Where an AFDD has both a test button and automatic test function, manufacturer’s instructions shall be followed with respect to test button operation.

Where the installation includes a surge protective device (SPD) the status indicator should be checked to confirm it is in operational condition in accordance with manufacturer’s information. If the indication shows that the device is not operational, seek expert advice. For safety reasons it is important that this instruction is followed.

Where the installation includes alternative or additional sources of supply, warning notice should be found at the origin or meter position or, if remote from the origin, at the consumer unit or distribution board and at points of isolation of all sources of supply.
ELECTRICAL INSTALLATION CONDITION REPORT

REPORT NO.: ______________________

SECTION A. DETAILS OF THE PERSON ORDERING THE REPORT

Name: ______________________
Address: ______________________

SECTION B. REASON FOR PRODUCING THIS REPORT
Date(s) on which inspection and testing was carried out: ______________________

SECTION C. DETAILS OF THE INSTALLATION WHICH IS THE SUBJECT OF THIS REPORT

Occupier: ______________________
Address: ______________________

Description of premises: ______________________
Residential [ ] Commercial [ ] Industrial [ ] Other (include brief description): ______________________

Estimated age of wiring system: _______ years
Evidences of additions / alterations: Yes [ ] No [ ] Not apparent [ ] If yes, estimate age _______ years
Installation record available? (Regulation 655.1) Yes [ ] No [ ] Date of last inspection: _______ (date)

SECTION D. EXTENT AND LIMITATIONS OF INSPECTION AND TESTING

Extent of the electrical installation covered by this report: ______________________

Agreed limitations including any reasons (see Regulation 653.2): ______________________

Agreed with: ______________________
Operational limitations including the reasons (see page no.): ______________________

The inspection and testing detailed in this report and accompanying schedules have been carried out in accordance with BS 7671:2018 as amended.

It should be noted that cope’s concerns within trunking and conduits, under floors, in roof spaces, and generally with portions of the building or unit/ground, have been inspected unless specifically agreed beforehand with the client and inspector prior to the inspection. An inspector should be made within an accessible roof space housing other electrical equipment.

SECTION E. SUMMARY OF THE CONDITION OF THE INSTALLATION

General condition of the installation (in terms of electrical safety): ______________________

Overall assessment of the installation in terms of its suitability for continued use SATISFACTORY / UNSATISFACTORY (Delete as appropriate)

An unsatisfactory assessment indicates that dangerous (code C1) and/or potentially dangerous (code C2) conditions have been identified.

SECTION F. RECOMMENDATIONS

Where the overall assessment of the suitability of the installation for continued use above is stated as UNSATISFACTORY, we recommend that any observations classified as ‘Danger present’ (code C1) or ‘Potentially dangerous’ (code C2) are acted upon as a matter of urgency. Investigation without delay is recommended for observations identified as ‘Further investigation required’ (code F).

Observations classified as ‘Improvement recommended’ (code C3) should be given due consideration.

Subject to the necessary remedial action being taken, we recommend that the installation is further inspected and tested by ______________________ (Date) for the following reasons:

SECTION G. DECLARATION

I/we, being the person(s) responsible for the inspection and testing of the electrical installation (as indicated by my/our signature/s below), particular observing which is described above, having exercised reasonable skill and care when carrying out the inspection and testing, hereby declare that the information in this report, including the observations and the attached schedules, provides an accurate assessment of the condition of the electrical installation taking into account the stated extent and limitations in section D of this report.

Inspected and tested by: ______________________

Report authorised for issue by: ______________________

Name (Capitals): ______________________
Signature: ______________________
Position: ______________________
Address: ______________________
Date: ______________________

SECTION H. SCHEDULE(S)

Inspection Schedule(s): _______ Schedule(s) of Circuit Details and Test Results are attached.

The attached Schedule(s) are part of this document and this report is valid only when they are attached to it.

SECTION I. SUPPLY CHARACTERISTICS AND EARTHING ARRANGEMENTS

Earthing arrangements: ______________________
Number and Type of Line Conductors: ______________________
Nature of Supply Parameters: ______________________
Supply Protective Device: ______________________

SECTION J. PARTICULARS OF INSTALLATION REFERRED TO IN THE REPORT

Means of Earthing: ______________________
Detail of Installation Earth Electrode (where applicable): ______________________
Installation earth electrode: ______________________
Electrode resistance to earth: ______________________

Main Protective Conductors

Earthing conductor: ______________________
Material: ______________________
Osga: ______________________
Connection / continuity verified: ______________________

Main protective bonding conductors: ______________________
Material: ______________________
Osga: ______________________
Connection / continuity verified: ______________________

To water installation pipes: ______________________
To gas installation pipes: ______________________
To oil installation pipes: ______________________
To structural steel: ______________________
To lightning protection: ______________________
To other: ______________________

Main switch / Switch-fuse / Circuit-breaker / RCD

Location: ______________________
Supplier: ______________________
Fuse rating: ______________________
Connection / continuity verified: ______________________

SECTION K. OBSERVATIONS

Observations are made in the following observations are made (see below):

OBSERVATIONS(S) include schedule reference, as appropriate: ______________________

Classification code: ______________________

One of the following codes, as appropriate, has been allocated to each of the observations made above to indicate to the person(s) responsible for the installation the degree of urgency for remedial action:

C1 = Danger present: Risk of injury: Immediate remedial action required
C2 = Potentially dangerous: urgent remedial action required
C3 = Improvement recommended
F1 = Further investigation required without delay
**CONDITION REPORT INSPECTION SCHEDULE FOR RESIDENTIAL AND SIMILAR PREMISES WITH UP TO 100 A SUPPLY**

**NOTE:** This form is suitable for many types of smaller installation, not exclusively residential. The persons responsible for the periodic inspection of the installation should include the relevant items in relation to the electrical installation, the inspection schedule can be reduced or expanded depending on the requirements for the installation.

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Acceptable condition</th>
<th>Unacceptable condition</th>
<th>C1 or C2</th>
<th>Improvement recommended</th>
<th>C3</th>
<th>Further investigation</th>
<th>FI</th>
<th>Not verified</th>
<th>N/V</th>
<th>Limitation</th>
<th>LIM</th>
<th>Not applicable</th>
<th>N/A</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item No</strong></td>
<td><strong>Description</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>INTAKE EQUIPMENT (VISUAL INSPECTION ONLY)</td>
<td>An outcome against an item in this section, other than access to live parts, should not be used to determine the overall outcome.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1.1 | - Service cable 
- Service head 
- Earthing arrangement 
- Meter tails 
- Metering equipment 
- Isolator (where present) |
| **NOTE 1:** Where inadequacies in the intake equipment are encountered, which may result in a dangerous or potentially dangerous situation, the person ordering the work and/or dutyholder must be informed. It is strongly recommended that the person ordering the work informs the appropriate authority. |
| **NOTE 2:** For this section only, where inadequacies are found, an 'X' should be put against the appropriate item and a comment made in Section K. |
| Person ordering work/dutyholder notified (Delete as appropriate) | **Y** / N/A |
| 1.2 | Consumer’s isolator (where present) |
| 1.3 | Consumer’s meter tails |
Guidance Note 3

Section 3.3.3

Appendix D
Be Mindful – Diverted Neutral Current
THEN OVER TIME
<table>
<thead>
<tr>
<th>Year</th>
<th>Number Reported</th>
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</thead>
<tbody>
<tr>
<td>2003</td>
<td>57</td>
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<tr>
<td>2004</td>
<td>112</td>
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<tr>
<td>2005</td>
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<td>123</td>
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<td>2010</td>
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<td>2011</td>
<td>271</td>
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<td>2012</td>
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<td>2013</td>
<td>412</td>
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<td>2016</td>
<td>344</td>
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<td>2017</td>
<td>299</td>
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<tr>
<td>2018</td>
<td>390</td>
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<tr>
<td>2019</td>
<td>428</td>
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<tr>
<td>2020</td>
<td>435</td>
</tr>
<tr>
<td>2021</td>
<td>474</td>
</tr>
<tr>
<td>2022</td>
<td>68</td>
</tr>
</tbody>
</table>
Part 7

Requirements for Electrical Installations

BS 7671:2018
Incorporating
Corrigendum 2018
Amendment 1:2020
Corrigendum 2020
Amendment 2:2022
701  Locations containing a bath or shower

701.512.3
712 Solar PV
712 Solar PV
712 Solar PV
714 Outdoor lighting installations

714.411.3.4 Additional protection

Lighting that is accessible to the public shall have additional protection by an RCD having the characteristics specified in Regulation 415.1.1.

Examples Includes;
(i) gardens, spaces to the public
(ii) telephone kiosks
(iii) bus shelters
(iv) advertising panels and town plans
Electric Vehicles
722.411.4.1

Where equipment to be used is not covered by a British or Harmonized Standard, or where there is no British or Harmonized Standard for the functionality of a piece of equipment used, it is the responsibility of the electrical installation designer or other person responsible for specifying the installation to establish that:

(i) the equipment meets the requirements of the Electrical Equipment (Safety) Regulations 2016 (as amended), the Electromagnetic Compatibility Regulations 2016 (as amended) and other relevant legislation, and

(ii) the equipment has either a CE, UKCA or UKNI mark and a Declaration of Conformity; where third-party approval is required, the equipment is marked appropriately.

The Declaration of Conformity is to be appended to the certification for initial verification. Where the above is satisfied, it is not considered to be a departure from BS 7671:2018+A2:2022.
Unless supplied by a circuit using the protective measure of electrical separation, each charging point incorporating a socket-outlet or vehicle connector complying with the BS EN 62196 series shall be protected individually by an RCD of Type A, Type F or Type B and having a rated residual operating current not exceeding 30 mA.
Electric Vehicles
Chapter 81

BS HD 60364-8-1:2019

Low-voltage electrical installations

Appendix 17
Energy efficiency

Chapter 82

BRITISH STANDARD

Requirements for Electrical Installations

IET Wiring Regulations
Eighteenth Edition

Chapter 83

BS EN 60364-8-3

Upcoming standard.

Operation of prosumer’s electrical installations
Or
Evolution of Electrical Installations
Appendix 17

Energy efficiency

78 pages into 6
<table>
<thead>
<tr>
<th>Electrical Installation Efficiency Classes</th>
<th>Total Number of Points</th>
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<tbody>
<tr>
<td></td>
<td>For Residential</td>
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<tr>
<td>Class EE0</td>
<td>from 0 to 14</td>
</tr>
<tr>
<td>Class EE1</td>
<td>from 15 to 30</td>
</tr>
<tr>
<td>Class EE2</td>
<td>from 31 to 49</td>
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<tr>
<td>Class EE3</td>
<td>from 50 to 69</td>
</tr>
<tr>
<td>Class EE4</td>
<td>from 70 to 89</td>
</tr>
<tr>
<td>Class EE5</td>
<td>90 or more</td>
</tr>
</tbody>
</table>
The Energy Manager
Energy audit and measure:

Building, industrial process, ...

Set the basics:

Initial equipment selection, higher efficiency consumption devices, initial service settings ...

Optimize through automation and regulation:

HVAC control, lighting control, variable speed drives, automatic power factor correction

Monitor, maintain:

Power metering and monitoring devices installation, monitoring services, electrical energy efficiency analysis, software, ...

Control improve:

Verification, maintenance, ...

Passive electrical energy efficiency

Active electrical energy efficiency
Barycentre Method

Procedure to optimize the position of energy source(s) and loads in consideration of energy efficiency
## Initial Installation

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Industry</th>
<th>Commercial</th>
<th>Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determination of energy consumption</td>
<td>7</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Consumption and local of main sub station</td>
<td>12</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Voltage drop</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Efficiency of Tx</td>
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<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Efficiency of current using equipment</td>
<td>4</td>
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<td>4</td>
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<tr>
<td>Power monitoring</td>
<td>Industry</td>
<td>Commercial</td>
<td>Infrastructure</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------</td>
<td>------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Power Factor</td>
<td>6</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Harmonics</td>
<td>8</td>
<td>6</td>
<td>8</td>
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</table>

<table>
<thead>
<tr>
<th>Bonus</th>
<th>Industry</th>
<th>Commercial</th>
<th>Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable Energy source</td>
<td>5</td>
<td>5</td>
<td>5</td>
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<tr>
<td>Electrical Energy storage</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
Chapter 82

Prosumers Low Voltage Electrical Installations
Producer and Consumer of energy

Prosumers Electrical Installation

PEI

PROSUMER
PEI Example
Island Mode – PEI is disconnected from the grid but remains energised
Connected Mode – PEI is connected to the grid
Direct feeding Mode – Grid supplies the PEI with energy
Reverse feeding Mode – PEI supplies the grid, and you get paid
825 Electrical Energy Management Systems (EEMS)

- Connection of PEI to the smart grid
- Manage local energy production
- Manage local energy consumption
- Manage energy procurement

See Annex D82
or BS HD 60364-8-1
or BS HD 60364-8-3
825  Electrical Energy Management Systems (EEMS)
825 Electrical Energy Management Systems (EEMS)
• Both a load and storage device
• Not permanently connected
• Should be managed by the EEMS
Net Zero
ZERO EMISSION

CO₂

2050

COP26
VIRAL
Confusing

NET ZERO by 2050
Eliminate Emissions
Marketing?
Decades of Inaction
Green Colonialism
Deflection
More harm than good
Green Washing
Money from Pollution
Money from Planting
Economic Stimulator
False Targets
Next Generations Problem
‘Net zero means that the UK’s total greenhouse gas (GHG) emissions would be equal to or less than the emissions the UK removed from the environment. This can be achieved by a combination of emission reduction and emission removal.’
Includes Green house Gas emissions or removals from:

- Businesses based in the UK regardless of where in the world they are registered
- The activities of people that live in the UK as well as non-UK visitors
- Land such as forest, crop or grazing land
Excludes Green house Gas emissions or removals from:

- International air travel
- International shipping
- UK residents abroad
- UK Crown dependencies and overseas territories
- The burning of biomass such as wood, straw, biogases and poultry litter for energy production
- Land such as peatland
- The production of goods and services that the UK imports from other countries
Emissions Vs Removal
Net zero means that the emission reduction and emission removal targets are met, with net emissions lowering to zero by 2050. Reducing net emissions to zero will potentially require between 75 to 175 million tonnes of emissions removal by carbon capture and storage according to the Committee on Climate Change.
NET ZERO
HOME

SOLAR PANELS

EFFICIENT LIGHTING

AIR FILTRATION AND VENTILATION

ROOF INSULATION

LOW FLOW WATER FIXTURES

HIGH PERFORMANCE WINDOWS

HEAT PUMP

HEAT PUMP HEATER

EFFICIENT APPLIANCES

INDUCTION COOKTOP

WALL INSULATION
The UK’s carbon footprint is classed as an **Experimental Statistic** due to inherent uncertainties in the estimates produced. The methodology used to produce them is subject to ongoing review and refinement.

[https://www.ons.gov.uk/methodology/methodologytopicsandstatisticalconcepts/guidetoexperimentalstatistics](https://www.ons.gov.uk/methodology/methodologytopicsandstatisticalconcepts/guidetoexperimentalstatistics)
Ongoing CPD
Draft Order laid before Parliament under sections 2(6) and 9(1)(a) of the Climate Change Act 2008, for approval by resolution of each House of Parliament.

DRAFT STATUTORY INSTRUMENTS

2019 No.

CLIMATE CHANGE

The Climate Change Act 2008 (2050 Target Amendment) Order 2019

Made 

***

Coming into force in accordance with article 1

A draft of this instrument was laid before and approved by a resolution of each House of Parliament, in accordance with sections 2(6) and 9(1)(a) of the Climate Change Act 2008 (“the Act”).

Before the draft was laid, the Secretary of State—

(a) obtained and took into account the advice of the Committee on Climate Change, in accordance with section 83(1)(a) of the Act; and

(b) took into account representations made by the Scottish Ministers, the Welsh Ministers and the Department of Agriculture, Environment and Rural Affairs in Northern Ireland in accordance with section 83(1)(b) of the Act.

The Secretary of State considers that since the Act was passed, there have been significant developments in scientific knowledge about climate change that make it appropriate to amend the percentage specified in section 1(1) of the Act.

Accordingly, the Secretary of State, in exercise of the power conferred by section 2(1)(a) of the Act, makes the following Order:

Citation and commencement

1. This Order may be cited as the Climate Change Act 2008 (2050 Target Amendment) Order 2019 and comes into force on the day after the day on which it is made.

---

\[a\] 2008, c. 27

\[b\] see sections 93 and 96 of the Act for definitions of “national authority” and “relevant Northern Ireland Department”.

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Taking charge: the electric vehicle infrastructure strategy
Clean Growth
The UK Carbon Capture Usage and Storage deployment pathway
An Action Plan

Kemper, Mississippi, USA $7.5bn

Gorgon, Australia $3bn
HOME ELECTRICAL INFRASTRUCTURE OF THE FUTURE

How Net Zero is changing the electrical foundations in our homes
A Consumer Access Device (CAD) is a cloud-connected secure smart meter gateway device that accesses real-time energy data from smart meters and sends that data to a designated cloud service.
More CPD
IET Electrician Webinars

Temporary Power Distribution
James Eade CEng MIET
Jamie Holmes IEng MIET

Watch on-demand

Foundation Earthing and Lightning Protection
Robin Earl TMIEET
Sean Passant MIET
Lawrence Harrington EngTech TMIEET

Watch on-demand

Cable Calculation, Stage 2
John Peckham IEng FIET LCGI
Simon Ogborn FIET MSET LCGI
Colin B Penfold IEng MIET
AMRAeS (chair)

Watch on-demand

Battery Storage
Russell Jobbins LCGI (Elec Eng)
MCGI EngTech MIET
EUR ING Graham Kenyon BEng (Hons) CEng MIET TechIosh
Tracey Scott BEng (Hons) MSc CEng CMgr FIET FCMI

Watch on-demand

Isolated lightning protection for hazardous areas and Lightning protection zone concept (LPZ)
Sean Passant MIET
Robin Earl TMIEET
John Peckham IEng FIET (Chair)

Watch on-demand

EICRs – Coding, and the link to the Electricity at Work Regulations 1989
Nikki Dennois EngTech MIET
Mark Coles BEng (Hons) MIET
Alex Gray BEng (Hons) CEng MIET

Watch on-demand

RCDs: Selection, Types and Testing
EUR ING Graham Kenyon BEng(hons) CEng MIET TechIosh
John Peckham IEng FIET LCGI
Colin Penfold EngTech ARAeS MIET

Watch on-demand

Renewables and new technologies, their application and installation
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