

Requirements for Electrical Installations

BS 7671

The IET Wiring Regulations

**Standards and the
Electrical Industry**

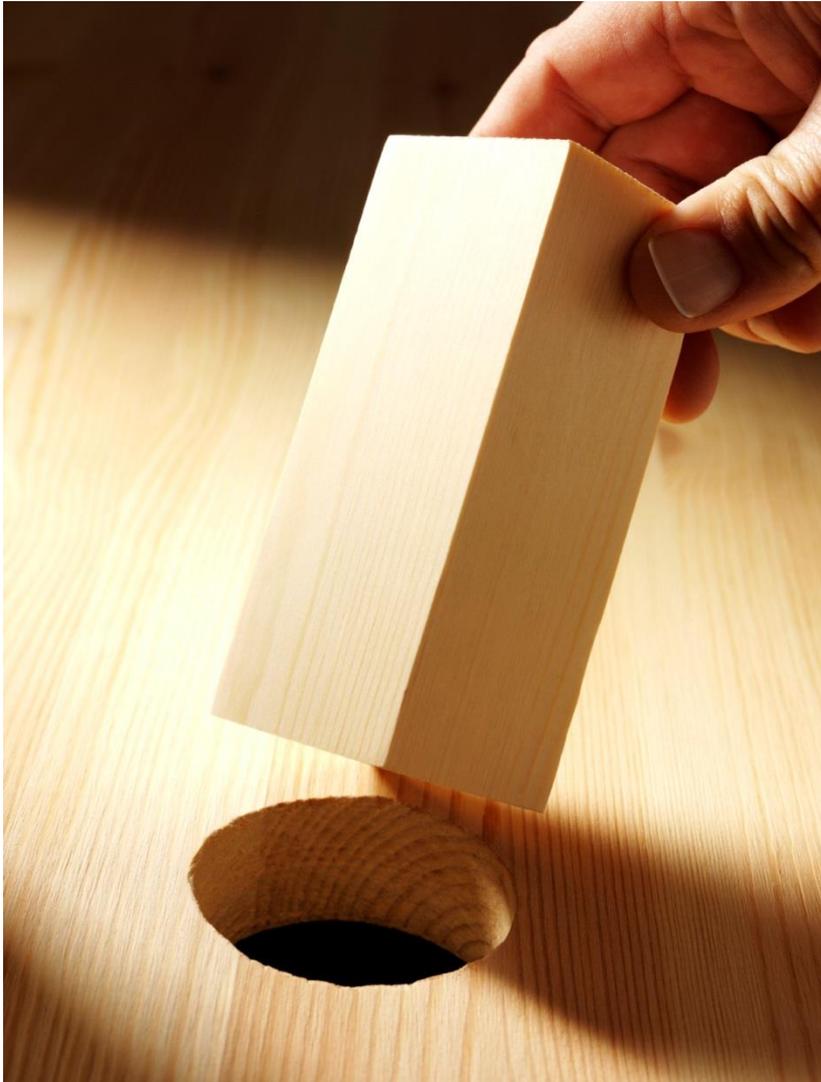
Presenter:

Mark Coles
Head of Technical Regulations

The Institution of Engineering and Technology

Standards and Standardisation

Why do we need standards?



History of BS 7671

The history of BS 7671

The Wiring Regulations were first issued in 1882 by the **Society of Telegraph Engineers and of Electricians**, consisting of four pages and 21 Regulations:

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., <i>Vice-President.</i>	Professor D. E. Hughes, F.R.S., <i>Vice-President.</i>
Sir Charles T. Bright.	W. H. Preece, F.R.S., <i>Past</i> <i>President.</i>
T. Russell Crompton.	Alexander Siemens.
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J. E. H. Gordon.	
Dr. J. Hopkinson, F.R.S.	

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.

The chief dangers of every new application of electricity arise mainly from ignorance and inexperience 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 ordinarily 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.

I. THE DYNAMO MACHINE.

1. The dynamo machine should be fixed in a dry place.
2. It should not be exposed to dust or flyings.
3. It should be kept perfectly clean and its bearings well oiled.
4. The insulation of its coils and conductors should be perfect.
5. It is better, when practicable, to fix it on an insulating bed.
6. All conductors in the Dynamo Room should be firmly supported, well insulated, conveniently arranged for inspection, and marked or numbered.

II. THE WIRES.

7. Every switch or commutator used for turning the current on or off should be constructed so that when it is moved and left to itself it cannot permit of a permanent arc or of heating, and its stand should be made of slate, stoneware, or some other incombustible substance.
8. There should be in connection with the main circuit a safety fuse constructed of easily fusible metal which would be melted if the current attain any undue magnitude, and would thus cause the circuit to be broken.
9. Every part of the circuit should be so determined, that the gauge of wire to be used is properly proportioned to the currents it will have to carry, and changes of circuit from a larger to a smaller conductor, should be sufficiently protected with suitable

safety fuses so that no portion of the conductor should ever be allowed to attain a temperature exceeding 150° F.

N.B.—These fuses are of the very essence of safety. They should always be enclosed in incombustible cases. Even if wires become perceptibly warmed by the ordinary current, it is a proof that they are too small for the work they have to do, and that they ought to be replaced by larger wires.

10. Under ordinary circumstances complete metallic circuits should be used, and the employment of gas or water pipes as conductors for the purpose of completing the circuit, should in no case be allowed.

11. Where bare wire out of doors rests on insulating supports it should be coated with insulating material, such as india-rubber tape or tube, for at least two feet on each side of the support.

12. Bare wires passing over the tops of houses should never be less than seven feet clear of any part of the roof, and they should invariably be high enough, when crossing thoroughfares, to allow fire escapes to pass under them.

13. It is most essential that the joints should be electrically and mechanically perfect. One of the best joints is that shown in the annexed sketches. The joint is whipped around with small wire, and the whole mechanically united by solder.



14. The position of wires when underground should be efficiently indicated, and they should be laid down so as to be easily inspected and repaired.

15. All wires used for indoor purposes should be efficiently insulated.

16. When these wires pass through roofs, floors, walls, or partitions, or where they cross or are liable to touch metallic masses, like iron girders or pipes, they should be thoroughly protected from abrasion with each other, or with the metallic masses, by suitable additional covering; and where they are liable to abrasion

from any cause, or to the deprivations of rats or mice, they should be efficiently encased in some hard material.

17. Where wires are put out of sight, as beneath flooring, they should be thoroughly protected from mechanical injury, and their position should be indicated.

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.

III. LAMPS.

18. Arc lamps should always be guarded by proper lanterns to prevent danger from falling incandescent pieces of carbon, and from ascending sparks. Their globes should be protected with wire netting.

19. The lanterns, and all parts which are to be handled, should be insulated from the circuit.

IV. DANGER TO PERSON.

20. To secure persons from danger inside buildings, it is essential so to arrange the conductors and fittings, that no one can be exposed to the shocks of alternating currents exceeding 60 volts; and that there should never be a difference of potential of more than 200 volts between any two points in the same room.

21. If the difference of potential within any house exceeds 200 volts, whether the source of electricity be external or internal, the house should be provided outside with a "switch," so arranged that the supply of electricity can be at once cut off.

By Order of the Council.

F. H. WEBB, *Secretary.*

Offices of the Society,
4, The Sanctuary, Westminster,
June 21, 1882.

The First Edition of The Regulations had requirements for:

Isolation – Regulation 7:

7. Every switch or commutator used for turning the current on or off should be constructed so that when it is moved and left to itself it cannot permit of a permanent arc or of heating, and its stand should be made of slate, stoneware, or some other incombustible substance.

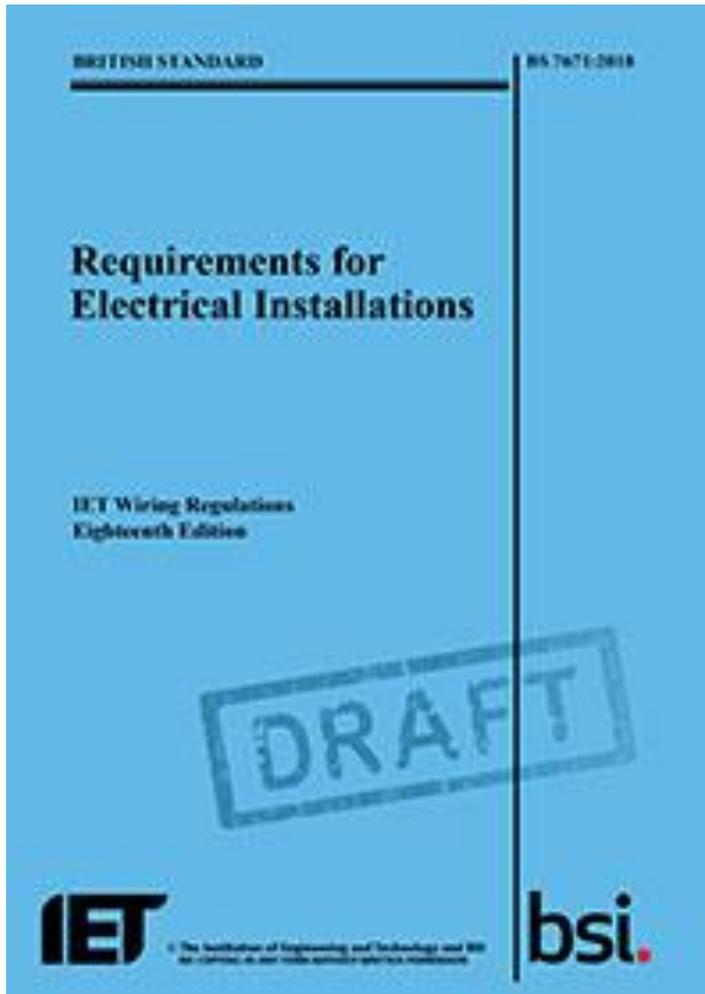
Mechanical protection and labelling – Regulation 17:

17. Where wires are put out of sight, as beneath flooring, they should be thoroughly protected from mechanical injury, and their position should be indicated.

Periodic Inspection and Testing:

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.

BS 7671:2018 - planned



Planned publication date 1st July 2018

Intention that installations from:

1st January 2019 shall comply with BS 7671:2018

Standards and Industry – case studies

Updates, revisions and new editions

Updates to BS 7671 occur ≥ 3.5 years:

- To align with CENELEC HDs



- To take account of changes to IEC standards



- **When evidence demonstrates that a change is necessary**

Consumer unit fires



Consumer unit fires

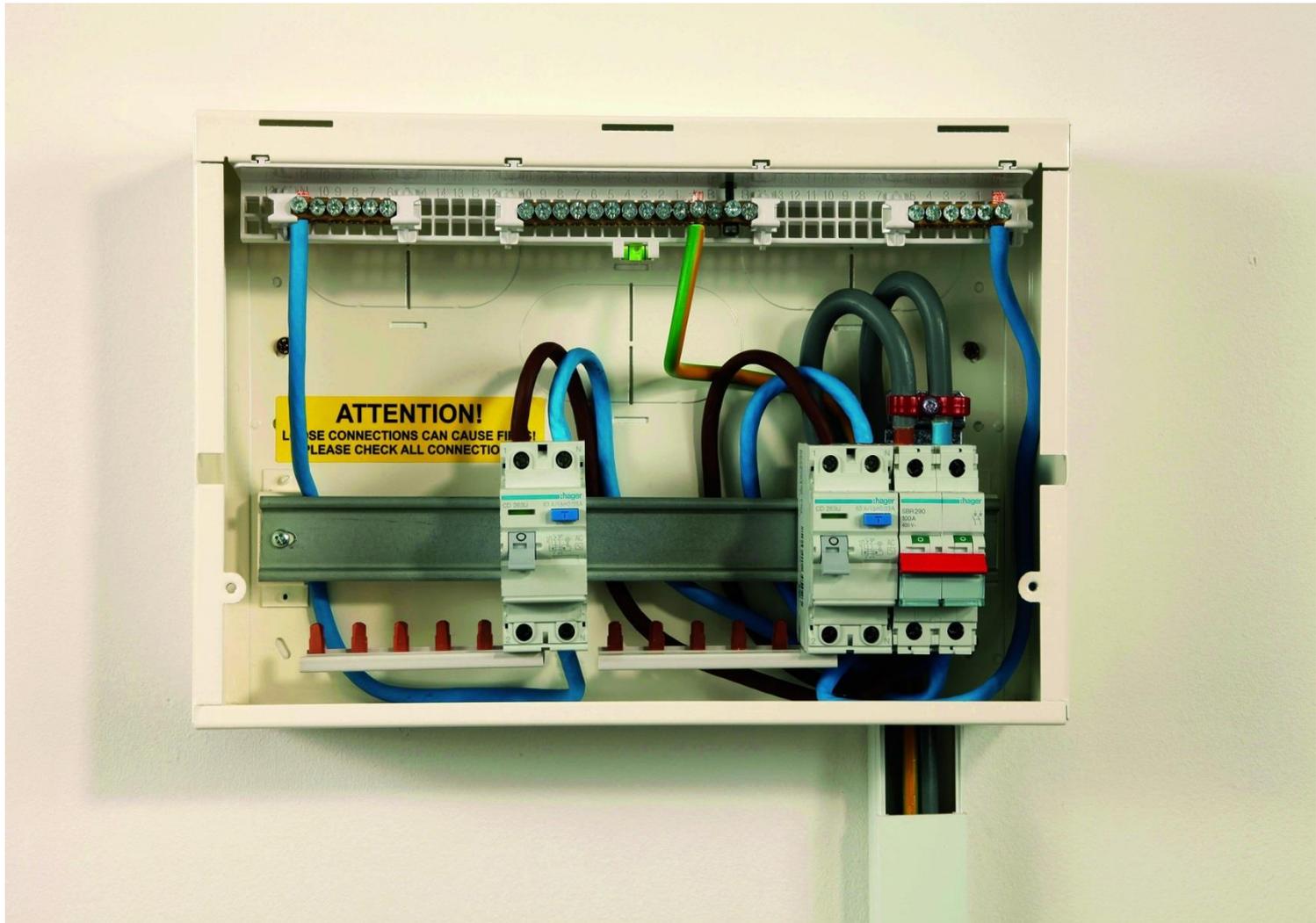


Consumer unit fires

Information from London Fire Brigade

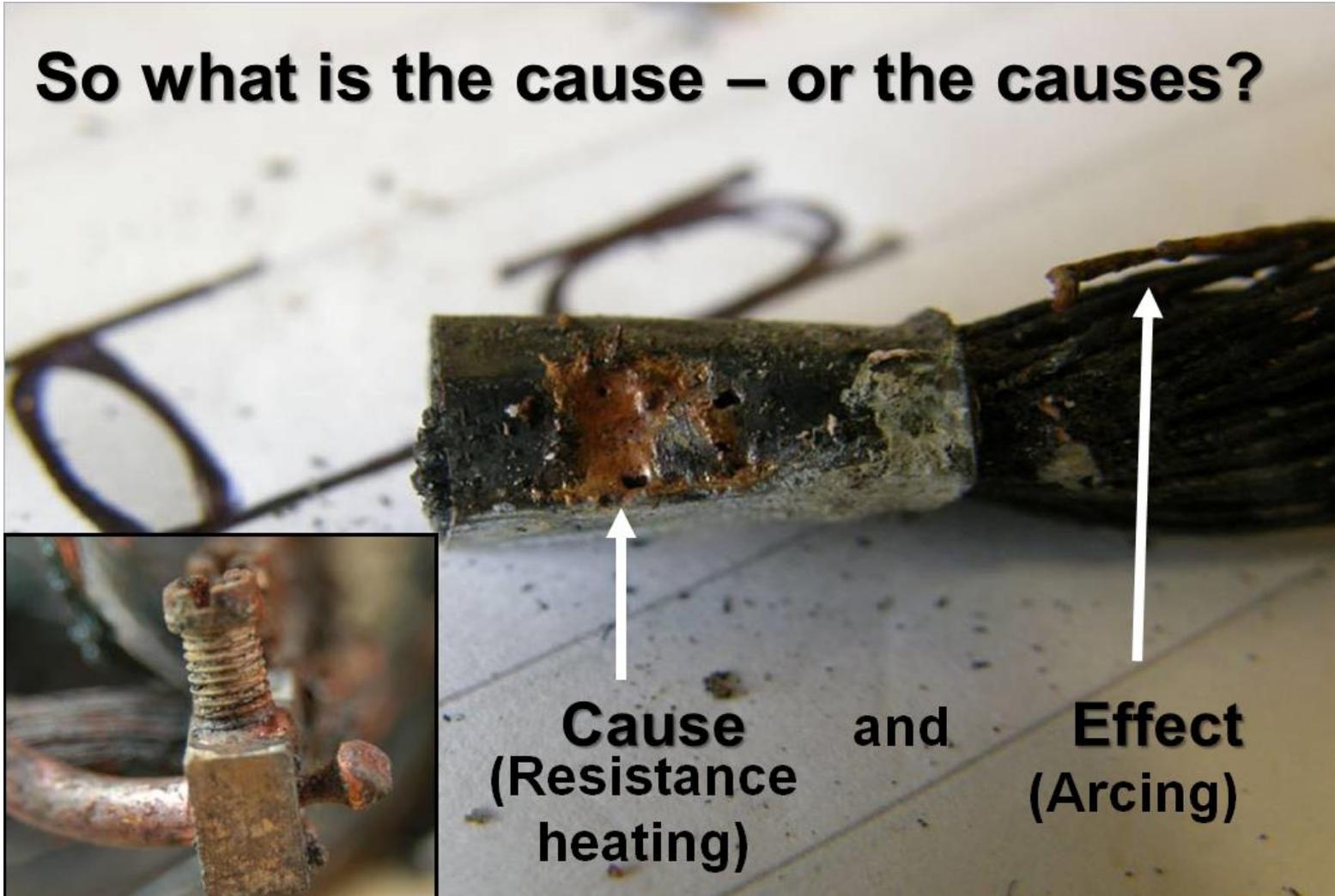
London data only	Incidents
2005/06	27
2006/07	28
2007/08	33
2008/09	21
2009/10	54
2010/11	73
2011/12	71
2012/13	220
2013/14	253

BS 7671:2008+A3:2015



BS 7671:2008+A3:2015

So what is the cause – or the causes?

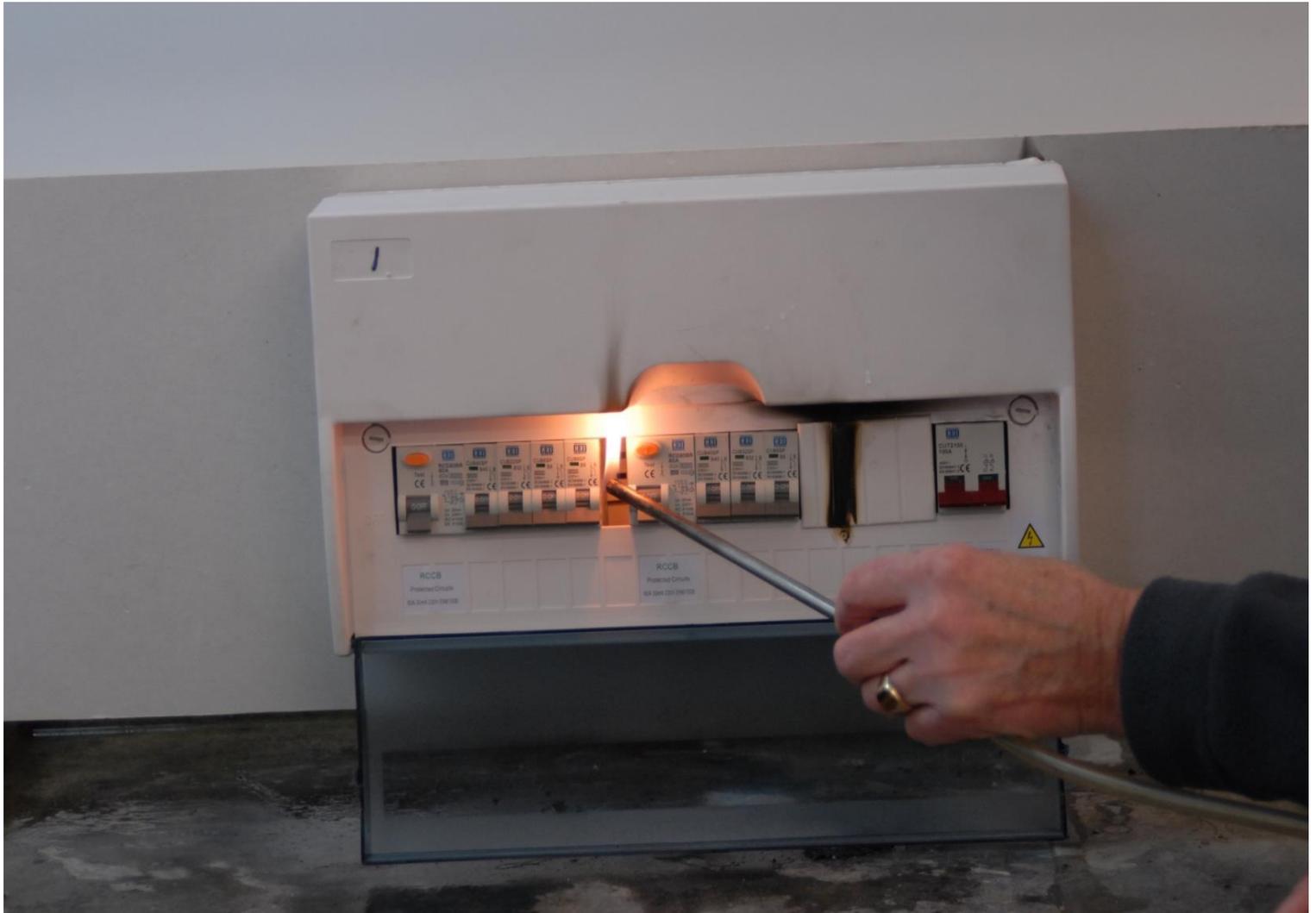


**Cause
(Resistance
heating)**

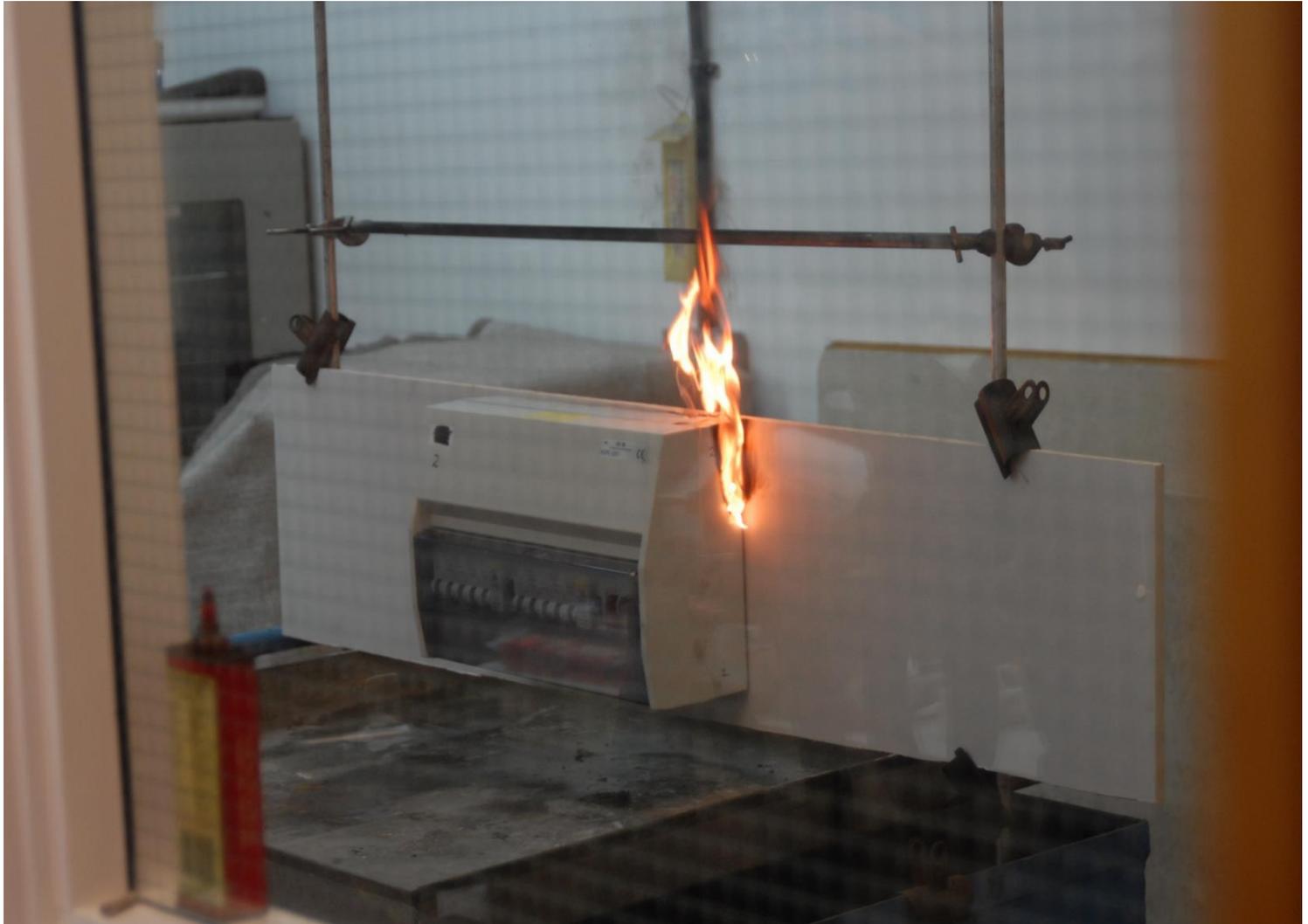
and

**Effect
(Arcing)**

BS 7671:2008+A3:2015



BS 7671:2008+A3:2015



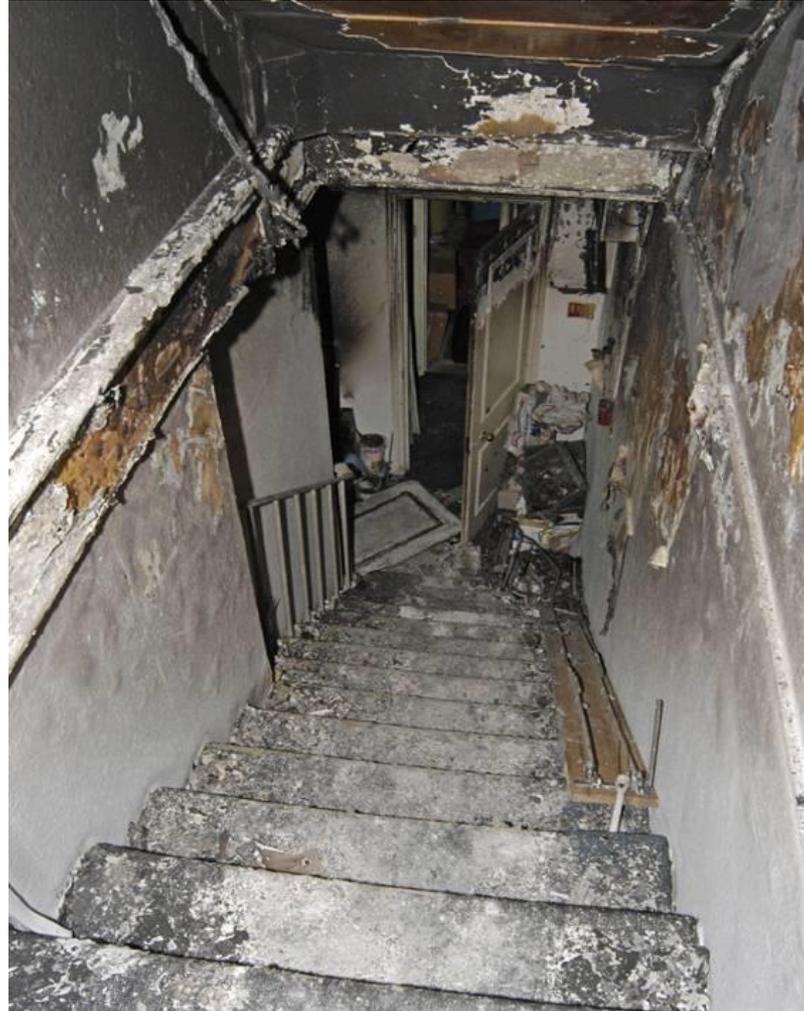
BS 7671:2008+A3:2015



BS 7671:2008+A3:2015



BS 7671:2008+A3:2015



BS 7671:2008+A3:2015



BS 7671:2008+A3:2015

421.1.201 Within **domestic (household) premises**, consumer units and similar switchgear assemblies shall comply with BS EN 61439-3 and shall:

- (i) have their enclosure manufactured from non-combustible material, or
- (ii) be enclosed in a cabinet or enclosure constructed of non-combustible material and complying with Regulation 132.12

Implementation date of 1st January 2016

BS 7671:2008+A3:2015

521.11 Wiring systems in escape routes

521.11. 201 Wiring systems in escape routes shall be supported such that they will not be liable to premature collapse in the event of fire..

BS 7671:2008+A3:2015



BS 7671:2008+A3:2015

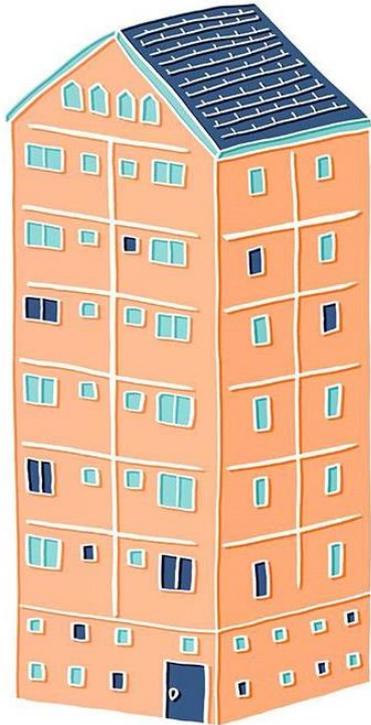


BS 7671:2008+A3:2015



BS 7671:2008+A3:2015

527.2 Sealing of wiring system penetrations



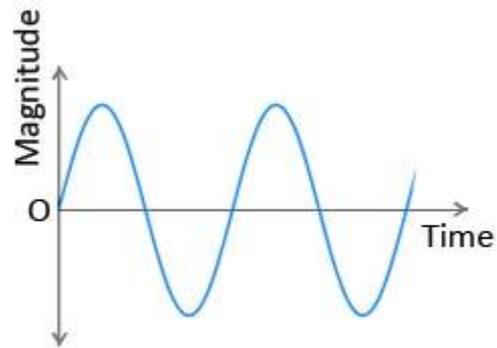
The future?

Arc fault detection devices

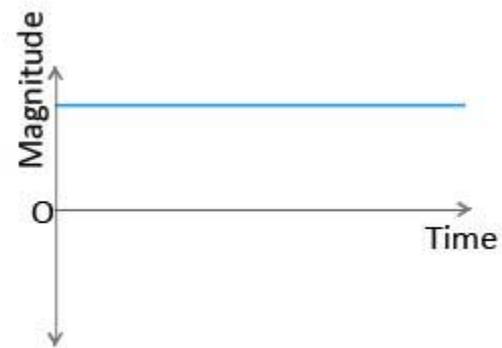


The future?

- LVDC in all buildings



Alternating Current

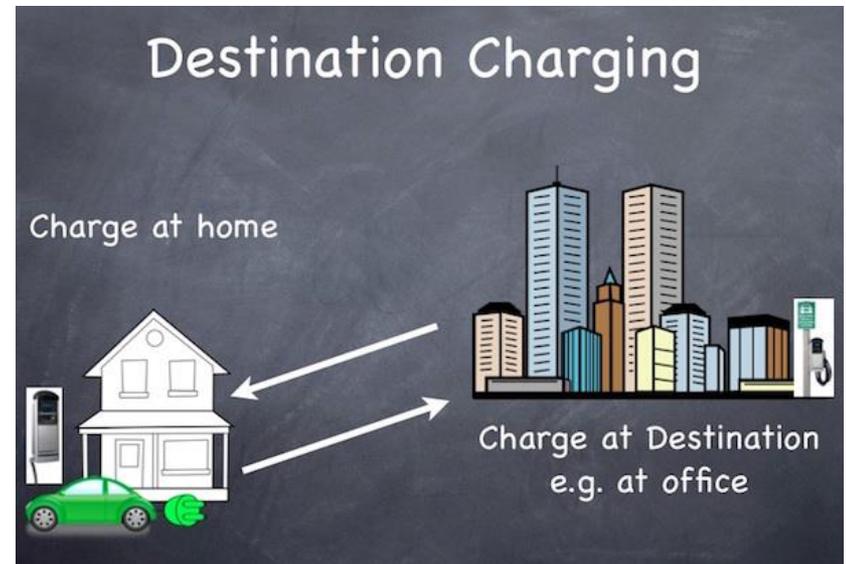


Direct Current



The future?

- EV charging/generation



The future?

- Energy storage (Tesla wall)



Thank you for listening

**Any
questions?**

