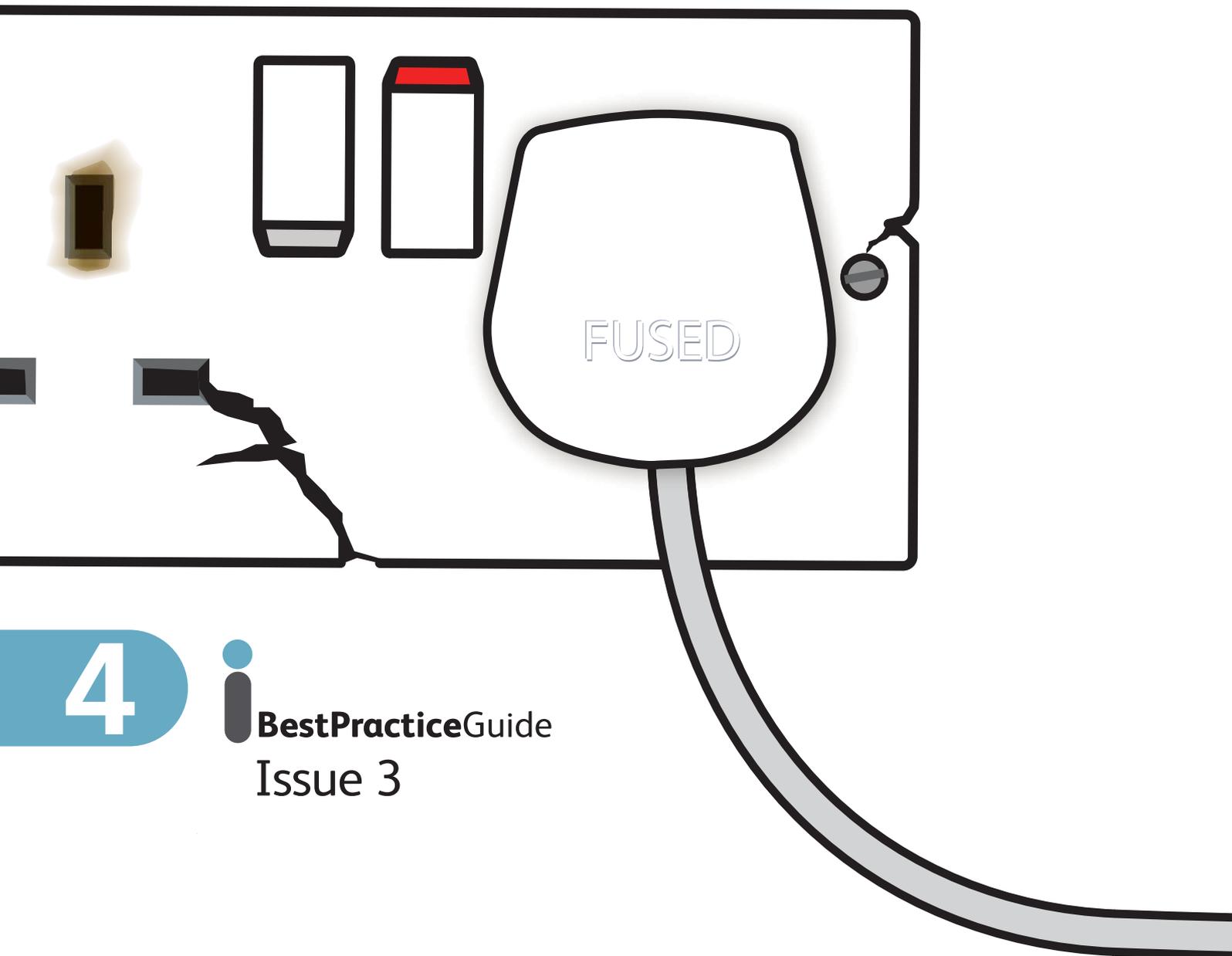


Electrical installation condition reporting:

Classification Codes for
domestic and similar
electrical installations



4

 BestPracticeGuide
Issue 3

BestPracticeGuide

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Electrical installation condition reporting:

Classification Codes for domestic and similar electrical installations

The aim of this Guide is to provide practical guidance for competent persons on the use of the Classification Codes that need to be attributed to each observation recorded during the periodic inspection and testing of an electrical installation for the benefit of the person ordering the report.

The guidance is limited to the range of observations that are likely to be associated with domestic and similar electrical installations. It takes into account the publication of Amendment 1 to BS 7671: 2008.

Introduction

Every electrical installation deteriorates with use and time. Therefore, if the safety of the users is not to be put at risk, it is important that every installation is periodically inspected and tested by a competent person. Indeed, it is recommended in BS 7671: 2008 as amended (Regulation 135.1) that every electrical installation is subjected to periodic inspection and testing.



Inspecting a socket-outlet

The inspection and testing should be carried out at appropriate intervals in order to determine what, if anything, needs to be done to maintain the installation in a safe and serviceable condition.

The results of the inspection and testing need to be clearly detailed in a report. Any observed damage, deterioration, defects, dangerous conditions and non-compliances with the requirements of the current edition of BS 7671 that may give rise to danger should be recorded and appropriately classified for remedial action.

It should be borne in mind that, as stated in the introduction to BS 7671, existing installations that have been constructed in accordance with earlier editions of the Standard may not comply with the current edition in every respect, but this does not necessarily mean that they are unsafe for continued use or require upgrading.

An electrical installation condition report is, as its title indicates, a report and not a certificate. It provides an assessment of the in-service condition of an electrical installation against the requirements of the edition of BS 7671 current at the time of the inspection, irrespective of the age of the installation.

The report is primarily for the benefit of the person ordering the work and of persons subsequently involved in additional or remedial work, or further inspections. The report may be required for one or more of a variety of reasons, each of which may impose particular requirements or limitations on the inspection and testing.

The report is required to include details of the extent of the installation and of any limitations of the inspection and testing, including the reasons for any such limitations and the name of the person with whom those limitations were agreed. It should be noted that the greater the limitations applying, the lesser is the scope of the inspection and testing carried out, and hence the value of the report is correspondingly diminished. The report is also required to include a record of the inspection and the results of testing.

The report provides a formal declaration that, within the agreed and stated limitations, the details recorded, including the observations and recommendations, and the completed schedules of inspection and test results, give an accurate assessment of the condition of the electrical installation at the time it was inspected.



A typical periodic inspection notice for an older installation

Purpose of periodic inspection, testing and reporting

The main purpose of periodic inspection and testing is to detect so far as is reasonably practicable, and to report on, any factors impairing or likely to impair the safety of an electrical installation.

The aspects to be covered include all of the following:

- Safety of persons against the effects of electric shock and burns
- Protection against damage to property by fire and heat arising from an installation defect
- Confirmation that the installation is not damaged or deteriorated so as to impair safety
- Identification of non-compliances with the current edition of BS 7671, or installation defects, which may give rise to danger.



Electrical installations in poor condition present risks of fire as well as electric shock

The inspector

All persons carrying out the inspection and testing of electrical installations must be competent to do so.



A continuity test being carried out

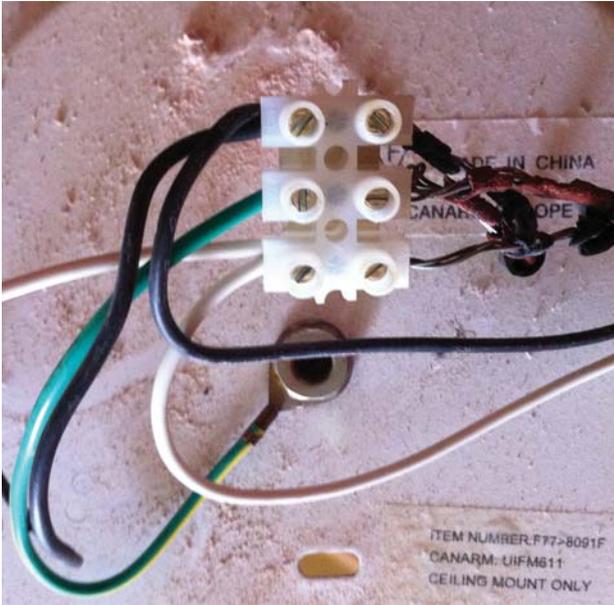
To be competent to undertake the periodic inspection and testing of an existing electrical installation, persons must as a minimum:

- Have sufficient knowledge and experience of electrical installation matters to avoid injury to themselves and others
- Be familiar with, and understand, the requirements of the current edition of BS 7671 including those relating to inspection, testing and reporting
- Be skilled in the safe application of the appropriate test instruments and procedures
- Have a sound knowledge of the particular type of installation to be inspected and tested
- Have sufficient information about the function and construction of the installation to allow them to proceed in safety.

If the inspector is competent and takes all the necessary safety precautions including following the correct procedures, the process of inspecting and testing should not create danger to persons, or cause damage to property.

Past events indicate that persons undertaking electrical installation condition reporting need to have extensive knowledge and experience of electrical installation matters to enable them to safely and accurately assess the condition of an existing electrical installation. This is especially so when they do not have access to the design or maintenance information relating to that installation.

Guidance on safe isolation procedures is available in another Best Practice Guide (No 2 in the series) published by the Electrical Safety Council, which can be downloaded free of charge from the websites of the Council and other contributing bodies.



A dangerous condition - line conductor connected to the metallic enclosure of a light fitting (in addition to exposed conductors)

Some certification, registration and membership bodies make available 'dangerous condition notification' forms. These assist inspectors to record, and then to communicate immediately to the person responsible for the safety of the installation, any dangerous condition discovered.

Observations

The periodic inspection and testing procedures should identify any damage, deterioration, defects and conditions within the installation that give rise, or potentially give rise, to danger. The procedures should also identify any deficiencies for which remedial action would contribute to a significant improvement in the safety of the electrical installation.

After due consideration, each such observed safety issue should be recorded at the appropriate point in the inspection or test results schedule, and further detailed in the 'observations' section of the report.

The observations should be based on the requirements of the edition of BS 7671 current at the time of the inspection, not on the requirements of an earlier edition current at the time the installation was constructed.

Each observation should be written in a clear, accurate and concise manner that is likely to be understood by the person ordering the work. Technical terms should be avoided or explained unless it is known that the recipient is an electrical engineer or electrician, for example.

An electrical installation condition report is intended to be a factual report on the condition of an installation, not a proposal for remedial work. Therefore, each recorded observation should describe a specific defect, omission or item for which improvement is recommended.

The observation should detail what the situation is, and not what is considered necessary to put it right. For example, 'excessive damage to the consumer unit enclosure' would be appropriate, whereas 'consumer unit to be replaced' would not.

Only observations that can be supported by one or more regulations in the edition of BS 7671 current at the time of the periodic inspection should be recorded. The particular regulation number(s) need not be entered in the report (unless specifically required by the client), but should serve to remind the inspector that it is only compliance with BS 7671 that is to be considered. Observations based solely on personal preference or 'custom and practice' should not be included.



Recessed luminaire above a bath (outside the zones)

Classification Codes

Each observation relating to a concern about the safety of the installation should be attributed an appropriate Classification Code selected from the standard codes C1, C2 and C3. Each code has a particular meaning:

- Code C1** 'Danger present'. Risk of injury.
Immediate remedial action required.
- Code C2** 'Potentially dangerous'.
Urgent remedial action required
- Code C3** 'Improvement recommended'.

Only one of the standard Classification Codes should be attributed to each observation. If more than one Classification Code could be attributed to an observation, only the most serious one should be used (Code C1 being the most serious).

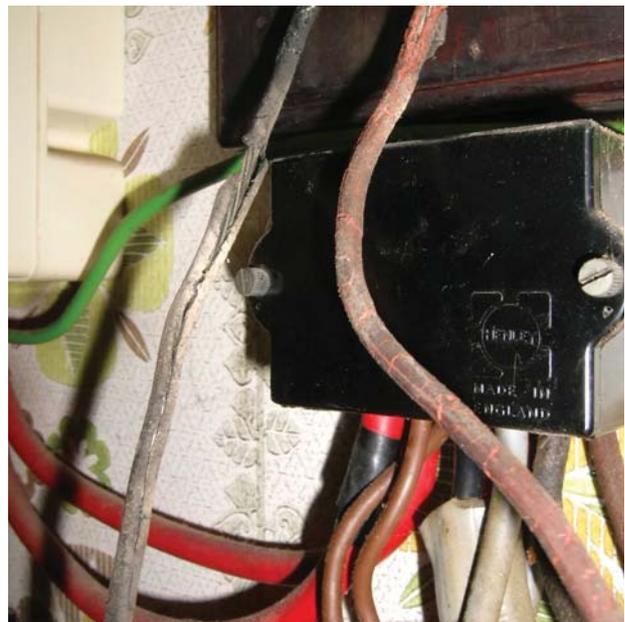
Where the inspection and testing procedures identify an item which is dangerous or potentially dangerous, it should be identified in the inspection or test results schedule of the report by attributing to it a Classification Code C1 or C2, as appropriate, in the 'outcome' column of the inspection schedule or, where provided, the 'remarks' column of the test schedule.

Where the inspection and testing procedures identify an item which is not dangerous or potentially dangerous, but for which improvement is recommended, it should be identified in the inspection or test results schedule of the report by attributing to it a Classification Code C3 in the 'outcome' column of the inspection schedule or, where provided, the 'remarks' column of the test schedule.

Where during inspection and testing a real and immediate danger is observed that puts the safety of those using the installation at risk, Classification Code C1 (danger present) must be given.

Where a Classification Code C1 is considered appropriate, the client is to be advised immediately, and also in writing, that immediate remedial action is required (or has been taken) to remove the danger. As previously indicated, this action is necessary to satisfy the duties imposed on the inspector and other duty holders by the Health and Safety at Work etc Act 1974 and the Electricity at Work Regulations 1989.

Wherever an item in the inspection or test results schedule has been attributed a Classification Code C1, C2 or C3, there should be a corresponding observation in the 'observations' section of the report.



Live parts exposed to touch

In general terms, the Classification Codes should be used as follows:

Code C1 (Danger present)

This code should be used to indicate that danger exists, requiring immediate remedial action.

The persons using the installation are at immediate risk. The person ordering the report should be advised to take action without delay to remedy the observed deficiency in the installation, or to take other appropriate action (such as switching off and isolating the affected parts of the installation) to remove the danger. The inspector should not wait for the full report to be issued before giving this advice.

As previously indicated, some certification, registration and membership bodies make available 'dangerous condition notification' forms to enable inspectors to record, and then to communicate immediately to the person ordering the report, any dangerous condition discovered.

Code C2 (Potentially dangerous)

This code should be used to indicate that, whilst an observed deficiency is not considered to be dangerous at the time of the periodic inspection, it would become a real and immediate danger if a fault or other foreseeable event was to occur in the installation or connected equipment.

The person ordering the report should be advised that, whilst the safety of those using the installation may not be at immediate risk, remedial action should be taken as a matter of urgency to remove the source of potential danger.

Code C3 (Improvement recommended)

This code should be used to indicate that, whilst an observed deficiency is not considered to be a source of immediate or potential danger, improvement would contribute to a significant enhancement of the safety of the electrical installation.

Further investigation

The model forms in BS 7671: 2008 incorporating Amendment 1 provide for a need for further investigation to be indicated against each inspection and test outcome, and against each observation. Usually, however, it should be possible to attribute a Classification Code to each observation without the need for further investigation.

The purpose of periodic inspection, as previously stated, is not to carry out a fault-finding exercise, but to assess and report on the condition of an installation within the agreed extent and limitations of the inspection. Therefore, where an observation can be attributed a Classification Code, further investigation would not be required for the purposes of completing the condition report.

Further investigation should not be called for in respect of any observation unless that investigation could reasonably be expected to reveal danger or potential danger. Further investigation should not be called for simply because it would be 'nice to know' – for example, why a socket-outlet is unearthed.

If an observation cannot be attributed a Classification Code due to reasonable doubt as to whether danger or potential danger exists, the outcome of the assessment must be reported to be unsatisfactory.

The person ordering the report should be advised that the inspection and/or testing has revealed a potential safety issue which could not, due to the agreed extent or limitations of the inspection, be fully determined, and that the issue should be investigated as soon as possible.

An example of an observation that might possibly justify further investigation is given on page 17.

Departures from the requirements of the current edition of BS 7671 that do not give rise to danger or need improvement

Amendment 1 to BS 7671: 2008 no longer requires departures from the requirements of the current edition of BS 7671 that do not give rise to danger or need improvement to be recorded in condition reports. (Examples of such departures are given on page 17.)

Summary of the condition of the installation

The summary should adequately describe the general condition of the installation in terms of electrical safety, taking into account the specific observations made. It is essential to provide a clear summary of the condition of the installation having considered, for example:

- The adequacy of the earthing and bonding arrangements
- The suitability of the consumer unit and other control equipment
- The type(s) of wiring system, and its condition
- The serviceability of equipment, including accessories
- The presence of adequate identification and notices
- The extent of any wear and tear, damage or other deterioration
- Changes in use of the premises that have led to, or might lead to, deficiencies in the installation.

Minimal descriptions such as ‘poor’, and superficial statements such as ‘recommend a rewire’, are considered unacceptable as they do not indicate the true condition of an installation. It will often be necessary or appropriate to explain the implications of an electrical installation condition report in a covering letter, for the benefit of recipients who require additional advice and guidance about their installation.

For example, where an installation has deteriorated or been damaged to such an extent that its safe serviceable life can reasonably be considered to be at an end, a recommendation for renewal should be made in a covering letter, giving adequate supporting reasons. Reference to the covering letter should be made in the report.



Unsatisfactory connection to a downlighter

On the model electrical installation condition report given in BS 7671, a box is provided for the overall assessment of the condition of the installation to be given. After due consideration, the overall condition of the installation should be given as either ‘satisfactory’ or ‘unsatisfactory’.

If any observation in the report has been given a Code C1 or Code C2 classification as categorised in this Guide, or if any observations require further investigation to determine whether danger or potential danger exists, the overall assessment of the condition of the installation must be reported to be ‘unsatisfactory’.

If there are no observations in the report classified as C1 or C2, or that require further investigation, it would not be reasonable to report the overall condition of the installation as unsatisfactory.

The recommended interval until the next inspection should be made conditional upon all observations that have been given a Classification Code C1 (danger present) being remedied immediately and all observations that have been given a Code C2 (potentially dangerous) or that require further investigation being remedied or investigated respectively as a matter of urgency.

Where the space provided for the description of the general condition of the installation is inadequate for the purpose and it is necessary to continue the description on an additional page(s), the page number(s) of the additional page(s) should be recorded.

Examples of the use of Classification Codes

It is entirely a matter for the competent person conducting the inspection to decide on the Classification Code to be attributed to an observation. The inspector's own judgement as a competent person should not be unduly influenced by the person ordering the work. The person(s) signing the report are fully responsible for its content and accuracy.

The following examples are not exhaustive. All references to RCD protection mean additional protection by an RCD having a rated operating (tripping) current ($I_{\Delta n}$) not greater than 30 mA and an operating time not exceeding 40 ms at a residual current of $5 I_{\Delta n}$.

Code C1 (Danger present)

Observations that would almost certainly warrant a Code C1 classification include:

- Exposed live parts that are accessible to touch, such as where:
 - a fuse carrier or circuit-breaker is missing from a consumer unit and a blanking piece is not fitted in its place
 - terminations or connections have no (or damaged) barriers or enclosures
 - live conductors have no (or damaged) insulation
 - an accessory is badly damaged.



Socket-outlet with broken face plate

- Conductive parts have become live as the result of a fault
- Incorrect polarity

Code C2 (Potentially dangerous)

Observations that would usually warrant a Code C2 classification include:

- Absence of a reliable and effective means of earthing for the installation



Absence of a reliable means of earthing

- A public utility water pipe being used as the means of earthing for the installation
- A gas or oil pipe being used as the means of earthing for the installation
- Cross-sectional area of the earthing conductor does not satisfy adiabatic requirements (that is, does not comply with Regulation 543.1.1)
- Absence of a circuit protective conductor for a lighting circuit supplying one or more items of Class I equipment, or connected to switches having metallic face plates²
- Absence of a notice warning that lighting circuits have no circuit protective conductor²
- Absence of a circuit protective conductor for a circuit, other than a lighting circuit, supplying one or more items of Class I equipment
- Absence of earthing at a socket-outlet
- Absence of main protective bonding

² See the Electrical Safety Council Best Practice Guide No 1 - replacing a consumer unit in domestic premises where lighting circuits have no protective conductor.

- Inadequate cross-sectional area of a main protective bonding conductor where the conductor is less than 6 mm² or where there is evidence of thermal damage
- Absence of supplementary bonding where required³, such as in a location containing a bath or shower, where **any** of the following three conditions are not satisfied:
 - All final circuits of the location comply with the requirements of Regulation 411.3.2 for automatic disconnection, **and**
 - All final circuits of the location have additional protection by means of a 30 mA RCD, **and**
 - All extraneous-conductive-parts of the location are effectively connected to the protective equipotential bonding (main earthing terminal).
- Socket-outlets other than SELV or shaver socket-outlets located less than 3 m horizontally from the boundary of zone 1 in a location containing a bath or shower
- Absence of fault protection (protection against indirect contact) by RCD where required, such as for a socket-outlet circuit in an installation forming part of a TT system
- Circuits with ineffective overcurrent protection (due, for example, to oversized fuse wire in rewirable fuses)



Absence of supplementary bonding

- The main RCD or voltage-operated earth-leakage circuit-breaker on a TT system fails to operate when tested with an instrument or integral test button
- Absence of RCD protection for portable or mobile equipment that may reasonably be expected to be used outdoors
- Absence of RCD protection for socket-outlets in a location containing a bath or shower, other than for SELV or shaver socket-outlets



Checking a fuse carrier (base missing)

- A protective device installed in a neutral conductor only
- Separate protective devices in line and neutral conductors (for example, double-pole fusing)



Double-pole switch with fuses in each pole

³ Where the presence of supplementary bonding cannot be confirmed by inspection, it may be verified by a continuity test (< 0.05Ω)

Examples of the use of Classification Codes

- Earth fault loop impedance value greater than that required for operation of the protective device within the time prescribed in the version of BS 7671/IET Wiring Regulations current at the time of installation
- A ring final circuit having a discontinuous conductor
- A ring final circuit cross-connected with another circuit
- Inconsistent resistance values for the conductors of ring final circuits
- Unsatisfactory electrical connection (such as a loose connection or type, number and/or size of conductors unsuitable for the means of connection)



Unsatisfactory electrical connections

- A 'borrowed neutral', for example where a single final circuit neutral is shared by two final circuits (such as an upstairs lighting circuit and a separately-protected downstairs lighting circuit)
- Insulation resistance of less than 1 M Ω between live conductors connected together and Earth, when measured at the consumer unit with all final circuits connected

- Insulation of live conductors deteriorated to such an extent that the insulating material readily breaks away from the conductors



Crumbling vulcanised rubber insulation

- Sheath of an insulated and sheathed non-armoured cable not taken inside the enclosure of an accessory, such as at a socket-outlet or lighting switch, where the unsheathed cores are accessible to touch and/or likely to come into contact with metalwork. (Note: Code C3 would apply if the unsheathed cores are not accessible to touch nor likely to come into contact with metalwork)



Cable sheath not taken inside metallic enclosure

- Unenclosed electrical connections, such as at luminaires. (Such a defect can contribute to a fire, particularly where extra-low voltage filament lamps are used)
- Fire risk from incorrectly installed electrical equipment, including incorrectly selected or installed downlighters

- Fire risk from lamps exceeding the maximum rated wattage for the luminaires, or placed too close to combustible materials
- Evidence of excessive heat (such as charring) from electrical equipment causing damage to the installation or its surroundings
- Unsatisfactory functional operation of equipment where this might result in danger
- Immersion heater does not comply with BS EN 60335-2-73 (that is, it does not have a built-in cut-out that will operate if the stored water temperature reaches 98 °C if the thermostat fails), and the cold water storage tank is plastic



Older immersion heater without thermal cut-out

- Electrical equipment having an inadequate degree of ingress protection (IP rating) for the external influences likely to occur in the location, if this results in potential danger
- Absence of warning notices indicating the presence of an alternative or secondary source of electricity, such as a standby generator or microgenerator



Photovoltaic installation (Photo courtesy Energy Saving Trust)

- Fixed equipment does not have a means of switching off for mechanical maintenance, where such maintenance involves a risk of burns, or injury from mechanical movement.

Code C3 (Improvement recommended)

Observations that would usually warrant a Code C3 classification include:

- Absence of RCD protection for a socket-outlet that is unlikely to supply portable or mobile equipment for use outdoors, does not serve a location containing a bath or shower, and the use of which is otherwise not considered by the inspector to result in potential danger. (Note: Code C2 would apply if the circuit supplied a socket-outlet in a location containing a bath or shower in accordance with Regulation 701.512.3)



RCD in a consumer unit

- Absence of RCD protection for cables installed at a depth of less than 50 mm from a surface of a wall or partition where the cables do not incorporate an earthed metallic covering, are not enclosed in earthed metalwork, or are not mechanically protected against penetration by nails and the like
- Absence of RCD protection for circuits of a location containing a bath or shower where satisfactory supplementary bonding is present

Examples of the use of Classification Codes

- Reliance on a voltage-operated earth-leakage circuit-breaker for fault protection (protection against indirect contact), subject to the device being proved to operate correctly. (If the circuit-breaker relies on a water pipe not permitted by Regulation 542.2.6 as the means of earthing, this would attract a Code C2 classification.)
- Sheath of an insulated and sheathed non-armoured cable not taken inside the enclosure of an accessory, such as at a socket-outlet or lighting switch. (Note: Code C2 would apply if unsheathed cores are accessible to touch and/or likely to come into contact with metalwork)



60 A voltage-operated earth-leakage circuit-breaker.
(Photo courtesy of RF Lighting)

- Absence of a quarterly test notice for any RCD or voltage-operated earth-leakage circuit-breaker
- Absence of circuit protective conductors in circuits having only Class II (or all-insulated) luminaires and switches⁴
- Absence of 'Safety Electrical Connection — Do Not Remove' notice



Unmarked bonding conductor

⁴ See the Electrical Safety Council Best Practice Guide No1 - replacing a consumer unit in domestic premises where lighting circuits have no protective conductor.



Cable sheaths not taken inside non-conducting enclosure

- Bare protective conductor of an insulated and sheathed cable not sleeved with insulation, colour coded to indicate its function
- Electrical equipment having an inadequate degree of ingress protection (IP rating) for the external influences likely to occur in the location, if this does not result in potential danger
- Socket-outlet mounted in such a position as to result in potential damage to socket, plug and/or flex
- Absence of a notice indicating that the installation has wiring colours to two versions of BS 7671 (if appropriate)
- Absence of circuit identification details

Further investigation required

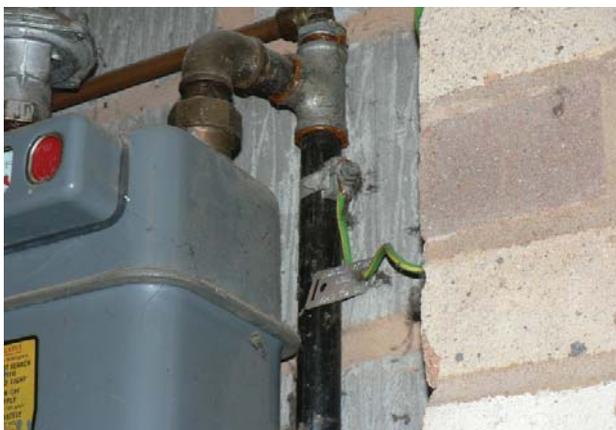
Observations that would usually require further investigation include:

- Characteristics of electricity supply (such as voltage or external earth fault loop impedance) do not conform to supply industry norms.

Departures from the requirements of the current edition of BS 7671 that do not give rise to danger or need improvement

Amendment 1 to BS 7671: 2008 no longer requires departures from the requirements of the current edition of BS 7671 that do not give rise to danger or require improvement to be included in condition reports. Such departures include:

- Absence of a reliable earth connection to a recessed metallic back box of an insulated accessory, such as where there is no 'earthing tail' connecting the earthing terminal of the accessory to the box, and the box does not have a fixed lug that comes into contact with an earthed eyelet on the accessory
- Inadequate cross-sectional area of a main protective bonding conductor provided that the conductor is at least 6 mm² and that there is no evidence of thermal damage
- Absence of supplementary bonding for installed Class II equipment where required (such as in a location containing a bath or shower), in case the equipment is replaced with Class I equipment in the future



Main bonding connection not made before branch pipework

- Main protective bonding to gas, water or other service pipe is inaccessible for inspection, testing and maintenance, or connection not made before any branch pipework. (Note: The connection should preferably be within 600 mm of the meter outlet union or at the point of entry to the building if the meter is external.)
- Protective conductor of a lighting circuit not (or incorrectly) terminated at the final circuit connection point to a Class II (or insulated) item of equipment, such as at a switch mounting box or luminaire
- Switch lines not identified as line conductors at terminations (for example, a conductor having blue insulation is not sleeved brown in switches or lighting points)
- Circuit protective conductors or final circuit conductors in a consumer unit not arranged or marked so that they can be identified for inspection, testing or alteration of the installation
- Installation not divided into an adequate number of circuits to minimise inconvenience for safe operation, fault clearance, inspection and testing
- Inadequate number of socket-outlets. (Code C3 or, where appropriate C2, if extension leads run through doorways, walls or windows, or under carpets, or are otherwise being used in an unsafe manner)
- Use of unsheathed flex for lighting pendants
- Cable core colours complying with a previous edition of BS 7671.

Items that are NOT departures from the current edition of BS 7671

The following items are commonly included in electrical installation condition reports as requiring remedial action, **but are not departures** from the current edition of BS 7671, and should therefore not be recorded:

- Absence of earthing and/or bonding to metallic sinks and baths (unless they are extraneous-conductive-parts in their own right)
- The use of rewirable fuses (where they provide adequate circuit protection)



Consumer units having rewirable fuses can continue to provide satisfactory service

- The use of circuit-breakers to BS 3871
- Absence of barriers inside a consumer unit (provided the cover is removable only with the use of a key or tool)
- Absence of bonding connections to boiler pipework (where the pipework is not an extraneous-conductive-part in its own right)
- Shaver supply units installed in zone 2 of a location containing a bath or shower and located where direct spray from a shower is unlikely
- Absence of switches on socket-outlets and fused connection units
- Any other observation not directly related to electrical safety and hence to the suitability of the installation for continued service.



Consumer unit with circuit-breakers and fuses

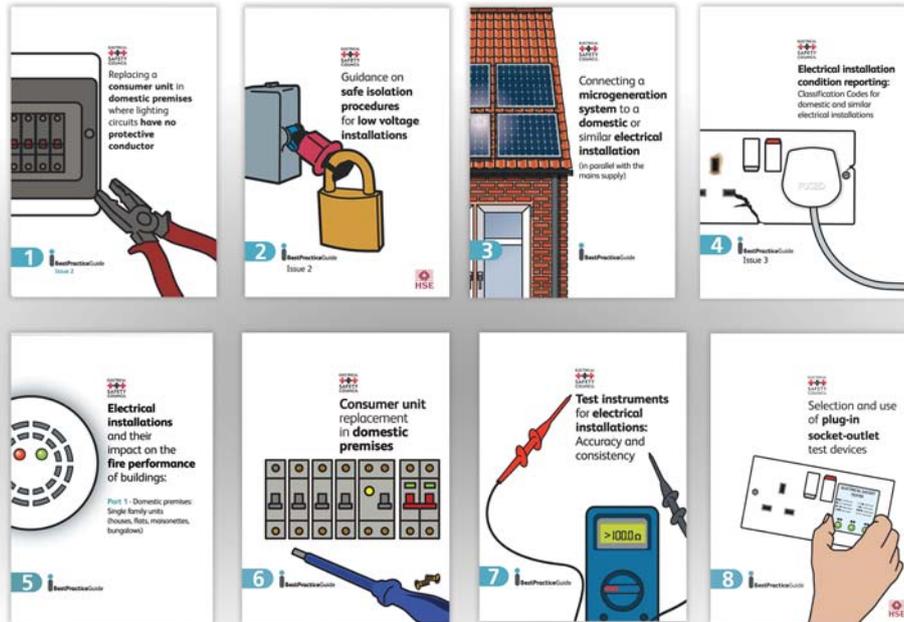
Other issues

The following items are worthy of an appropriate note in the electrical installation condition report, but should not be given a Classification Code:

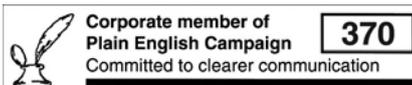
- The absence of a fire detection and alarm system (smoke/heat/carbon monoxide detectors etc)
- The absence of an emergency lighting system in a location normally requiring such a system (for example in a communal area of a block of flats)
- Combustible materials stored in close proximity to the electrical intake equipment (consumer unit/meter/service head)



Label warning against storing combustible materials near to electrical equipment



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The Electrical Safety Council is a UK charity committed to reducing deaths and injuries caused by electrical accidents at home and at work.

