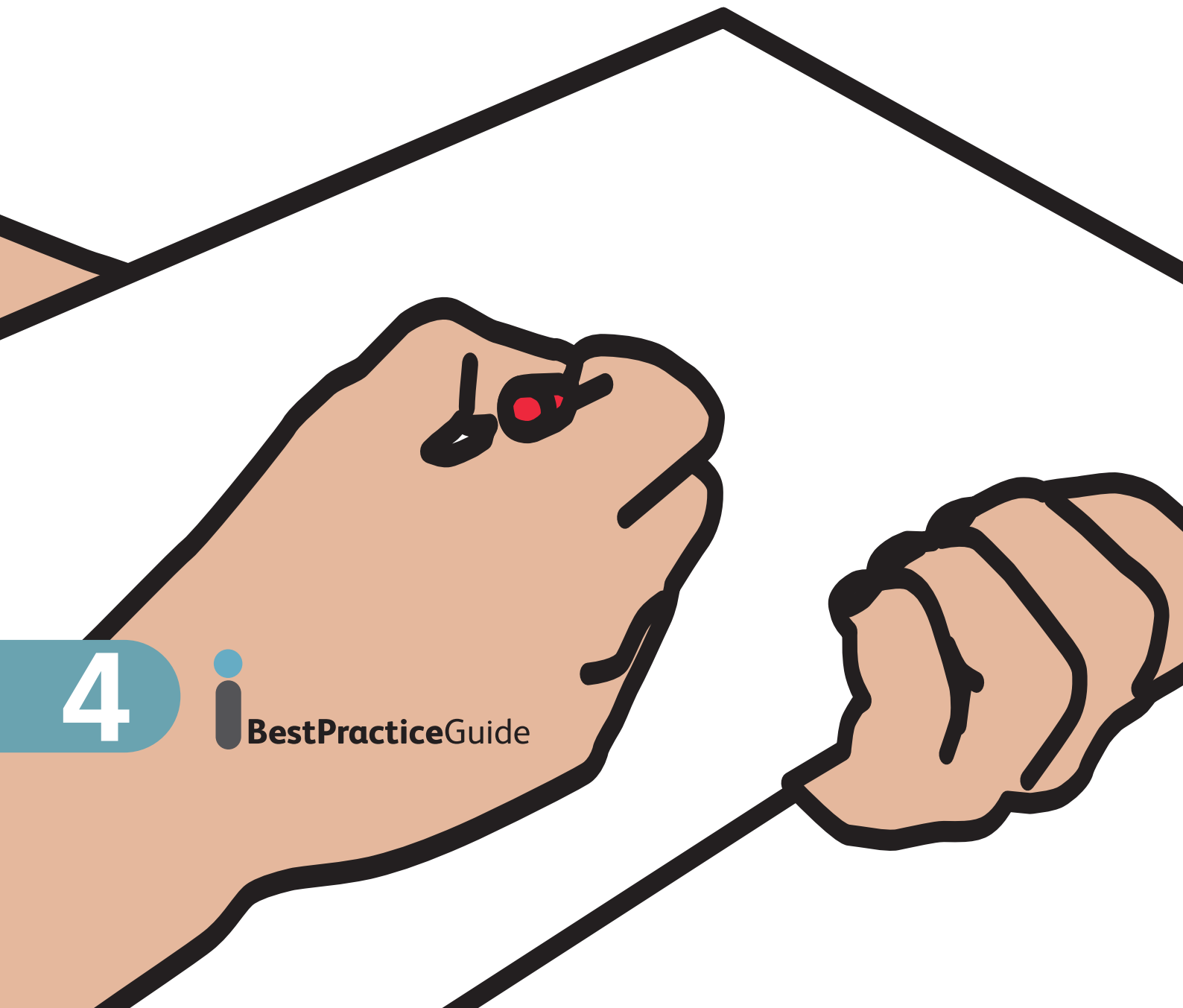


Periodic inspection reporting -

recommendation codes
for domestic and similar
electrical installations



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 BestPracticeGuide

BestPracticeGuide

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Published by:

The Electrical Safety Council
18 Buckingham Gate
London
SW1E 6LB

Tel: 0870 040 0561 **Fax:** 0870 040 0560

Email: enquiries@esc.org.uk

Website: www.esc.org.uk

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Periodic inspection reporting - recommendation 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 Recommendation Codes that need to be attributed to each observation recorded during the periodic inspection 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 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 (Regulation 135.1) that every electrical installation is subjected to periodic inspection and testing.

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. Appropriate recommendations should be made for any damage, deterioration, and defects observed that may give

rise to danger to be remedied, such that the installation may continue to be used in safety.

A periodic inspection report is, as its title indicates, a report and not a certificate. It relates to an assessment of the in-service condition of an electrical installation against the requirements of the issue 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. 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 issue 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, unless they are under the direct supervision of such a competent person.



(photo courtesy goodphotoart.com)

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 issue 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.

Experience indicates that persons undertaking periodic inspection reporting need to have above-average 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 as another Best Practice Guide published by the Electrical Safety Council, which can be downloaded free of charge from the websites of the Council and other contributing bodies.

Periodic inspection and testing procedures

The procedures for periodic inspection and testing differ in some respects from those for the initial verification of new installation work. This is because the subject of a periodic inspection report is usually an installation which has been energized and in use for some time. Particular attention therefore needs to be given during the inspection process to assessing the condition of the installation in respect of:

- Safety
- Wear and tear
- Corrosion
- Damage and deterioration
- Excessive loading
- Age
- External influences
- Suitability (taking account of any changes in use or building extensions etc).



Potentially overloaded socket-outlet

Also, for reasons beyond the inspector's control, the inspector may be unable to gain access to parts of the existing installation. For example, it is usually impracticable to inspect cables that have been concealed within the fabric of the building.

Such restrictions are likely to result in the inspection and testing of those parts of the installation being limited, or being omitted entirely from the process.

Some degree of sampling may be involved in the inspection and testing process. Such sampling requires careful consideration to be given to the selection of the parts of the installation to be inspected and tested.



Inspecting a socket-outlet

In the event of deficiencies being discovered in the initial sample, the size of the sample should be increased as described in IEE Guidance Note 3 (Inspection and Testing), published by the Institution of Engineering and Technology. The sampling technique used, and the parts of the installation sampled, should be carefully recorded in the periodic inspection report.

Where, during the course of inspection or testing, a real and immediate danger is found to be present in an installation (from an exposed live part, for example), immediate action will be necessary to make it safe before continuing.

Contractors should note that, even in domestic premises, Section 3 of the Health and Safety at Work etc Act 1974 and the Electricity at Work Regulations 1989 effectively require them to endeavour to make safe, before leaving site and with the agreement of the user or owner, any dangerous conditions found in an installation. For example, where blanks are missing from a consumer unit, suitable temporary barriers should be installed to protect persons from direct contact with live parts.

It is not sufficient simply to draw attention to the danger when submitting the periodic inspection report. At the very least, the inspector must ensure that the client is made aware at the time of discovery of the danger that exists. An agreement should be made with the client as to the appropriate action to be taken to remove the source of danger (for example, by switching off and isolating the affected part of the installation until remedied), before continuing with the inspection or testing.

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 and recommendations

Any relevant observations and associated recommendations relating to the installation should, after due consideration, be provided in the 'observations and recommendations' section of the report.

The observations and recommendations should take due account of the results of the inspection and testing. They should be based on the requirements of the issue of BS 7671 current at the time of the inspection, not on the requirements of an earlier standard current at the time the installation was constructed.



Recessed luminaire above a bath (outside the zones)

The observation(s) should be provided in an accurate, succinct and easily-understandable manner, and given a Recommendation Code 1, 2, 3 or 4 as appropriate.

Where a real and immediate danger is observed that puts the safety of those using the installation at risk, Recommendation Code 1 (requires urgent attention) must be given.

Where a Recommendation Code 1 is given, the client is to be advised immediately, in writing, that urgent work is necessary to remedy the deficiency. As previously indicated, this action is necessary to satisfy the duties imposed on the inspector and others by the Health and Safety at Work etc Act 1974 and the Electricity at Work Regulations 1989.

Observations

The inspection and testing procedures should identify any damage, deterioration, defects and dangerous conditions within the installation. Such items should be identified in the inspection and testing schedules of the report as unsatisfactory, and be given an 'X' (meaning 'unsatisfactory') in the appropriate box. Wherever an item is so identified, there should be a corresponding observation in the appropriate part of the periodic inspection report.

A periodic inspection 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 or omission in the electrical installation.

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 current issue of BS 7671 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.



Consumer unit with fuses and circuit-breakers

Observations based solely on personal preference or 'custom and practice' should not be included.

Each observation should be written in a manner that will be understood by the client. Comments should be clear and unambiguous, but the use of technical terms should be avoided unless it is known that the recipient is an electrical engineer or electrician, for example.

Recommendations

Each observation must be given an appropriate Recommendation Code, selected from the standard codes numbered 1, 2, 3 and 4. Each code has a particular meaning:

- Code 1** Requires urgent attention.
- Code 2** Requires improvement
- Code 3** Requires further investigation
- Code 4** Does not comply with the current issue of BS 7671.

Only one of the standard recommendation codes should be attributed to each observation.

If more than one recommendation code could be applied to an observation, only the most serious one should be used (Code 1 being the most serious).

In general terms, the recommendation codes should be used as follows:

Code 1 (Requires urgent attention)

This code is to be used to indicate that danger exists, requiring urgent remedial action.

The persons using the installation are at 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 2 (Requires improvement)

This code is to be used to indicate that the observed deficiency requires action to remove potential danger.

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 soon as possible to improve the safety of the installation.

Code 3 (Requires further investigation)

It would be unusual to need to attribute a Recommendation Code 3 to an observation made during the periodic inspection of a domestic or similar installation.

However, the code could be used to indicate that the inspector was unable to come to a conclusion about an aspect of the installation or, alternatively, that the observation was outside the agreed purpose, extent or limitations of the inspection, but has come to the inspector's attention during the inspection and testing.

The person ordering the report should be advised that the inspection has revealed an apparent deficiency which could not, due to the agreed extent or limitations of the inspection, be fully identified, and that the deficiency should be investigated as soon as possible.

A Recommendation Code 3 would usually be associated with an observation on an aspect of the installation that was not foreseen when the purpose and extent of the inspection, and any limitations upon it, were agreed with the client.

As previously indicated, the purpose of periodic inspection is not to carry out a fault-finding exercise, but to assess and report on the condition of the installation within the agreed extent and limitations of the inspection.

Code 4 (Does not comply with the current issue of BS 7671)

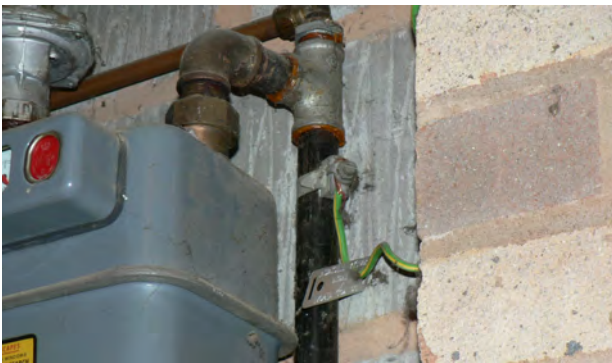
This code is to be used to indicate that certain items have been identified as not complying with the requirements of the current issue of BS 7671, but that the users of the installation are not in any danger as a result.

The person ordering the report should be advised that the code is not intended to imply that the installation is unsafe, but that careful consideration should be given to the benefits of improving those aspects of the installation.

Summary of the inspection

The summary should adequately describe the overall condition of the installation, 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



A main bonding connection (not made before branch pipework)

- 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 the installation. It will often be necessary or appropriate to explain the implications of a periodic inspection 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.

On the model periodic inspection 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 assessment should be given as either 'satisfactory' or 'unsatisfactory'.

It would not be reasonable to indicate a 'satisfactory' assessment if any observation in the report had been given a Code 1 or Code 2 recommendation. The recommended interval until the next inspection should be made conditional upon all the Code 1 and Code 2 departures being rectified without undue delay.

As previously indicated, it would be unusual to have to attribute a Code 3 (requires further investigation) to an observation made during the periodic inspection of a domestic or similar installation. Where a Code 3 is justified, and if there are no Code 1 or Code 2 recommendations, the competent person needs to exercise judgement as to whether the overall assessment of the condition of the installation should be indicated as 'satisfactory' or 'unsatisfactory'.

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 Recommendation Codes

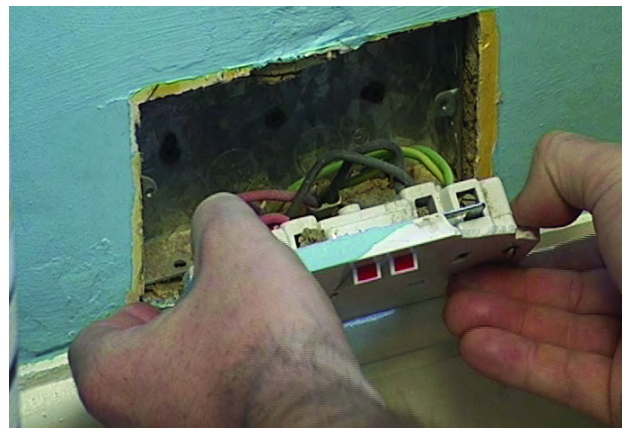
It is entirely a matter for the competent person conducting the inspection to decide on the Recommendation Code to be attributed to an observation. The person's own judgement as a competent person should not be unduly influenced by the client. The person(s) signing the report are fully responsible for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

The following examples are not exhaustive. All references to RCD protection mean 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 1 (Requires urgent attention)

Observations that would usually warrant a Code 1 recommendation include:

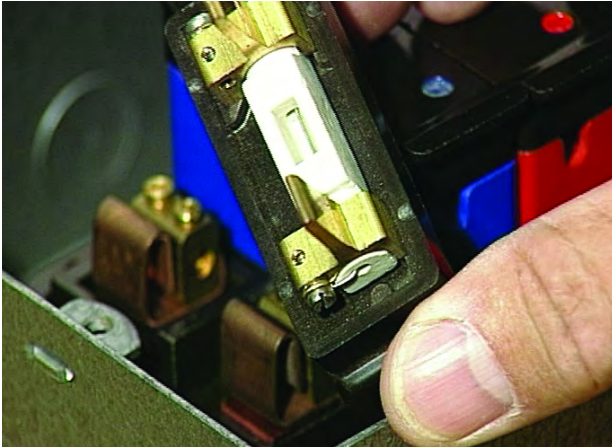
- Exposed live parts that are accessible to touch, such as where:
 - a fuse carrier or circuit-breaker is omitted from a consumer unit and a blanking piece is not fitted in its place
 - terminations or connections have no (or damaged) barriers or enclosures, such as those belonging to a consumer unit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



Socket-outlet with broken face plate

- Conductive parts that have become live as the result of a fault
- Absence of an effective means of earthing for the installation
- 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
- Evidence of excessive heat (such as charring) from electrical equipment causing damage to the installation or its surroundings

- Incorrect polarity, or protective device in neutral conductor only
- Circuits with ineffective overcurrent protection (due, for example, to oversized fuse wire in rewirable fuses)



Checking a fuse carrier

- Absence of RCD protection for socket-outlets in bathrooms or shower rooms, other than SELV or shaver socket-outlets
- Socket-outlets other than SELV or shaver socket-outlets located within 0.6 m horizontally from the boundary of zone 1 in a location containing a bath or shower
- Absence of earthing at a socket-outlet.

Code 2 (Requires improvement)

Observations that would usually warrant a Code 2 recommendation include:

- A 30/32 A ring final circuit discontinuous or cross-connected with another circuit
- 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
- Absence of a circuit protective conductor for a lighting circuit supplying one or more items of Class I equipment*

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

- Absence of main equipotential bonding (except to a lightning protection system conductor, where a Recommendation Code 3 may be appropriate)
- 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
- 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)
- Absence of a warning notice indicating the presence of a second source of electricity, such as a microgenerator



Photovoltaic installation (photo courtesy Energy Saving Trust)

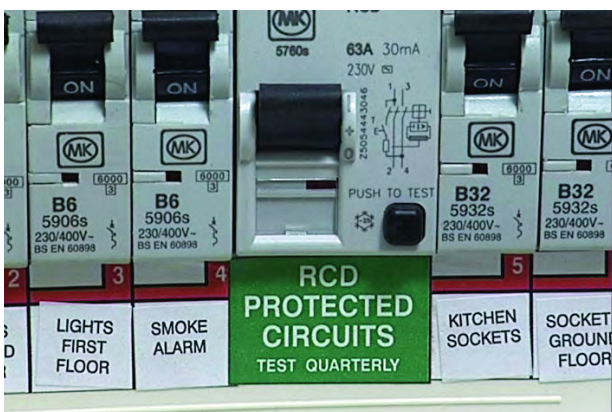
- Fire risk from incorrectly installed electrical equipment, including incorrectly installed downlighters
- Undersized main bonding conductors, where the conductor is less than 6 mm² or where there is evidence of thermal damage
- Unenclosed connections at luminaires (Such a defect can contribute to a fire, particularly where extra-low voltage filament lamps are used)

- 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

- Unsatisfactory functional operation of equipment where this may result in danger
- Socket-outlets other than SELV or shaver socket-outlets located between 0.6 m and 3 m horizontally from the boundary of zone 1 in a location containing a bath or shower
- Absence of RCD protection for portable or mobile equipment that may reasonably be expected to be used outdoors



RCD in typical split load consumer unit

- 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/IEE Wiring Regulations current at the time of installation

- Insulation of live conductors deteriorated to such an extent that the insulating material readily breaks away from the conductors
- Neither local supplementary bonding (where necessary) nor RCD protection is present in a bathroom or shower room. Note: where the presence of supplementary bonding cannot be confirmed by inspection, it may be verified by a continuity test
- Any one circuit has an insulation resistance of less than 20 kilohms.

Code 3 (Requires further investigation)

Observations that would usually warrant a Code 3 recommendation include:

- Unable to trace final circuits
- Unable to access equipment or connections needing to be inspected that are known to exist but have been boxed in such as by panels or boards that cannot be easily removed without causing damage to decorations
- Insulation resistance of less than 1 Megohm between live conductors connected together and Earth, when measured at the consumer unit with all final circuits connected. If any one circuit has an insulation resistance of less than 20 kilohms, a Code 2 recommendation should be given
- Absence of a main equipotential bonding connection to a lightning protection system conductor, where it is not known by the inspector if it is required to protect against lightning side flashes**. (Absence of other main equipotential bonding connections would usually warrant a recommendation Code 2.)

**Lightning protection bonding may be required by the lightning protection system designer/installer, to protect against lightning side flashes between the lightning protection system and the electrical installation. Such bonding should only be carried out by (or under the instruction of) a specialist lightning protection system designer/installer.

Code 4 (Does not comply with BS 7671 as amended)

Observations that would usually warrant a Code 4 recommendation include:

- 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.
- Undersized main bonding conductors (subject to a minimum size of 6 mm²), if there is no evidence of thermal damage
- Absence of circuit protective conductors in circuits having only Class II (or all insulated) luminaires and switches*
- 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
- Absence of 'Safety Electrical Connection – Do Not Remove' notice



Unmarked bonding conductor

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

- Absence of a notice indicating that the installation has wiring colours to two versions of BS 7671
- Absence of RCD periodic test notice
- Absence of circuit identification details
- 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



Cable sheath not taken inside enclosure

- Bare protective conductor of an insulated and sheathed cable not sleeved with insulation, colour coded to indicate its function
- Installation not divided into an adequate number of circuits to minimize inconvenience for safe operation, fault clearance, inspection, testing and maintenance
- 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
- Absence of supplementary bonding to installed Class II equipment where required (such as in a bathroom or shower room), in case the equipment is replaced with Class I equipment in the future)

- Reliance on a voltage-operated earth-leakage circuit-breaker for fault protection (protection against indirect contact)
- 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 cables concealed, at whatever depth, in a wall or partition the internal construction of which includes metallic parts (other than metallic fixings such as nails, screws and the like) where the cables do not incorporate an earthed metallic covering, are not enclosed in earthed metalwork, or are not mechanically protected to avoid damage to them during construction of the wall or during their installation
- Absence of RCD protection for socket-outlet circuits that are unlikely to supply portable or mobile equipment for use outdoors, or that are in a bathroom or shower room
- Absence of supplementary bonding where required, such as in a bathroom or shower room, where all the following three conditions are not satisfied:
 - All final circuits of the location comply with the requirements 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)

Other issues

The following items are worthy of an appropriate note on the periodic inspection report, but should not be given a Recommendation Code:

- The absence of a fire detection and alarm system
- Where appropriate, the absence of an emergency lighting system (for example in a communal area)

The following items are commonly included in periodic inspection reports as requiring remedial action, but are not departures from the current issue BS 7671, and should therefore not be recorded:

- Absence of earthing and/or bonding of 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 bonding connections to boiler pipework (where the pipework is not an extraneous-conductive-part in its own right)
- Any other observation not directly related to electrical safety and hence to the suitability of the installation for continued service.