

A GUIDE ON HOW TO
INSPECT AND TEST
PORTABLE APPLIANCES
SAFELY AND EFFECTIVELY

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Why Inspect and Test Equipment?

For a long time there has been a need to maintain portable equipment to ensure that it is safe for the purpose intended.

From April 1st 1990 the Electricity at Work Regulations 1989, in particular Regulation 4(2), introduced statutory requirements to the effect that "all systems shall be maintained so as to prevent, so far as is reasonably practicable, danger". The emphasis placed on the requirement for regular maintenance both in Regulation 4(2) and as further explained in the associated Memorandum of Guidance, has heightened the awareness of local authorities, shop owners, office managers etc, of the need for inspection and testing. They are, therefore, now approaching electrical contractors with a view to having much of the portable equipment in their care inspected and tested on a regular basis.

What Should We Maintain?

To help identify items of equipment the term 'portable appliance' can be considered to be an appliance that is intended to be moved while in operation or an appliance which can easily be moved from one place to another while connected to the supply, e.g. vacuum cleaner, drill, hair dryer.

Procedures for Inspection

When an inspection is carried out, the equipment being inspected should be checked for signs of damage to the equipment itself, its connecting lead and plug including whether the cable sheath is correctly gripped at the equipment and at the plug. If the check reveals signs of damage, poor electrical standards, inadequate or temporary repairs to the equipment, lead or plug, it should be withdrawn from use and labelled to indicate that it must not be used. This also applies to extension leads and associated plugs and sockets. Any equipment so labelled should be recorded on a log sheet.

Procedures for Testing

The use of correct test equipment is of the utmost importance, as the safety of the equipment can only be ensured if the appropriate range of tests has been carried out.

Test instruments that undertake a series of tests on portable equipment are commercially available, and where a large number of tests are to be carried out, the use of such instruments would seem the most sensible option considering the saving in time that could be made. Nevertheless, the use of such semi-automated testers does not lessen the responsibility of the contractor to provide a 'competent person' to carry out the testing.

It must be realised that these tests should not be considered as the definitive version, as some items of equipment may require certain additional tests which must be assessed, by a competent person, at the time of testing.

It is important to note that standard test instruments can be used in place of a portable appliance tester and, provided the user has the required level of competence, this would seem the most economical solution where only a small number of tests are required.

Problems When Testing

a) Dielectric or Flash Testing

Much equipment available today contains electronic components susceptible to damage when subjected to high voltages. Dielectric or flash testing should, therefore, only be carried out when the equipment has been extensively repaired and then only after the manufacturer has been consulted.

b) Earth Bond Test

Equipment is often unnecessarily deemed to have failed this test. Failure usually occurs when the equipment lead is in excess of 1.8m, and has therefore a resistance greater than the maximum permissible value of 0.1 ohms. When this does occur the calculated resistance of the flex should be deducted from the measured value, then if the difference is less than 0.1 ohms the earth bond is satisfactory. However, for equipment that is fused at 3A or less an earth bond resistance of up to 0.5 ohms is considered satisfactory.

c) Insulation Resistance Test

Items of equipment that, from a visual check, appear to be acceptable but subsequently fail this test require further investigation.

Equipment containing electronic components should receive careful consideration, and perhaps advice from the manufacturer before applying 500V d.c. insulation tests.

All electrical equipment deteriorates with age, so the use of a portable appliance tester which has a pre-set value of insulation resistance acceptable for testing a new appliance may be unduly onerous for an older item of equipment. A typical example of this is the 'table top' type of cooker which can have a value of insulation resistance lower than the pre-set level and may therefore be deemed to have 'failed' the test. Where this situation occurs it is important that the manufacturer of the equipment be consulted before the equipment is passed or failed.

Frequency of Initial Inspection and Testing

The intervals between both inspection and testing can be determined initially by assessing the risk (the likelihood of danger arising), and will vary with the type of equipment, usage, and the nature of the environment in which it is used. Also, the age of the equipment and previous test results need to be considered. The frequency of inspection can be determined by experience and will generally be more frequent than testing.

More onerous conditions will demand more frequent inspection and testing while less onerous conditions (and good inspection and test results) can lead to a reduced frequency.

The table at the top left of the following page follows the recommendations given in the IEE's Code of Practice for In-Service Inspection of Electrical Equipment and can be used until sufficient experience is built up to establish what is appropriate to the circumstances.

Testing IT Equipment

Many items of equipment, typically found in the modern office environment, contain electronic components which may be damaged if connected to a portable appliance tester when carrying out the sequence of tests described in Appendix 1, so great care must be exercised when dealing with this equipment.

Separate guidance on this subject has been prepared by the Federation of Electronic Industries (FEI) entitled

TYPE OF BUSINESS	EXTERNAL VISUAL INSPECTION	FULL INSPECTION & ELECTRICAL TESTING
Equipment Hire	Before issue and after return	Before issue))
Construction	Before initial use - 1 month	3 months) Unless earlier) inspection) indicates
Industrial	Before Initial use-1-3 months	6-12 months) immediate) testing is
Commercial/office	6 months - 2 years	6 months-4 years) necessary)
Premises used by the public e.g Hotels	6 months - 2 years	12 months - 4 years)
Schools	4 months - 1 year	12 months - 4 years)

"Recommendations for periodic safety checks for business equipment".

However, as general guidance when testing equipment thought to contain electronic components, the following should be observed:

- a) Prior to testing ensure the equipment is totally disconnected from the mains and other power sources, and from all other equipment, interfaces and telecom lines. Be particularly careful where equipment is powered from an uninterruptible power supply or has internal battery back-up.
- b) Only polarity, earth continuity and insulation resistance tests are considered appropriate to ensure compliance with Regulation 4(2) of the Electricity at Work Regulations 1989. These should be carried out in the following order:
 - i) Polarity
 - ii) Earth Continuity
 - iii) Insulation Resistance or Earth Leakage
- c) Always remember that most IT equipment is sensitive to changes in voltage levels applied to it, and that such equipment contains circuitry to minimise the effects of these fluctuations. This circuitry may lead to erroneous readings when the equipment is tested, indicating that the equipment has failed due to too low a reading e.g. insulation resistance. The tester should be aware of this possibility and may have to substitute the earth leakage test for an insulation resistance test if this situation arises.

The Need to Maintain Records

After completion of the tests as prescribed in Appendix 1, it is recommended that each item of equipment tested be individually marked to indicate whether it passed or failed the tests, the date of the test, and the date a re-test is due.

It is also recommended that the details of the tests and results also be recorded onto a log sheet, suitable for recording the information obtained from the test and inspection carried out on that item of equipment. A check should be made to ensure that the details entered on the test label, fixed to the equipment, tally with those entered on the log sheet.

It is of paramount importance that a record of maintenance, including test results, is maintained throughout the life of each item of equipment. The provision of these records will demonstrate that testing has been carried out to an adequate standard, and any difference between subsequent tests can be noted. Should these tests show a deterioration in any part of the equipment, remedial action is necessary to ensure that danger does not arise.

It is worth noting that some of the more advanced Portable Appliance Testers can store the information in their own memory. This information can be transferred into the company's database for record keeping purposes and analysis.

The type of label to be affixed is as shown, and these can be obtained from either test equipment manufacturers or wholesale outlets.

Serial/Reference No. Date tested Pass/Fail Retest Due Tested By

Finally, if the equipment tested fails any of the inspection or tests it must be immediately withdrawn from service until the fault has been rectified. Further investigation of the reason for failure will normally be required. After repair of the fault the equipment should be tested before it is returned to service.

N.B. Appendix 2 shows an example of the type of record to keep.

Other Guidance

Advice on inspection and testing of portable electrical equipment in particular situations is given in a number of other publications:

1) HSE (Available from HSE Books - Tel. NO. 01787881165

HS(R)25 Memorandum of Guidance on the Electricity at Work Regulations 1989

GS50 Electrical Safety at Places of Entertainment

IND(G)102L Electrical Safety for Entertainers

IND(G)160L Maintaining Portable Electrical Equipment in Offices and Other Low Risk Environments

IND(G)164L Maintaining Portable Electrical Equipment in Hotels and Tourist Accommodation

HS(G)107 The Maintenance of Portable and Transportable Electrical Equipment

2) Federation of Electronic Industries (FED "Recommendations for periodic safety checks for business equipment".

FEIRussellSquare House, 10-12 Russell Square, London WC1B 5EE

3) The Institution of Electrical Engineers (IEE) "Code of Practice for In-Service Inspection of Electrical Equipment.

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Appendix 1

Item	Test	Pass Condition
1) mains lead	(a) visual inspection (b) mains plug	two layers of insulation; BS colours; no damage; correctly connected; cable clamp gripped to sheath; correct fuse fitted
2a) detachable mains lead	(a) visual inspection of equipment male connector (b) attempt to open socket without tool (c) attempt to pull socket cable from female connector (d) polarity of 3-pin units	BS type or equivalent unopenable no movement as per BS 4491
2b) grommet/clamp around mains lead	(a) inspection of grommet (b) sharp pull on cable (c) rotation of cable	cable insulation protected no appreciable movement no rotation
3) mains on/off switch either 4 or 5, and 6	(a) visual inspection	correct operation; no damage
4) conducting case	(a) visual inspection (b) resistance of earth connections between plug and equipment. (c) high voltage insulation 500V dc minimum test	case undamaged earth resistance 0.1 ohms and resistance of supply cable. Earth resistance 0.5 ohms for luminaires including resistance of the supply cable Insulation resistance of 0.5 Mohms for a Class I appliance and 1.0 Mohms for a class II appliance
5) insulating case	visual inspection	maker's double insulation mark visible; case undamaged
6) accessible fuse holders	visual inspection	no damage removal of carrier does not permit live* part to be touched

* i.e. Live at more than 50V in use

N.B. For full details of tests to be carried out reference should be made to the IEE'S Code of Practice

PORTABLE APPLIANCE TEST SHEET

Equipment Formal Visual and Combined Inspection and Test Record

Equipment Inspection and Test Record					1. Register No.							
2. Description of Equipment		3. Construction Class		4. Equipment Type		5. Location and suitability for the Environment			6. Frequency of <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> Formal Visual Inspection m </td> <td style="width: 50%; border: none; vertical-align: top;"> Combined Inspection and test m </td> </tr> </table>		Formal Visual Inspectionm	Combined Inspection and testm
Formal Visual Inspectionm	Combined Inspection and testm											
7. Make * Model Serial No.		8. * VoltageV RatingA Fuse RatingA		9. * Date of Purchase		10. * Guarantee						
<div style="display: flex; justify-content: space-between;"> Inspection Test </div>												
11. Test Date	12. Disconnect	13. Plug	14. Flex	15. Body	16. Continuity	17. Insulation	18. Operational Check	19. Comments/Other tests	20. OK to Use	21. Signature		
Name of Tester (PRINT)					Ω	$M\Omega$						
/ / 19												
/ / 19												
/ / 19												
/ / 19												
/ / 19												

Note (i) Indicates pass (x) Indicates fail (N/A) Not applicable (N/C) Not checked

* To be completed by client



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