

Guidance Note OUES/BS/E/GN004 Rev00 **In-service inspection and testing of Electrical Equipment**



Written by: R Gregg – Principal Electrical Engineer.
Approved: S.Pearson – Head of Building Services
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Both the Health and Safety at Work Act 1974 and the Electricity at Work Regulations 1989 impose requirements concerning the use of electrical equipment in the workplace. One of these requirements is that electrical equipment be maintained in a safe condition. The following document sets out the University's general policy on this and describes the procedures that individual departments must follow.

Policy

It is a fundamental policy (Safety office policy S4/10) requirement of the University that all electrical installations or items of equipment that may create an electrical danger to any person be subjected to regular scrutiny by means appropriate to the nature and use of the equipment to ensure that they remain in a safe condition. This requirement applies to all electrical systems including building fixed wiring installations as well as to stationary, moveable and portable electrical equipment. As a general principle, responsibility for testing of the fixed wiring installation rests with the Estates Services. Departments are required to implement appropriate procedures for periodic inspection and maintenance of equipment for which they are responsible.

Responsibility for equipment

All electrical equipment that is connected to the building wiring installation either by permanent connection or by plug and socket, is regarded as the responsibility of the Department under whose control the equipment is operated.

If there is any lack of clarity over responsibility for equipment, for example, between different departments and Estates then all parties involved should attempt to reach agreement on responsibility for the equipment. If, despite reasonable effort, such agreement cannot be reached the issue should be referred up the management chain.

Departments Role

Departments are responsible for the equipment under their control, are required to establish a suitable inspection and test regime. Broadly speaking the steps involved in this are as follows:

1. Appoint a member(s) of staff to develop, manage and monitor the departments arrangements for inspection and testing of the electrical equipment for which it is responsible.
2. Ensure that an inventory of electrical equipment operated under the departments control is compiled and maintained in an up-to-date condition.
3. Ensure that procedures for periodic inspection and, where appropriate, test are developed, resourced and implemented.

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4. Ensure that in-house staff charged with carrying out electrical inspection or test are appropriately trained to a level of competence commensurate with the duties they are required to undertake or that an appropriately skilled contractor can be used for the inspection and testing process.
5. Ensure that records of inspection and tests of electrical equipment are kept and that equipment is marked to indicate its most recent inspection or test date.
6. Establish a monitoring system to ensure that the inspection and test regime in place is being carried out effectively. This could, for example, be achieved by periodic or ongoing self-inspection of equipment, or areas, on a sample basis.

Scope of inspection regime

Although systems for periodic inspection and testing of electrical equipment are often commonly referred to as “Portable Appliance Testing” (PAT testing), the scope of the system established must extend beyond purely portable equipment.

ALL electrical equipment that is capable of causing harm to an individual, should its physical condition deteriorate, will require some form of periodic check to make sure that it remains in good condition. This will include: Portable/movable/stationary equipment This encompasses the majority of equipment that most departments will have. Such equipment is normally connected to the mains by means of a plug and socket and may be moved around during use or may operate in stationary position. E.g. kettle, convector heater, fridge, computer. Many units will also have ancillary equipment such as extension leads, plug multi-way adapters, RCD circuit breaker adapters.

Fixed equipment, Some units will have equipment that is fixed, or situated, in a permanent position and connected to the mains by a permanent wired connection. E.g. workshop machines, large centrifuge, fume cupboard, microbiological safety cabinet, electron microscope, X-ray machines, MRI equipment. Such equipment is the responsibility of the Department who operate it unless an alternative agreement on maintenance responsibility is in place.

Equipment that is leased to the University should be included in any inspection regime where we have a maintenance responsibility for it or if appropriate electrical checks are not already carried out by the equipment supplier. Where possible, contracts should ideally be structured to place this obligation on the equipment owner. Items operating at low voltages (e.g. 12v) where there is no electric shock risk can normally be excluded from the inspection and test regimes set out in this document. Although they do not present an electric shock risk in normal circumstances, note that such items can still present a risk of fire, burn or ignition of flammable vapours and therefore may still require some form of periodic check on their condition.

Fixed wiring and equipment that forms part of the building infrastructure will, in all cases be the responsibility of the Director of Estates.

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Types of maintenance check

Various checks can be made to help ensure that electrical equipment remains in a safe condition. Essentially there are three main types of check that can be made and a regime incorporating some, or all, of these is needed to ensure that electrical equipment is kept in a safe condition.:

1. User check

These should be performed by the user before plugging in and switching on an item of equipment and involves a visual inspection which includes that plug, flex and the appliance. The purpose of the check is to look for obvious physical damage. If equipment is particularly prone to damage such checks should be carried out by the user each time it is used. For lower risk equipment, such as desktop computers, only an occasional check would be needed. These are informal checks and normally no record of them is required.

2. Formal Visual Inspection

The key element of a formal maintenance regime is the formal visual inspection. This is done at pre-defined periodic intervals and consists of a visual check, similar to a user check, but with an additional inspection of the interior of the plug, plug wiring and fuse rating. (Many items of equipment now have a moulded-on plug and only the fuse rating can be checked.)

The formal visual inspection must be done by someone who is competent to carry out the task but does not require any formal electrical qualification. A basic ability to look for physical damage, assess the fuse rating and (where accessible) check that the plug is correctly wired are the most important attributes that the tester should possess. The formal visual inspection should be recorded and the equipment labelled to indicate that it has been checked.

3. Combined Inspection and Test:

The combined inspection and test commences with a formal visual inspection, as indicated above, and is followed by some basic electrical tests to verify the safety of the equipment. Commercial test equipment is available that allows these tests to be done quickly and with a minimal amount of electrical knowledge. The test process usually checks the equipment earthing and insulation. Class I (earthed) equipment will usually require both tests. Health and Safety Executive guidance indicates that Class II (double insulated) equipment used in office and low-risk environments does not require testing. Records should be kept of the inspection and tests carried out. Note that some types of equipment containing electronic components may be damaged by the standard portable appliance tests. (E.g. some IT equipment) In such cases “soft” tests can be carried out as an alternative to the normal PAT tests. E.g. low current continuity test of earth bond using a multi-meter, reduced voltage insulation resistance tests.

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Skills required

It is not necessary to have a formal electrical qualification to be able to carry out any of the checks indicated above. The fundamental legal requirement is that anyone involved with such work be competent to undertake the tasks required. This requires only a basic level of knowledge and skills that fall far below that required of a qualified electrician.

For visual inspection the key skill is the ability to identify physical damage to the plug, flex or appliance. Most people are able to do this fairly easily. Additional support may be needed to enable staff to distinguish between earthed or double insulated equipment's, to assess the suitability of plug wiring and to identify correct fuse ratings competently.

There are various guidance documents entitled Step-by-step Guide to Inspection of Electrical Equipment that is designed to provide basic guidance in the skill of visual inspection or user checks. With the aid of this, or other online resources, many staff should be able to carry out formal visual inspections competently.

For combined inspection and test, an ability to operate the test equipment correctly is additionally required. The training needed to achieve this will vary depending on the instrument complexity and the individual's pre-existing knowledge and skills.

Test equipment varies in type from simple pass/fail instruments that can be used with little specialist training to more complex instruments that display results as electrical measurements and which require additional knowledge to use and interpret.

Instrument suppliers may be willing to provide initial training in use of test instruments. Manufacturer's instruction must be made available to all users of test equipment.

Formal courses on in-service inspection and testing of electrical equipment are available from many training providers and will provide a sound knowledge of your health and safety responsibilities.

Frequency of inspection and testing

The frequency with which a particular item of equipment requires inspection or test is not set by law but has to be assessed by the organisation responsible for the equipment. The inspection frequency is determined by a risk assessment process.

Although there are no firm rules for this, risk factors that might be taken into account would include the following:

- Equipment construction (earthed or double insulated)
- Equipment type and age (hand held, portable, moveable or stationary equipment)
- Working environment (wet or dry conditions)
- Degree of liability to damage (transported frequently, rough handling)
- Intensity of use (heavily used or infrequently used)
- Nature of the users. (likelihood of users to cause damage and report faults)

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Equipment that is used in arduous and wet environments where it is likely to have sustained unreported damage, E.g. a construction site, will require more frequent inspection and test than equipment used in a relatively benign office environment where the potential for damage is low.

Due to the variability of risk it isn't possible to give definitive inspection and test frequencies for particular pieces of equipment without assuming a "worst case" inspection regime that is likely to be unduly onerous for most equipment. It is more appropriate for the inspection frequency to be decided on a local basis where the risk factors discussed above can be taken into account.

In compiling the local inventory of electrical equipment an initial inspection/test frequency must be assigned to each item or class of items. This can be varied later as information is gained from the inspection/test process. E.g. If many faults are found, this could be indicative of a need to increase the frequency of inspection; conversely, only a few minor faults found may indicate that a longer interval might be used.

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The table below provides a guide to a suitable initial examination frequency for various types of equipment but it is anticipated that these will be varied locally according to the conditions in which equipment is used. Inspection/ test intervals should not be extended beyond five years. Additional checks should be carried out if equipment is moved and it is foreseeable that it may have sustained damage as a result. (E.g. after and office or lab move.)

Risk Category	Inspection/ Test Regime	Some Examples
High Risk	User check before first use and regularly during working life of the equipment. · Formal Visual Inspection at 6 month intervals. (more frequently if damage risk is high) · 12 monthly PAT test of Class I/ earthed equipment.	Hand-held, earthed equipment or equipment used in wet or arduous conditions. E.g. portable power tools, pressure washers, vacuum cleaners, portable extension leads used in association with such equipment.
Medium Risk	User check before first use and periodically thereafter. · Formal Visual Inspection at 24 month intervals. · 24 monthly PAT test of Class I/ earthed equipment.	The majority of electrical equipment used in workshop, laboratory or office environments, E.g. portable heaters, kettles, fridges.
Low Risk	· User/ IT technician check before first use and after the equipment has been moved. · Formal visual inspection at (max) 5 yearly intervals. · PAT test only with IT-safe instrument or method.	IT and audio/video equipment used in a stationary position within a dry environment with minimal damage risk. E.g. desktop computers, data projectors.