

Edinburgh Napier University

Electrical Portable Appliance Testing Policy (PAT)



Electrical Portable Appliance Testing (PAT) Policy	Date of Issue: May 2015
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Policy Statement

The policy of Edinburgh Napier University is to provide and maintain safe and healthy working conditions, equipment and systems of work for all staff, students and others, and to provide such resources, information, training and supervision as needed for this purpose.

The University will provide resource and maintain appropriate management systems, systems of work and equipment to ensure that electrical risks to all staff, students and others associated with the use of portable electrical appliances are controlled.

The University will adopt the principles of control as set out in the Health & Safety at Work Act 1974, the Management of Health & Safety at Work Regulations 1999, the Electricity at Work Regulations 1989, the Workplace (Health, Safety and Welfare) Regulations 1992 and the Provision and Use of Work Equipment Regulations 1998.

The management of portable electrical appliances will be a continual commitment by the University and will involve regular monitoring and progress meetings, a risk assessment programme, monitoring, inspection and record keeping.

This policy is formally accepted by the University.

The University will do all that is reasonably practicable to comply with its requirements, and will make the necessary resource available.

Signed

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Electrical Portable Appliance Testing (PAT)

Policy

1.0 Executive Summary

The Electricity at Work Regulations 1989 came into force on 1 April 1990. The Regulations are made under the Health & Safety at Work etc. Act 1974 and require precautions to be taken to prevent death or personal injury from the use of electricity in work activities. The Regulations impose responsibilities on the employer and employees to conform to these regulations in every respect.

The inspection and testing of electrical equipment is an inherent part of compliance with the Regulations, therefore, The Institute of Electrical Engineers (IEE) have issued a Code of Practice for In-service Inspection and Testing of Electrical Equipment(4th edition) (IEE Code of Practice).

The Edinburgh Napier University has a legal obligation to carry out, on a regular basis, electrical testing to all electrical equipment and installations. Such testing is a requirement of the Electricity at Work Regulations of 1989.

Since it is Edinburgh Napier University's policy to comply fully with such duties, All Heads of School and Directors of Service must ensure that the requirements of the Regulations are discharged, and that this policy on Electrical Portable Appliance Testing is incorporated into its local safety statements. It is the responsibility of the Heads of Schools and Directors of Service to ensure the testing of all Portable Appliances within their area.

The effectiveness of these arrangements will be monitored periodically by the Health and Safety Department.

2.0 Introduction

2.1 Legislation

Edinburgh Napier University undertakes to comply with the Electricity at Work Regulations (1989) made under the Health and Safety at Work Act (1974), the Provision and Use of Work Equipment Regulations (PUWER) (1998) and all future statutory requirements concerned with the inspection and testing of portable electrical appliances.

This Policy covers the regular electrical checks, which are carried out on electrical equipment to make it safe for students, staff and visitors and should be read in conjunction with the University Health and Safety Policy.

2.2 Definitions

2.2.1 Portable and Transportable equipment

A Portable Electrical Appliance is, literally, any electrical equipment capable of being carried and, in general, connected to the mains supply by a flexible lead and a plug. The definition includes appliances with their own power sources, e.g., "intrinsically safe" equipment used in potentially explosive environments and equipment designed to operate at 110 volts. The definition does not include equipment which is "hard" wired, e.g., heavy equipment supplied by a fixed, armoured, power cable, which is tested using other regimes.

(H) Hand held - Intended to be held in the hand during normal use.			
Drills	Inspection lamps	Domestic irons	Soldering irons
Vacuum cleaners	Floor polishers	Floor washers	

(P) Portable - Less than 18kg in mass. Intended to be moved in operation OR can be easily moved.			
Fan heater	Kettles	Toasters	Fan heaters
Electric fires	Hotplates	Angle poise lamps	Food mixers

(IT) Information Technology & Business – Computers and certain equipment used in offices			
Answering machines/faxes)	Computer Data terminals	Printers VDU	Telephones Typewriters
Desktop Photocopier	Power packs	Electric plotters	Mail processing machines

(M) Movable - 18kg or less in mass. Not fixed in place. OR has handles, wheels, castors to facilitate movement			
Air conditioning unit			

(S) Stationary – Mass exceeds 18kg. No carrying handle			
Fridge	Washing Machine	Freezer	Photocopier

It is most important that all items of hand-held portable equipment are tested because faults in this type of equipment account for a high proportion of electrical accidents.

2.3 Equipment Classes

CLASS I electrical equipment is provided with one layer of insulation over the live conductors, and exposed metalwork is bonded to earth so that it cannot become live in the event of an insulation failure. The external metal casing of any item of electrical equipment must be earthed as a legal requirement. With correctly earthed supply installations and equipment, the risk of electric shock is virtually nil.

CLASS II appliances are "double insulated", i.e. they rely on two layers of insulation between live internal parts and the user for protection against electric shock. British double insulated equipment is marked with the symbol .

CLASS III equipment is defined as equipment that relies on supply from a SELV (Safety extra low Voltage) source to protect against electric shock.

2.4 Competent Person

Competent Person is a person who is employed or contracted by the University who has received suitable and sufficient training in Portable Electrical Appliance Inspection and Testing.

3.0 Responsibilities

3.1 Property and Facilities

The Director of Property and Facilities is responsible for the provision of safe electrical supplies within the fabric of University buildings up to and including the outlet sockets. Beyond the electrical outlet, each school/professional service is responsible for any further distribution of the supply and for all equipment connected thereto, unless the equipment is initially supplied and connected by Property and Facilities. A supplementary convector heater would be one such example.

Connections to the three-phase supply should only be carried out by Property and Facilities.

Property and Facilities will manage a testing regime for all identified equipment on a rolling program as frequencies detailed in Section 4.5 and are responsible for.

- a) Administration of the contract.
- b) Liaison between contractor and Heads of School etc.
- c) Maintaining the University asset register of equipment
- d) Maintaining a register of test results.

3.2 Heads of School and Directors of Service

Whilst every effort is made for this testing to be comprehensive there is a responsibility on each Head to take appropriate measures to ensure that all electrical equipment is safe and suitable for the purpose intended. All relevant persons should be made aware of the

associated hazards and of the requirements to adopt working procedures designed to keep the risks to their health, and to the health of other persons, as low as reasonably achievable.

The University Health and Safety Policy must be supplemented by local school rules relating to the specific activities of the school/service, so that when read in conjunction with this part of the Policy, the two documents form an effective means of securing the safe use of electrical equipment, where appropriate written records of action taken should be maintained. Computerised record keeping is equally acceptable.

Departmental Heads shall be responsible for the following in relation to Portable Appliance testing.

- a) Appointing departmental liaison person to deal with portable equipment
- b) Authorisation of non-departmental equipment.
- c) Ensuring equipment and access is available for testing.
- d) Informing Property and Facilities of new or redundant equipment
- e) Departmental asset register of equipment to be tested.
- f) Ensure non authorised equipment is not in use
- g) Ensure equipment that has failed PAT test is removed from service immediately

3.3 Equipment on hire or supplied for service.

Responsibility lies with the Head of department hiring equipment to ensure that the supplier tests and labels the equipment in accordance with University policy prior to the equipment being brought in to service.

3.4 Staff Equipment

Personal equipment brought in to the University to be used by staff must have the prior approval in writing of the Head of Department, e.g. Laptops would be permitted, kettles, toasters, heaters etc. would not be permitted.

3.5 Student Equipment

Personal equipment brought in to the University by students must have prior approval in writing of the Head of School.

3.6 Residential Accommodation

Equipment owned and supplied by Edinburgh Napier University as part of the lease agreement with the resident e.g. fridge's, kettles etc shall be tested in accordance with the University Portable Appliance Testing Policy.

Equipment owned by students and brought in to the residences for their own use is the responsibility of the student but may be subject to testing in accordance with the University Portable Appliance Testing Policy.

3.7 European Plug top adaptors

These are not permitted to be used on University premises, all equipment must have plugs fitted in compliance with BS 1363. Property and Facilities should be made aware of any such equipment.

4.0 Control Methodology

4.1 Inspection and Testing

4.1.1 User Check

This is a simple visual check performed by the user of the equipment, or by someone giving equipment out to students. User checks are not recorded unless a defect is noticed.

Section 7 of Health & Safety at Work Act 1974 puts a duty of care on **employees** to ensure the safety of all persons using the workplace. It is important that employees perform routine, simple safety checks. This includes checking the exterior of the plug, cable, socket outlet, etc. and making sure that cables are not trapped or trailing in a dangerous manner. Simple checks such as these need only take a moment or two, and records of such checks only need to be kept where a fault is found. Obviously, any faulty, unsafe equipment needs to be disconnected and reported to the **Property and Facilities Helpdesk** ext. 5000.

Generally, user checks should be carried out with a frequency of between "before each use" (for example, with some types of equipment used in commercial kitchens) to "weekly" (for example, with some types of equipment used in schools).

The following schedule is recommended:-

Component	Common fault to look for
Mains Lead	Cuts Cuts covered with tape Crushed Fraying Too long/short Taped joints Over stretched
Plug	Is flex secured in gripper Shows signs of overheating Cracked casing Exposed or pulled cables out of plug
Socket outlet or Mains Lead outlet	Shows signs of overheating Cracked casing
Appliance	Does it work? On/Off switch functioning Cracked casing Chemical or corrosion damage to casing Damage resulting in access to live parts

Environment	Suitability for the environment it will be used in
Job	Suitability for the work to be undertaken

4.1.2 Combined formal visual inspection and testing ('PAT Testing')

Since over 80% of electrical faults are discovered by visual inspection it is University Policy that the Formal Visual inspection is carried out by a competent person as part of the Combined Test.

Formal visual inspection involves a lot more work than simple user checks and includes procedures such as dismantling plugs to check connections, fuses, etc., looking for signs of overheating, checking cable runs to make sure that they don't have heavy equipment placed on top of them, making sure that items such as filing cabinets are not blocking access to the socket, plug and switch, etc. The following schedule is recommended.

Component	Common fault to look for
Plug	Cracked casing Bent pins Incorrectly rated fuse Incorrectly connected wires Loose connections Loose cable clamp
Mains Lead	Cuts, fraying, brittle Kinked, coiled Taped joints Overloaded (overheated) Male connector (if fitted) Non-standard (IEC 320, BS4491, CEE22) Not secured by grommet/clamp on appliance Damaged cable covered with tape
Appliance	Suitability for the environment or work being undertaken Damage/faulty operation of off/on switch Damage to casing Loose parts Missing screws Evidence of overheating Evidence of moisture Missing double insulation mark  on insulating casing (where Appropriate) Accessible fuse holders: damage or removal of carrier permits live part to be touched Exposed output connections have marked voltage rating > 50V

In addition to formal visual inspection, discussed above, specialised electrical test instruments are used (usually a dedicated portable appliance tester) to test for things such as earth bonding, insulation strength, touch current, leakage current, substitute leakage current and functional (running) tests. It is important that the person performing the tests understands the test results and that *formal recordings are taken for each test, even where no faults are found*. It is suggested that combined formal visual inspection and testing ('PAT Testing') should be carried out with a frequency of between "three-monthly" (for example, with most types of equipment used on construction sites) to "forty-eight months" (for example, with some types of equipment used in offices). In practice, and in particular with ease of management in mind, a compromise is made between very frequent and very infrequent checks.

The important thing to remember is that, by law, the electrical equipment in the workplace has to be, in simple terms, **'safe, well-maintained and suitable for the purpose for which it is being used'**, and at all times. Again: whilst formal visual inspection and testing (PAT Testing) will help to determine whether the equipment meets this criteria (at the time of testing), these procedures will not, in themselves, keep the University compliant with the law; the law requires that the equipment, at all times, must be safe, well-maintained and suitable for the purpose for which it is being used. For example, if an item is inspected and tested and is shown to be safe but, however, becomes electrically unsafe a few months later, then it is illegal to have this item in commission, reinforcing the importance of regular visual as well as documented inspections

Finally, it is important to point out that the frequency of inspection and testing must to be kept under review, especially when factors such as the environment or frequency of use, etc., change. The latest period of testing undertaken within the university was during 2016/17 and this proved that there was a very low failure rate of equipment which has demonstrated the benefits of a proactive testing regime and future rounds of testing will also be formally reviewed.

4.2 Schedule of Inspection and Testing

The following schedule is recommended, carried out in the order as written (Greater detail is provided in the *IEE: Code of Practice for In-Service Inspection and Testing of Electrical Equipment*, including pass/fail criteria)

4.2.1 Class 1 Appliances

Earth Continuity / Bonding Test

This test is for checking the earth lead continuity and earth connection (or bonding) to the metal casing of an appliance.

Insulation Test

This test checks the integrity of the appliance's insulation.

For Class I appliances the test voltage is applied between the appliance's mains supply plug P (phase) and N (neutral) pins connected together, and the E (earth) pin which is held at earth potential.

Earth Leakage Test

This test shows the level of leakage current in the appliance by monitoring the difference in currents flowing in the phase and neutral connections; any difference must be flowing to earth. This provides a useful way of predicting approach of appliance breakdown since the level of leakage current is a guide to the condition of insulation. Since many appliances are designed with earth leakage, this test is not mandatory; faults are indicated in the Insulation Test described above.

Flash Test (Dielectric strength test)

These tests are no longer carried out during PAT testing.

Operation V/A Test (OPTIONAL)

This test indicates that the appliance is in good working order and not drawing excessive current.

4.2.2 Class II Appliances

Test as for Class I Appliances, except with the omission of the Earth Continuity / Bonding Test.

4.2.3 Very Sensitive Electronic Equipment

Earth Continuity / Bonding Test ONLY – PAT device not to be used

Using a **multi meter** able to read to 300 milli Ohm, the resistance between the earth pin and any exposed metal (Not signal sockets) should be less than 300 milli Ohm.

4.2.4 Three Phase Equipment

The inspection and testing of three phase equipment is a specialist task which must be carried out, either:

- i. under service contract;
- ii. by Property and Facilities.

4.2.5 Extension Leads

These should be tested, by connecting, in turn, to each of the sockets an electrical appliance that has already been shown to be electrically safe, and then performing the usual electrical tests (depending on whether the extension lead and appliance are class 1 or class 2)

4.2.6 Power leads

These should be tested by being connected to an electrical appliance that has already been shown to be electrically safe, and then performing the usual electrical tests (depending on whether the extension lead and appliance are class 1 or class 2)

4.3 Testing Equipment

A commercially available Portable Appliance Tester (PAT) is used for electrical testing of robust appliances. Some PATs have a facility for testing 110V equipment. PATs must be calibrated annually.

A PORTABLE APPLIANCE TESTER SHOULD NOT BE USED on very sensitive electronic equipment, as permanent damage may be caused by the high test voltages and currents. The PAT should have a numerical readout for test results.

4.4 Categories of Equipment

By considering the type, class and use of Portable and Transportable equipment four main groupings of electrical equipment have been identified, as follows:

- 4.4.1 **Category 1: (H) Handheld** portable equipment, which is held in the hand while in use. Examples: Electric drills, portable saws, soldering irons, inspection lamps, vacuum cleaners, floor polishers, domestic irons, kettle, toasters.
- 4.4.2 **Category 2: (P) Portable equipment** used in fixed positions but frequently moved during use, or which is used in wet or hazardous locations. Examples: Laboratory bench top equipment, electric fires and heaters, kitchen equipment, mixers, slicers, etc.
- 4.4.3 **Category 3: (IT) Information Technology & Business and Moveable, (P) Portable or (M) Movable.** Seldom moved or less hazardous items. Examples: Desktop terminals, printers and PCs, photocopiers, calculators, fax and telephone answering machines, TV and radio receivers and other video and audio equipment.
- 4.4.4 **Category 4: (S) Stationary** and all other electrical plant and equipment, including three phase equipment, and items permanently connected to the supply without plug and socket connectors.

NB: The examples given above are not intended to be an exhaustive list, but are illustrative of the type of equipment concerned.

4.5 Frequency of Inspection and Testing

Portable appliances shall be inspected prior to being put in to use within the University and there after the frequency shall depend on the usage and movement of the equipment. No Combined Test is normally required provided the new equipment is purchased from a reliable source and new equipment is visually inspected for signs of obvious damage. New equipment can, in most environments and situations, be tested during the next "round" of PAT Testing at a frequency determined depending on the use/environment etc. .

Deciding on the frequency of testing and inspection of new and existing equipment is a matter of judgement, and should be based on an assessment of risk. This can be taken as part of the assessment of risks under the Management of Health and Safety at Work Regulations 1999.

The factors to be considered when choosing an appropriate testing frequency are:

- **The environment** – equipment used in benign environments will suffer less damage than equipment used in an arduous environment.
- **The users** – if equipment is likely to receive unreported abuse, more frequent inspection and testing may be required.
- **The equipment construction** – the safety of class 1 equipment is dependent on the fixed electrical installation; The safety of class 2 equipment is not. **If equipment is known to be Class 2, in a low risk environment, such as an office, recorded testing (but not inspection) may be omitted.**
- **The equipment type** – appliances which are hand held are more likely to be damaged than fixed appliances

In order to provide a basis for the initial testing regime, the following testing frequencies have been established through risk assessments considering the above factors and the results from the last testing programme carried out in 2016/17. It is expected that some departments may wish to vary these testing frequencies to better fit in with the diverse equipment and locations they have. Any such variation **MUST** be based on risk assessment and the justification recorded in writing.

Equipment Category	User Check	PAT Test
		Combined Formal Visual and Electrical Tests
<p>1 – (H)</p> <p>Portable equipment, which is held in the hand while in use.</p>	Before Use	6 Months
<p>2 (P+)</p> <p>Equipment used in fixed positions but frequently moved during use, or which is used in wet or hazardous locations.</p>	Before Use	12 Months
<p>3 (P, IT, M)</p> <p>Portable or Transportable, seldom moved or less hazardous items.</p>	Weekly	36 Months
<p>4 (S)</p> <p>All other electrical plant and equipment</p>	Weekly	36 Months

H Handheld equipment

P Portable equipment

IT Information technology and Business Equipment

+ High usage of extreme environment

M Moveable equipment

S Stationary equipment

New equipment in Categories 1, 2 and 4 should be formally visually inspected and tested before being put into use. Category 3 equipment should have at least a user inspection for physical damage.

4.6 Recording of Inspection and Testing Results

4.6.1 Test results

The Electricity at Work Regulations require that the results of electrical safety tests are recorded. A computer will often be a suitable medium for record keeping. The advantage of the more expensive portable appliance test instrument is that each has a memory in which the results of a large number of tests can be stored. This stores the date of each test, the unique number assigned to each piece of equipment, and the pass/fail and numerical results. Data from the memory can be sent to a printer or can be exported directly to a computer.

A dated test label must be affixed to the appliance (and to the plug, if the lead is detachable). The label should show the following:

- a) PASS or FAIL
- b) Test given (e.g. Combined Inspection & Test)
- c) Unique identification for the equipment (e.g. Departmental Inventory number)
- d) A "Do not use after 'date' warning, where 'date' is the due date of the next test.

A record must be kept of the inspection and test results in the area provided on the University asset inventory system.

If required, a local copy of the test records can be kept in an alternative format, either as paper records (see Appendix A) or computer records

4.6.2 Equipment failure

Equipment, which fails the test, shall be

1. Clearly labelled with a **FAIL** Label
2. Cable or plug removed to ensure it cannot be used.
3. Removed from area and service immediately by the Department.
4. Shall not be put back in to service until fault rectified and retested.
5. Equipment is deemed redundant and disposed of by the department.

All "failed" equipment must be removed immediately for repair or disposal.

5.0 Monitoring Compliance

Any Management system, if left alone, will deteriorate over time: where entry into confined spaces is concerned this could prove fatal. It is therefore a requirement of this Code of Practice that where such entry occurs, The Health and Safety Office will periodically monitor that this statement remains relevant and effective. and will, from time to time, require certain

information from the Head of School, Directors of Service and Property and Facilities. This will include, inter alia, testing records.

6.0 Guidance Notes

6.1 General

Nearly a quarter of all reportable electrical accidents involve portable equipment. The majority of these accidents result in electric shock; others result in fires. A major cause of such accidents is failure to maintain the equipment. The likelihood of accidents occurring and their severity will vary, depending on the type of electrical equipment, the way in which it is used, and the environment in which it is used.

Under no circumstances should a person use electrical apparatus if they have any doubts as to its safety. If in doubt they should consult their Supervisor/ Tutor/ Departmental Safety Supervisor as appropriate or the Health and Safety Office directly.

Specialised appliances frequently require special precautions to be taken and reference should always be made to the manufacturer's instructions.

If any person has concerns about the safety of connections to the electrical supply, Property and Facilities will give advice. Flexible leads should not be clipped to walls to form quasi-permanent extensions to the electrical installation. Where schools wish to extend the fixed wiring system within a University building, this must be done by, or in consultation with Property and Facilities.

If any doubt exists about the safety of a piece of electrical equipment, it must be taken out of service immediately and labelled 'Not for Use'. It should be removed immediately from the area concerned and repaired, or disposed of safely. A report must be made to a responsible person such as the school safety adviser, who must then take appropriate action.

6.2 Assessment of Risk

6.2.1 High Risks

High risks would result from the use of an electrically- powered pressure water cleaner outside, powered by 240 volt electrical supply, with the cable trailing on the ground, where it can be damaged by vehicles and other equipment, and where water is present.

Damage to the cable or other parts is likely to result in the operator or others receiving an electric shock. Similar risks result when other electrical equipment such as drills and portable grinders are used in harsh environments, e.g. construction sites, where there is a high probability of mechanical damage resulting in danger.

6.2.2 Medium Risks

Medium risks would result from floor cleaners or kettles which are usually used in a more benign environment, e.g. offices, but can be subject to intensive use and wear. This can eventually lead to faults which can also result in a shock, burns or fire.

6.2.3 Low Risks

Specialised equipment, e.g. information technology (IT) equipment (computers and printers), photocopiers, fax machines etc are considered low risk; they are usually double insulated, are used in dry clean environments and are infrequently moved or stressed.

6.2.4 Other Factors to Consider

Equipment which is held by hand or is handled when switched on will present a greater degree of risk because, if a dangerous fault occurs, then the person holding it will almost certainly receive an electric shock.

The risk of receiving an electric shock will be greater when the equipment user is standing on the ground outside or a concrete floor, scaffolding or similar which is a good conductor, than if standing on a wooden floor or dry carpet and not in contact with earthed metal work (i.e. using double insulated appliances or 110 volt tools which have a centre tapped transformer to give 55 volts between live and earth).

Because the consequences of an accident are so serious - potentially fatal electric shock, or fire affecting the whole premises - the inspecting and testing system is designed to be proactive, i.e. planned to prevent incidents arising, rather than reactive where action is taken following an incident/accident. The frequency of inspection and testing is directly related to risk.

The greatest overall reduction of risk will take place when the inspection and testing regime is first put into practice. Thereafter it will take time to establish the appropriate test frequency based on experience. A low failure rate would indicate that the test interval can be increased and a high failure rate that the interval should be shortened.

6.3 Further Guidance

The Institution of Electrical Engineers publish the *Code of practice for the in-service inspection and testing of electrical equipment* Institution of Engineering and Technology (IET) 2012 ISBN 978 1 84919 626 0