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**Guidance Note GN 019**

# Portable Electrical Appliance Testing - PAT

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This guidance note contains information on the health and safety aspects for departmental/divisional staff, students and visitor who use portable electrical appliances/equipment in their work. This guidance note includes an overview of:-

- What are portable appliances
- The risks
- The regulations
- Testing of the equipment
- Maintenance and servicing
- Testing/inspection time scales

## What is portable electrical equipment

Portable electrical equipment is generally equipment that has a lead (cable) and plug, which is normally moved around or can easily be moved from place to place, e.g. heaters, office equipment, small laboratory equipment items (power packs) etc. It also includes items that could be moved, although not readily, such as photocopiers, larger laboratory equipment etc. that is not hard wired into the mains.

## What are the risks

There are risks from portable electrical equipment used in offices and laboratories, especially of there has never been any inspection systems or if maintenance has been neglected. The most common causes of electrical accidents/incidents are the use of apparatus which is unsuitable for the duty and conditions of use, inadequate maintenance, the use of defective apparatus, careless or hurried assemblies, makeshift connections, high voltages and misuse by careless or inexperienced people.

Many such accidents can be easily prevented since the causes are frequently visibly obvious, for example faulty flexible cables, extension leads and plugs and sockets particularly with hand held tools etc.

Examples of the more common risks and accidents that occur are:

- the earth wire pulled out of its plug due to a loose or ineffective cord grip touches the live terminal thus making the metalwork of the apparatus live;

- flexible cables damaged by being run over, being dragged over sharp surfaces, making contact with moving parts of machinery, making contact with hot surfaces or chemicals, being continuously flexed close to the point of termination or being in contact with solvents etc. thereby exposing live conductors to the touch;
- badly made joints in flexible cables, which lose their insulation or pull apart when strained. Bare live conductors may then be exposed to the touch or the earth conductor may be severed so that the metalwork or frame becomes live;

- incorrect connections made to the plug or apparatus terminals resulting in the metalwork being made live;

- cover damaged (or missing!) exposing bare live conductors to the touch;

- insulation failure, causing leakage currents, resulting in metalwork being made live if the equipment is not properly earthed;

- servicing apparatus without disconnecting it from the supply;

## The Regulations

There are no set regulations governing the specific testing of portable electrical equipment, however, various pieces of legislation do apply.

The Health and Safety At Work etc. Act 1974, states that employers are required to maintain '..safe plant and systems of work.'

The Electricity at Work Regulations 1989 require that '..all electrical systems shall be maintained so far as to prevent, so far as is reasonably practicable, danger.'

The Provision and Use of Work Equipment Regulations 1992 state that all work equipment must be '...properly maintained and to have up to date maintenance logs.'

## Testing of equipment

Electrical accidents from portable electrical equipment can be reduced by adopting a system of regular checks and testing on all equipment.

This can be achieved by a combination of actions applied at three levels:

- checks by the user

- formal visual inspections by a person appointed to do this

- combined inspections and tests by a competent person

**User checks:**

Any person who uses electrical equipment should look critically at the equipment they use, particularly portable equipment, and visually check for signs that the equipment is not in a sound condition, *e.g.:*

- there is damage, apart from light scuffing, to the cable sheath;
- the plug is damaged, *e.g.* the casing is cracked or chipped or the pins are bent;
- there are inadequate joints, including taped joints in the cable;
- the outer sheath of the cable is not effectively secured where it enters the plug or equipment. Obvious evidence would be that the coloured insulation of the internal cable cores were showing;
- the equipment has been subjected to conditions for which it is not suitable, *e.g.* it is wet or excessively contaminated;
- there is damage to the external casing of the equipment or there are some loose parts or screws,
- there is evidence of overheating (burn marks or discolouration).
- These checks apply also to extension leads and associated plugs and sockets.

These checks should be undertaken by the user when the equipment is taken into use and during use. They should be applied to portable equipment every time that it is moved. Any faults should be reported to local management or your Divisional Safety Officer and the equipment taken out of use **immediately**.

Defective equipment must not be used until repaired by a person competent to do so.

Contact the College Estates Help Desk on 020 7549 8000 for assistance.

**Formal visual inspections:**

The majority of potentially dangerous faults with portable equipment can be picked up by formal visual inspections carried out routinely by a competent person who has sufficient information and knowledge on what to look for and what is acceptable. These checks will include visual checks similar to those listed above but will include also the removal of the plug cover to check that:

- a fuse of the correct rating is being used;

- the cord grip is effective;

- the cable terminations are secure and correct, including an earth where appropriate;

- there is no sign of damage, overheating or ingress of liquid or foreign matter.

The inspections should be carried out at regular intervals: the period between inspections depending upon the type of equipment, the conditions of use and the environment (see below)

Equipment, which is found to be faulty, should be repaired immediately if this is practicable. Where immediate repair is not practicable the equipment **must** be taken out of service and must not be used again until properly repaired and, if necessary, re-tested.

**Combined inspections and tests:**

The checks and inspections above will, if carried out properly, reveal most, but not all, potentially dangerous faults. However, some deterioration of the cable, its terminals and the equipment can be expected after significant use. Additionally, equipment may be misused or abused to the extent that it may give rise to danger. Testing, together with a thorough visual inspection can detect faults such as loss of earth integrity, *e.g.* a broken earth wire within a flexible cable, or deterioration of insulation, or contamination of internal and external surfaces. Failure of insulation could result in the user receiving an electric shock. Periodic inspection and testing are the only reliable way of detecting such faults.

Portable Appliance Testing (PAT) should be carried out:

- whenever there is reason to suppose that the equipment may be defective, and which cannot be confirmed by visual inspection;

- after any repair, modification or similar work;

- at periods appropriate to the equipment, the manner and frequency of use and the environment (see below).

These tests should be carried out by someone with a wide degree of competence who is trained in the use of the equipment used to undertake the tests and, where necessary, is capable of interpreting the results of the tests.

## Maintenance and servicing of portable electrical equipment

Any electrical equipment, which is in an unserviceable or unsafe condition, must be isolated from the mains electricity supply, labelled as faulty and withdrawn from use until the defects have been rectified. Only a competent person experienced in this class of work must carry out repairs. Repairs by an “armchair” expert to get the equipment “up and running” are not permitted.

Any apparatus, which has been in contact with hazardous microbiological or radioactive materials, must be decontaminated before the equipment is sent for servicing, attended to by a service engineer, or disposed of.

Switch off the power and remove the plug from the mains socket before removing any panels from electrical equipment.

Where this is impracticable make sure that a warning notice is displayed prominently and that the panel is replaced as soon as possible.

Flexible cables, which have become damaged, must be replaced, not repaired. The use of insulation tape as a temporary repair medium is not permitted.

Any equipment, which blows a fuse persistently, must be treated as faulty. Under no circumstances may the fuse be replaced by one of higher rating.

## Recommended inspection and testing time scales

| Equipment/environment | User checks | Formal visual inspection | Combined inspection and testing |
|---|---|---|---|
| **Battery-operated (less than 20 volts)** | **Yes** | **No** | **No** |
| **Extra low voltage (less than 50 volts)** *E.g.* **telephone equipment, low voltage desk lamps.** | **Yes** | **No** | **No** |
| **Information technology** *E.g.* **desktop computers, VDU screens** | **Yes** | **Yes, 2-4 years** | **No if double insulated - otherwise 5 years** |
| **Photocopiers, fax machines (NOT hand held), rarely moved.** | **Yes** | **Yes, 2-4 years** | **No if double insulated - otherwise 5 years** |
| **Double insulated equipment (NOT hand-held) moved occasionally,** *e.g.* **fans, table lamps, slide projectors.** | **Yes** | **Yes, 2-4 years** | **No** |
| **Double insulated equipment, HAND-HELD** *E.g.* **some floor cleaners.** | **Yes** | **Yes, 1 year** | **No** |
| **Earthed equipment, moved frequently,** *E.g.* **electric kettles, some floor cleaners and any laboratory equipment.** | **Yes** | **Yes, 1 year** | **Yes 1-2 years** |
| **Earthed equipment, rarely moved,** | **Yes** | **Yes, 1 year** | **Yes 3 years** |

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| **Cables (leads) and plugs connected to the above. Extension leads (mains voltage).** | **Yes** | **Yes, 1 year** | **Yes 1-5 years depending on what equipment it is connected to** |
| **All portable equipment used by maintenance staff, or in workshops or in cold rooms.** | **Yes** | **Yes, 6 months** | **Yes, 1 year** |