# PAT (Portable Appliance Testing) Guide for Schools

Anderson, Adam
MINERVA LEARNING TRUST

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## What is PAT?

Portable appliance testing (PAT) is the term used to describe the examination of electrical appliances and equipment to ensure they are safe to use. Most electrical safety defects can be found by visual examination, but some types of defect can only be found by testing. However, it is essential to understand that visual examination is an essential part of the process because some types of electrical safety defect cannot be detected by testing alone.

The Electricity at Work Regulations 1989 require that any electrical equipment that has the potential to cause injury is maintained in a safe condition.

As the employer of over 700 people and 6000+ students using our school facilities, MLT as part of their risk assessment approach require that all portable appliances be tested under the above Electrical Regulations

## Legislation

Legislation covered Health & Safety at Work Act of 1974, Electricity at Work Regulations of 1989, Provision and Use of Work Equipment regulations of 1998 and the Management of Health and Safety at Work regulations of 1999

## What should be tested?

There is no definition of what a 'Portable Appliance' is in the current legislation, however the standard interpretation is "any appliance that has a plug attached to it and plugs into a wall outlet".

Because of this, the word 'portable' is a bit misleading. There are actually 7 categories of appliance which should be considered for PAT testing or, at least, visual inspections:

- Fixed appliances
- Stationary appliances
- IT appliances
- Moveable appliances
- Portable appliances
- Cables and chargers
- Handheld appliances

| Appliance Category | Description | Risk Level | Visual Inspection needed? | PAT test needed? |
|---|---|---|---|---|
| **Fixed** | Equipment which is fastened to a support, or fixed in a permanent location | Low | Yes, infrequently | No |
| **Stationary** | Appliances such as fridges, washing machines and vending machines | Low | Only in higher risk environments | Yes, apart from Class 2 equipment in low risk environments |
| **IT** | Business equipment such as monitors, PCs, laptops, printers and photocopiers | Low | Only in higher risk environments | Yes, apart from Class 2 equipment in low risk environments |
| **Moveable** | Equipment under 18kg that sits in one place, but can be moved around easily | Low-Medium | Yes | Yes, apart from Class 2 equipment in low risk environments |
| **Portable** | Electrical items meant to be moved whilst connected to an energy supply | Medium | Yes | Yes, apart from Class 2 equipment in low risk environments |
| **Cables & Chargers** | Extension Cables, IEC Leads and Cable reels | Medium | Yes | Yes, apart from Class 2 equipment in low risk environments |
| **Handheld** | Equipment held in the hand, like hairdryers, hair straighteners and electric drills | High | Yes, frequently | Yes, apart from Class 2 equipment in low risk environments |

The class of an appliance helps determine whether it needs to be PAT tested and to what degree.

- Class 1 appliances need a full PAT test,
    - This type of electrical equipment has only basic insulation and relies on an earth for protection
- Class 2 appliances need a PAT insulation test.
    - This type of electrical equipment has extra insulation and so does not rely on an earth for protection, which makes it safer.
- Class 3 appliances do not need to be PAT tested at all.
    - Class 3 appliances are low voltage items and are the safest class of electrical appliance. Their charging leads may need to be PAT tested.

The following items usually (but not always) fall into the categories

| Class 1 | Class 2 | Class 3 |
|---|---|---|
| Floor Standing Printers | Desktop Printers | Laptops |
| Photocopiers | Hedge trimmers | Mobile Phone Chargers |
| Vending Machines | Lawn mowers | Torches |
| Industrial Machines | Drills | Cameras |
| Desktop Computers | Food Mixers | |
| Washing Machines | Lamps | |
| Tumble Dryers | Televisions | |
| Fridges | DVD Players | |
| Freezers | CD Players | |
| Dishwashers | Hairdryers | |
| Microwaves | Hair Straighteners | |
| Toasters | | |
| Kettles | | |
| Irons | | |
| Electric Heaters | | |
| Laptop Cables | | |

The table below gives an idea of the likely risk level of different types of business:

| | Environment | Risk Level | Why? |
|---|---|---|---|
| | Offices, Shops and Hotels | Low | Electrical items are rarely moved and so are less likely to be damaged. There is very little specialist equipment on site. |
| | Schools | Low-Medium | Electrical items are rarely moved and there is little specialist equipment, however the occupants (children) are more prone to accidents and causing damage |
| | Hospitals | Low-Medium | There is a large amount of electrical equipment on site that is used frequently, often in a fast-paced environment, and is therefore more subject to wear & tear, damage or misuse |
| | Industrial buildings<br>such as factories, commercial kitchens and workshops | Medium | Occupants are often working to tight schedules and regularly use a wide variety of different types of appliance, meaning there is a greater chance of accidents and damage |
| | Where equipment is used by the public<br>such as gyms and arcades | High | It is considerably more difficult to monitor use of electrical appliances and so there is a vastly increased risk of human error |
| | Construction Sites | Extremely High | The tough and sometimes chaotic environment of construction sites plus the frequent use of hand-held tools means they are exceptionally high risk environments |

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RECOMMENDED FREQUENCY OF PAT TESTING LOW TO MEDIUM

| Appliance Category | Class 1 | | Class 2 | |
|---|---|---|---|---|
| | **Visual inspection** | **PAT test** | **Visual inspection** | **PAT test** |
| **Fixed** | 2 yearly | Not required | Annually | Not required |
| **Stationary** | Not required | Annually | Annually | 4 yearly |
| **IT** | Not required | Annually | Annually | 4 yearly |
| **Moveable** | Each term | Annually | Each term | 4 yearly |
| **Portable** | Each term | Annually | Each term | 4 yearly |
| **Cables & Chargers** | Each term | Annually | Each term | 4 yearly |
| **Handheld** | Each term | Annually | Each term | 4 yearly |

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## What should we get from a PAT?

**Suppliers / Contractors should carry out the following.**

All pat testing work will be carried out according to the Institute of Electrical Engineers (IEE) Code of Practice for InService Inspection and Testing of Electrical Equipment

**a) VISUAL INSPECTION**

A visual inspection of the item been tested should be carried out to ensure that there is not visual physical damage to the item that would represent a potential hazard to its users.

**b) EARTH CONTINUITY SOFT TEST**

Soft Test Low current earth continuity testing is performed in all PAT testing. Normally referred to as a 'soft test', current ranges of 20mA to 200mA, but 100mA or 200mA are used for comprehensive evaluation. The 3rd Edition of the IEE Code of Practice defines the 'Earth Screen Test', 'Screen Bond Test' or 'Continuity Test' application used by equipment manufacturers as the baseline function analysis of all Class 1 equipment and IT equipment. Analysis of earth connection for screening purposes prefaces alternate high current earth continuity test which may damage the equipment. Battery operated testers are not involved in high current earth continuity testing. Soft test function testers are constrained by equipment updates, and therefore are not suitable for testing some IT equipment.

**c) EARTH CONTINUITY HARD TEST**

Hard Test Hard Testing by way of high current earth continuity test is carried out with a current not more than 1.5 times the rating current of the appliance. No greater than 25 amps may be used. High current testing ensures that potential corrosion of earth wires is suitably stressed so that any susceptibility of the depletion is identified. This is relevant to fridge, washing and drying machines, kettles, and similar household appliances. Battery testing does not allow for high current earth continuity test.

**d) INSULATION TEST (500V & 250V)**

Voltage of 500 Vdc insulation testing identifies resistance in appliance power systems. Not suitable for testing IT equipment or other electronic components. Alternatives to the test such as earth leakage, touch current, substitute leakage, or insulation resistance testing at a reduced voltage may employed. Alternate testing is usually measured at 250 Vdc

**1) Labelling**

To ensure that all items tested are labelled appropriately, the labels should show the following information as a minimum

a) PAT Unique Reference number.
b) Date test carried out.
c) Company carrying out the test.

**2) Information Requirements / Reporting**

A full log of all items tested should be provided electronically in a ***pdf or excel*** format showing the following information as a minimum

a) PAT Unique reference number
b) Building or room reference
c) Date Test Carried out
d) Class of item
e) Test results as per above 1a, 1b, 1c, 1d.