

## Portable Appliance Testing (PAT) - Electricity at Work Regulations & Testing

**It is a legal requirement under The Electricity at Work Regulations 1989 (EAW) that all portable electrical equipment must be regularly inspected and tested to ensure it is safe for use. This covers all electrical equipment used for performance, including permanently installed equipment and the electrical installation itself.**

The inspection and testing of a fixed installation, *i.e.* the wiring, switchgear etc, is best done by an approved electrical contractor. However the inspection and testing of all performance equipment is best carried out by a specialist company who are familiar with such items.

### EAW

The purpose of the Electricity At Work Regulations 1989 is not to outlaw existing equipment, but to assign responsibility for its proper maintenance. The regulations are designed to ensure that all users and operators are provided with the maximum protection against electrical shock. It is therefore just as important to check extension cables and removable power leads as it is individual appliances. It should be noted that it is the responsibility of *the venue* to ensure all hired-in equipment is visually inspected prior to and during its use.

Under the EAW Regulations, should *you* find something on-site that is considered dangerous, steps may be taken to disable the item, usually by removing the plug or fuse. If such action is taken, *the venue* must be informed of the action and why this has been taken. It is then the responsibility of *the venue* to repair the item safely before it is used.

The following is techref's understanding of the current position regarding the requirements of EAW. In no sense does it constitute legal advice.

### Types of Performance Equipment

- **Transportable**  
Equipment that has a flexible cable and plug fitted, capable of being moved, but generally is not. Examples include stage luminaires normally left fixed in one location for most of their life, and dimmer packs fixed to a wall but supplied via plug and socket outlet.
- **Portable**  
Equipment that can be, and often is, moved. Examples of this category include stage luminaires that are regularly rigged and de-rigged, strobes, followspots, pyrotechnic control systems, smoke machines, extension cables, touring equipment, portable sound and lighting systems and all hired-in equipment. Wear and tear on the cable, plug and connectors can be very heavy.
- **Hand-held**  
Equipment that is held whilst in use. Examples include smoke machines, and small self-contained dimmers (not low voltage controllers). Hand tools also come under this category. It is with this type of equipment that the risk of shock to the operator is at its greatest and the use of RCD (Residual Current Devices) is highly recommended. These will disconnect the supply in the event of a leakage of electricity to earth, thereby minimising any risk of electric shock.

## Inspection & Testing of Equipment

The more an item is used and moved, the more frequently it will need to be inspected and tested.

- Visual inspection

For items moved regularly, this is the most important check. Around 95% of faults or damage can be found just by looking. Visual inspections do not need to be carried out by a trained electrician, provided a competent person knows what to look for.

The things that should be looked for on the equipment, cable and plug (after disconnecting the appliance) are signs of:

- damage to the cable covering, such as cuts and serious abrasion;
- damage to the plug, such as cracked casing and bent pins;
- non-standard joints in the cable, including taped joints;
- the outer covering of the cable (sheath) not being gripped where it enters the plug or the equipment: the coloured insulation of the internal wires should not be seen;
- equipment that has been used in conditions where it is not suitable, such as wet or dusty workplaces;
- damage to the outer cover of the equipment or obvious loose parts or screws;
- overheating: indicated by burn marks, scorching or staining.

Inspection should also include the removal of the plug cover and checking that:

- a fuse of the proper rating is being used;
- all the wires are attached to the correct terminals;
- no bare wire is visible other than at the terminals;
- the terminal screws inside the plug are tight;
- there is no sign of internal damage, overheating, or entry of liquid, dust or dirt.

Inspection of luminaires should also include inspection for damage to the lampholder. The point where the cable enters the unit should be checked closely and the insulation of wiring inside the luminaire must be intact. There should be no signs of damage or severe overheating within the luminaire.

If any faults are found, the appliance must not be used until these are repaired.

- Frequency of Visual Inspection

The Institution of Electrical Engineers (I.E.E.) recommends that visual inspections should be carried out as indicated below. This assumes that the equipment and cables are in use; stored items that are not in use will not require inspection every week. If an item is used less regularly, a competent person may decide that less regular inspections are called for.

Equipment Type	Testing Schedule
Transportable	every six months
Portable	every month
Hand-held	every week
Extension Cables	every week
Hired-in Equipment	before use



- Testing

This must be carried out by a person competent to understand and inspect the equipment, use the test equipment, and understand the results. Each and every item (including extension cables) will require its own unique identification number. Testing should include the checks indicated below.

- 1) Visual Inspection

As described above.

- 2) Earth Continuity Test

This checks that there is earth continuity from the earth pin of the plug through to the appropriate parts of the appliance. The areas most likely to become live in the event of an insulation fault is that surrounding the cable entry point and the lampholder. The test probe or clip should be attached to an exposed metal surface on the exterior of the appliance casing.

- 3) Insulation Test

This checks that the insulation of the cable is intact at 500V DC and will show up any weaknesses not apparent to the naked eye. It is important that this test is *not* done on computers or other electronic equipment. If in doubt, check with the equipment manufacturer.

**WARNING:**

Check with equipment manufacturer before testing computerised or electronic control appliances. Failure to do so may result in loss of stored data or other damage.

- Frequency of Testing

The Institute of Electrical Engineers (I.E.E.) recommends that testing as described above should be carried out as indicated.

Equipment Type	Testing Schedule
Transportable	every twelve months
Portable	every twelve months
Hand-held	every twelve months
Hire Equipment	before issue

### Test Results & Schedules

You *should* keep records of all testing schedules and PAT test results as part of Health & Safety documentation. This information *may* also be required for validation of Public Performance Licences and Insurance Policies.

Local law *may require* you to record the dates of inspections and any findings



### 5A and 15A Plugs

It is industry understanding that 3-pin 5A and 15A plugs are not illegal if used on performance equipment connected to the mains supply via a correctly protected controller. However, all *new* performance equipment (such as smoke machines, followspot dimmers, strobes etc) which is normally connected direct to the mains supply should be fitted with a 13A plug (providing the total load of the equipment does not exceed 3kW). All *new* 13A plugs must, by law, have sleeved live and neutral pins and comply with BS1362 or BS1363/A in the case of resilient clad plugs.

The legislation is *not* retrospective and there is no argument whatsoever for the expensive replacement of 5A or 15A plugs fitted to performance luminaires, unless the plug shows signs of wear and tear, overheating or other condition that would make it unsafe for use.



### Further Information

Further information on Electrical Maintenance including Portable Appliance Testing (PAT) is contained within a booklet of the same name by the Institute of Electrical Engineers. This is available free of charge by enclosing a self addressed C5 envelope to the following address.  
I.E.E., PO Box 96, Stevenage, HERTS, SG1 2SD.

Alternatively, further information is available at <http://www.techref.info/safety>.