Health and Safety Guidance

Guidance on the Inspection & Testing Of Portable (and Transportable) Electrical Appliances: (Including PAT Testing)

1. Introduction

1.1 This guidance has been drawn from Appendix B of the University Electricity at Work policy and code of practice as a stand-alone guidance note on the inspection and testing of portable (& transportable) electrical appliances (including PAT testing).

In order to ensure compliance with the Electricity at Work Regulations 1989 and the University Electricity at Work policy and code of practice, Schools / Support Services are responsible for ensuring that all portable (& transportable) electrical equipment is maintained in a safe condition. The objective of this guidance note is to provide advice to Schools / Departments / Support Services on how to achieve this.

Low risk equipment may not require a Portable Appliance Test (PAT) and a visual inspection will suffice. User checks will be carried out by person(s) using the equipment in question. Periodic formal visual inspections and combined inspections and PAT tests will be carried out by competent persons properly trained and appointed to do so.

There is considerable evidence to indicate that almost 95% of equipment defects can be detected by visual inspection. Furthermore the defective components are most likely to be the plug and flexible cable. The types of checks and tests, by whom they should be carried out and what they should include are outlined in Table 1 below. (This is not an exhaustive list, however it represents a guide to what should be included.

Heads of Schools / Support Services are responsible for ensuring that inspection and test records are maintained. The results of inspection and test will be recorded in the equipment register, and a label indicating the next due date for inspection and test will be attached to the equipment. (See 10 (f) (Competence of PAT testers). Where the equipment's flexible lead is wired into its supply terminals, the label should be affixed to the plug or on the cable adjacent to the plug.

The benefits of keeping records are;

• That it is a useful management tool for monitoring and reviewing the maintenance scheme,
• That it enables managers to demonstrate maintenance does take place, and,
• It provides an inventory of portable and transportable electrical equipment
  which will identify any unauthorised equipment. However, this does not supersede
  any other existing inventory scheme being operated. Where records are stored on
  electronic systems it must be possible to extract a paper copy print out for
  presentation when requested.

Where equipment fails, it should be removed from service, repaired or scrapped.

Table 1

<table>
<thead>
<tr>
<th>Type of testing</th>
<th>Conducted by</th>
<th>To include</th>
</tr>
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</table>
| User checks                     | Person using equipment                            | Damage to cable sheath. Damage to plug. Inadequate joints, including
taped joints in the cable. Damage to the external parts of
the casing of the equipment. Evidence of overheating |
| Formal visual inspections       | Competent person with School / Department / Support Service | Removing the plug and checking the fuse Checking the cord grip is effective
Cable terminations are secure and correct |
| Combined inspection and test    | Competent person with School / Department / Support Service | The correct polarity of supply cables. Correct fusing. Effective termination of cable and cores. That the equipment is suitable for its environment. Any loss of earth or insulation integrity Earth continuity and insulation resistance |

1.2 Visual inspections are carried out on equipment and associated flexible leads and plugs to confirm that;

• they are free from defects,
• they are fitted with a correctly wired and fused plug,
• cable grommets, where fitted, protect cable insulation and prevent significant movement or rotation of the cable,
• there are no exposed conductors live at voltages exceeding 25 V AC or 60 V DC that can deliver 5ma or more,
• where appropriate, it carries the Class II (no earth required) label,
• all control devices function correctly and the equipment performs satisfactorily.
2. PAT testing frequencies

Regular routine PAT testing of portable (and transportable) electrical equipment should be implemented in accordance with the Electrical safety Policy and Code of Practice. The standard interval for testing portable and transportable electrical appliances at Loughborough University is 12 months. However, Schools / Departments / Support Services may decrease or increase this frequency in accordance with their own electrical safety risk assessment, (see Appendix C of the University Electricity at Work policy and code of practice), and standards recommended by the HSE. (See Table 2 below).

Table 2

<table>
<thead>
<tr>
<th>Equipment / environment</th>
<th>User checks</th>
<th>Formal visual inspection</th>
<th>Combined inspection and testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery operated (less than 40 volts)</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Extra low voltage (less than 50 volts AC): telephone equipment, low voltage desk lights</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Desk computers, VDU (DSE) screens</td>
<td>No</td>
<td>Yes, 2-4 years</td>
<td>No, if double insulated, otherwise up to 5 years</td>
</tr>
<tr>
<td>Photocopiers, fax machines; not hand held, rarely moved</td>
<td>No</td>
<td>Yes, 2-4 years</td>
<td>No, if double insulated, otherwise up to 5 years</td>
</tr>
<tr>
<td>Double insulated (Class II) equipment: Not hand held. Moved occasionally e.g. fans, table lamps</td>
<td>No</td>
<td>Yes, 2-4 years</td>
<td>No</td>
</tr>
<tr>
<td>Double insulated (Class II) equipment: Hand held, e.g. some floor cleaners, some kitchen equipment</td>
<td>Yes</td>
<td>Yes, 6 months - 1 year</td>
<td>No</td>
</tr>
<tr>
<td>Earthed equipment (Class 1): Electric kettles, some floor cleaners, some kitchen equipment and irons</td>
<td>Yes</td>
<td>Yes, 6 months - 1 year</td>
<td>Yes, 1 - 2 years</td>
</tr>
<tr>
<td>Cables (leads and plugs connected to the above) and mains voltage extension leads and battery charging equipment</td>
<td>Yes</td>
<td>Yes, 6 months – 4 years depending on the type of equipment it is connected to</td>
<td>Yes, 1 - 5 years depending on the type of equipment it is connected to</td>
</tr>
</tbody>
</table>

(Source: “Maintaining portable electrical equipment in low risk environments” – indg 236 (rev3) HSE))

(Note; PAT testing can be arranged through Facilities Services (FS), who
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have a contract with an external provider. Contact the Electrical maintenance supervisor in FS for further details).

3. Duties of students

Portable (and transportable) electrical equipment brought in by students is the responsibility of the individual(s) concerned. Certain items of electrical equipment are prohibited in Residential Halls. If found, this equipment can be confiscated by the Hall Manager, members of the Warden team, Campus Living staff or the University Health and Safety Service (UH&SS). PAT testing can be carried out on permitted equipment at the request of the student or member of staff. Any equipment found to be causing problems e.g. circuit tripping or damaged, can be PAT tested and if found to be unsafe, removed.

4. Duties of visitors

Equipment belonging to and used by persons visiting the University must be in an electrically safe condition. The University reserves the right to prohibit the use of any electrical equipment brought onto the campus by a visitor which does not appear to meet this requirement. Any equipment found to be causing problems e.g. circuit tripping or damaged, can be PAT tested and if found to be unsafe, removed.

5. Duties of contractors

Equipment belonging to and used by contractors of the University must have a valid PAT test certificate or label attached which is available for inspection upon request by any University employee. If the equipment does not possess relevant safety documentation, it will not be allowed onto the University campus.

6. Duties of competent persons

The competent persons appointed to monitor the equipment must instruct users of hand held or frequently moved equipment with flexible leads to carry out the following pre-use checks on each day of use:

- Socket outlet - is there any sign of surface damage or overheating or missing cover screws?
- Plug – is there any evidence of a cracked case, loose or bent pins, missing cover screws, or cable sheath pulled from cable grip?
- Cable – is there damage to sheath other than light scuffing? There must be no taped joints.
- Equipment – is there damage to the casing or cover screws missing. Is there evidence of misuse, e.g. damage due to water ingress, heat or corrosion.

The competent person responsible for monitoring the condition of the equipment
should repeat the pre-use checks weekly for equipment used by students, and quarterly for other equipment. All defects should be reported and the appropriate action taken.

7. PAT testing equipment

Portable (& transportable) electrical appliances should, apart from specified low risk equipment, be subject to testing utilising a PAT tester. The use of a pass/fail PAT tester is normally acceptable as a minimum requirement for checking the validity of the earth and insulation. In cases following repair, or where more sophisticated specific readings are required, the School or Service may use a more comprehensive form of portable appliance tester capable of producing specific readings.

8. Equipment excluded from PAT testing

Equipment which is rarely moved and is connected by permanent connection or industrial coupler and which has its flexible cable protected against damage due to tension or impact may be treated as part of the fixed installation and therefore can be excluded from a PAT testing regime.

8.1 Equipment operating at voltages less than 25 V AC or 60 V DC can be excluded from test and inspection procedures, providing that the electrical risk assessment shows there is no risk from injury from electric shock, electric burn, electrical explosion or arcing, or from fire or explosion initiated by electrical energy.

9. New equipment to the School / Department / Support Service

Before equipment is taken into service, the competent person appointed to monitor its condition must enter equipment details on the appropriate register and record that a competent person has confirmed that the equipment is:-

- suitable for the intended service environment,
- free from defects and is correctly fused,
- equipped with a serviceable flexible lead manufactured to the relevant standard,
- functioning correctly and has passed the relevant electrical tests.

10. Competence of those undertaking checks and PAT testing

“User checks” will be carried out by person(s) using the equipment. Periodic “Formal Visual Inspections” and “Combined inspection and testing” (See Table 2) will be carried out by competent persons properly trained and appointed to do so.

The periodic inspection and testing of portable (& transportable) electrical equipment (PAT testing), must be carried out by person(s) competent to do the following:-
(a) Avoid the dangers presented by the PAT test and the equipment under test.

(b) Securely isolate the equipment under test from the supply system and safeguard other persons who may be affected by the test.

(c) Visually inspect and electrically test portable (and transportable) electrical equipment and correctly interpret the results of the test and inspection.

(d) Take the necessary action to withdraw defective equipment from service and initiate repairs or scrap it.

(e) Record the results of the inspection and test.

(f) Affix a sticker to the equipment to indicate pass/fail and the next date of inspection.

11. General electrical safety guidance – safe systems of work

11.1 Multi-way plug adaptors, (see picture below), must not be used. Overloaded adaptors can cause overheating from excessive current load and the earth pins on the appliances plugged into them are also vulnerable to incomplete contact, which stops earth faults from blowing the circuit as designed. Where there are insufficient sockets:-

- only individually fused extension leads are permitted, (no multi-way plug adaptors),

- extension leads must not be coupled in series (“daisy chained”). (See picture below.) Where additional distribution of electrical power is found necessary, more socket outlets should be requested through FS.
• Proprietary purpose designed and manufactured desk leads can be used to comply with BS 6396:2008. (MK Ackerman Desk Pods and approved similar specification. (See picture below.)

11.2 Electrical tests will be carried out on the following equipment and associated flexible lead and plug;

   a) Class I (requiring an earth) equipment
   b) Extension leads and extension lead hand lamps
   c) Any equipment including Class II identified at registration as likely to be used in a hostile or conductive environment
   d) Portable (and transportable) RCD’s

PAT tests will consist of the following; For 11.1 (a), 11.1(b) and 11.1(c) above;

11.2.1 An earth continuity test. The maximum pass resistance should be 0.1 ohm or 0.5 ohm for equipment protected at 3 amps or less. The value of test current will be determined at registration. For electronic equipment it will be 0.1 Amps. For electrical equipment it will be 1.5 times the protective device rating of the equipment. Where test instruments deliver a 25 amp test current, care must be taken that such current does not damage equipment supply cables.

11.2.2 An insulation test at twice the operating voltage. The minimum pass resistance should be 1meg ohms.

11.2.3 Flash tests should not be used as a routine practice. FS can provide
further advice.

For 11.1 (d) above:

11.2.4 Portable RCD’s should be tested by using the test button provided and checked for tripping times and tripping current accuracy using an RCD test instrument.

11.3 Electrical tests may be carried out using portable (& transportable) appliance testers which conform to the current BS EN 61010-2-201:2013, “Safety requirements for electrical equipment for measurement, control and laboratory use. Particular requirements for control equipment”. All new equipment should comply with this or an equivalent standard. Equipment predating this standard is not necessarily unsafe. PAT testers for departmental use can be of the simple ‘pass-fail’ type.

11.4 FS and some departments possessing the necessary expertise will keep one or more PAT testers capable of applying all appliance standard tests including flash tests and giving measured results. Equipment that fails the simple pass-fail test will be subjected to diagnostic testing using such PAT’s. Test equipment itself is portable (& transportable) equipment and subject to this CoP. PAT testing equipment should be calibrated in line with control measures identified by the risk assessment.

11.5 Work on University electrical services by Schools / Support Services is not permitted. Such work is only to be carried out by, or through FM.

Work on portable (& transportable) electrical equipment belonging to Schools / Support Services, including experimental rigs, is the responsibility of the relevant School / Support Service.

All work must be done with the system securely isolated from its supply and all conductors discharged to earth potential, except when live diagnostic testing and the use of measuring instruments for carrying out minor adjustments is required.

Secure isolation will be achieved by the most convenient means, such as locking of isolators and labelling (Lock out tag out LOTO), that ensures:- (a) that the system cannot be re-energised until the persons doing the work and their tools and equipment are withdrawn from the system, and (b) all persons likely to be affected are informed that the system is to be re-energised.

11.6 Where risk assessments have identified other associated hazards, e.g. radiation, chemical, laser etc., precautions shall be taken in accordance with other relevant University Policies, CoP or guidance.

11.7 To prevent damage and / or injury during testing, safe arrangements must be made for the disconnection of equipment such as IT equipment, lasers and optical fibre systems during checks and testing.
11.8 Training

11.8.1 Heads of Schools / Departments / Support Services and all other persons with responsibilities under this guidance, (except students), must be familiar with their duties under the Regulations and Section 3 of the University Electricity at Work policy. Familiarity with legal duties can be achieved by reference to the H&SS, it’s website, published guidance, and other publications such as the University newsletter; “Health & Safety matters”, e-bulletins and attending training courses and seminars, or by personal study. It should be noted that it is a legal requirement that managers and supervisors must be familiar with any risks associated with the use of equipment in their departments or sections.

11.8.2 Copies of statutory Instruments, codes of practice, guidance notes etc., referred to in this Policy and CoP, must be made available to all University employees having duties in respect of this guidance, should they request them.

11.8.3 Persons appointed to monitor portable (& transportable) electrical equipment must be competent. Any formal training given should be entered on the person’s training and employment records.

11.8.4 All users of electrical equipment must be instructed in its safe use by a competent person. For equipment with no special risks, reading the manufacturer’s instructions for use will be adequate.

11.8.5 Users of equipment that may contain or produce special risks must be formally trained by a competent person, to avoid danger.

11.8.6 Where people are at greater risk of electric shock, and therefore may require emergency resuscitation or treatment for electrical burns, the provision of specialized training for first aiders should be provided. The departmental electrical safety risk assessment and/or the first aid risk assessment will inform the decision on the number of first aiders to receive this additional training. (For further information on electrical first aid training courses contact the UH&SS on 222181 or email; hse@lboro.ac.uk).

Document management table

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<td>Electrical Safety Policy review</td>
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