The Institution of Engineering and Technology

The safe use of electrical work equipment at home

theiet.org/engineering-safety

1. About this guide

This document has been created by the Institution of Engineering and Technology (IET) to provide guidance on using electrical devices safely when working from home.

Information on the different kinds of devices that need to be monitored and maintained is provided. In addition, we share guidance on who should perform checks and processes that can be put in place to mitigate potential safety risks.

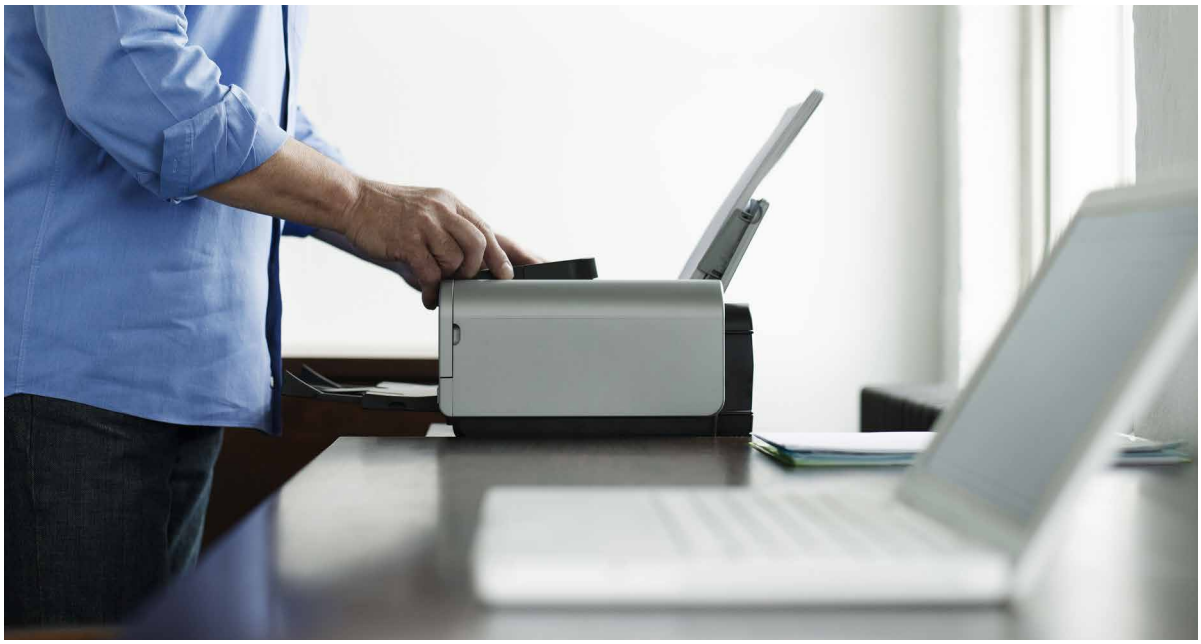
Both employers and employees have responsibilities to confirm that electrical equipment provided for use at home is used safely, and inspected or maintained for safety.

It is important to note that employers do not have a responsibility for employees' own equipment used in their own home, or for their electrical installation itself. The highest risk electrical equipment used in the home is more likely to be domestic equipment, rather than work supplied equipment. More information on general electrical safety around the home can be found at Electrical Safety First[1].

The safe use of electrical work equipment at home is published by the Engineering Safety Policy Panel at the Institution of Engineering and Technology.

[1] https://www.electricalsafetyfirst.org.uk/
[2] https://www.hse.gov.uk/

2. Regulatory and legal background



Most countries have regulations in place for the safety of workers. In essence, the legal duties placed upon employers and employees are largely the same whether an employee is working from home or in the office. It is clearly much easier for an organisation to maintain electrical equipment in the workplace than in employees' homes. However, regardless of the location, such maintenance is still necessary. Employers should have procedures in place that provide the necessary guidance and framework that enable employees to comply from wherever they work.

Such a procedure needs to:

- Inform and provide guidance to employees on how to safely check electrical equipment away from the office.
- Provide a framework for risk assessment.
- Enable a formal system of record keeping.
- Provide clarity on equipment that must be inspected in the workplace.
- Provide a 'help line' to assist with any queries.
- Instruct employees on how to deal with end-of-life disposal of equipment.

The employee needs to:

1. Be confident in carrying out simple user checks and visual inspections of electrical equipment.
2. Complete a generic risk assessment that includes periodic user checks and visual inspections of equipment, a record of the location of working, for example kitchen table vs study, as well as a 'reminder' of possible hazards such as trailing cables, children, pets, lighting.

3. Understanding electrical devices

The electrical maintenance activity required depends on the type of electrical equipment and the environment in which it is used. Battery powered equipment (such as laptops, mobile phones or removable batteries in tools) generally need little more than a good visual inspection to make sure that there is no physical damage. This is as long as they are being used and charged in accordance with the manufacturer's instructions.

Electrical equipment connected to ordinary domestic power sockets operating on mains voltage (230V) typically falls into two distinct safety classes:

Class I

Class I

This type of equipment usually has a metal case that is connected to the safety earth. If a fault develops with the equipment, the earthed metal case helps provide protection by causing the fuse to blow or the circuit breaker (trip switch) in the premises to operate.

Class II

Double insulated can be used without an earth wire

Class II

Class II equipment is also known as 'double-insulated' equipment. This type of electrical equipment has been designed with extra insulation to protect against accidental exposure to live parts — even if there is a catastrophic internal failure. It also does not require a safety earth connection. This type of equipment should generally never be repaired or modified in any way.

Both classes of electrical device will require visual and sometimes more thorough checks (such as electrical tests) to verify that the integrity of the protection is maintained. However, Class II equipment typically presents less of a risk and a visual inspection is often sufficient.

It is never advisable to daisy-chain multiple extension leads together, nor to overload multi-way blocks. The circuit must never be overloaded, for example in the UK the maximum permissible load on a domestic circuit is 13 amps. Some extension leads are not suitable for this type of continuous load.

Modern 13A plugs and sockets are conservatively rated but can inadvertently be overloaded by the combined cumulative application of several small loads through socket adaptors or multi-way sockets on extension leads. The Electrical Safety First site provides an animated socket overload calculator[3].

Through user checks and visual inspections, a general impression of the safety of modern electrical equipment can be accurately determined. More involved electrical testing will be required periodically for Class I equipment. However, for most common Class II equipment such as mobile phone chargers or laptop power supplies, which rely on robust electrical insulation, a good visual inspection to check for damage to the casing is often sufficient.

It must be remembered that with modern electrical and electronic equipment there can be dangerous voltages in small items of equipment. All plug and socket connections, such as USB connections, and not just the mains connection lead, must be maintained in a good condition.

A regime of user checks and visual inspection is given in Appendix 1.

[3] https://www.electricalsafetyfirst.org.uk/overloadingsockets

4. In-service inspection and testing of electrical equipment

In-service inspection and testing is a more formal approach to the user checks and visual inspections described here. It was formerly commonly referred to as Portable Appliance Testing (PAT). This formal approach goes beyond the visual checks and will typically include various electrical tests designed to check the integrity of the safety measures used by the equipment, such as the connection to earth of the metal casing in Class I equipment.

Despite common misconceptions, this work does not need to be carried out by an experienced electrician. However, proper training and adequate test instruments are required if the work is to be carried out properly, effectively and safely.

Even if portable electrical equipment is passed by someone doing the formal inspection and testing, it is still important for users to carry out the checks as described.

The IET Code of Practice for In-Service Inspection and Testing of Electrical Equipment[4] provides guidance on how to assess the risk of equipment damage, and other factors that can be used to assess a reasonable period for maintenance. It also provides more detailed information on electrical maintenance generally, including record keeping and reporting.

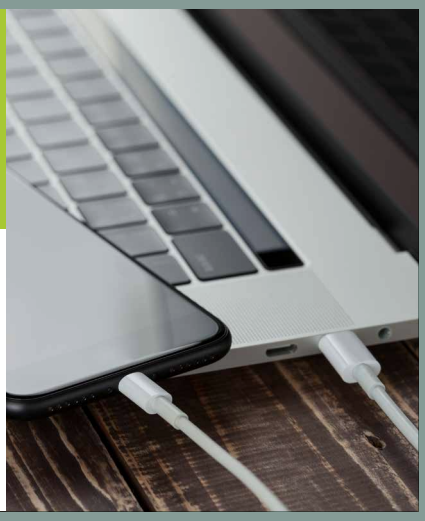
The UK Health and Safety Executive (HSE) has further information on equipment testing on their website[5]. There is also a useful guide on maintaining equipment[6] along with frequently asked questions[6].

[4] https://shop.theiet.org/code-of-practice-for-in-service-inspection-and-testing-of-electrical-equipment-5th-edition
[5] https://www.hse.gov.uk/electricity/index.htm
[6] https://www.hse.gov.uk/pubns/indg236.pdf
[7] https://www.hse.gov.uk/electricity/faq-portable-appliance-testing.htm

5. Conclusion

Employers are responsible for the safety of electrical work equipment that they provide to employees for use at home. Employees must use this equipment as instructed and take care of it to prevent damage.

Employees must also routinely inspect the equipment including the power supply, power lead and plug for any signs of physical damage. The employer should periodically remind their employees to do this and tell them what to look for. Modern work equipment, especially double-insulated equipment, is extremely safe to use provided that this is done in accordance with the manufacturer's instructions and the guidance in this document.



6. Appendix 1: User checks

User checks require very little formal training. They should always be done before using any electrical equipment, and preferably while the device is unplugged.

Users of particular pieces of equipment are best placed to check the device as they are typically the most familiar with it. Checks include:

- Any exposed wiring along the length of the flex, especially where plugs and power leads meet. Be sure to check the entirety of extension leads.
- Damage to power plugs, including their casing and plug pins.
- Damage to power leads, such as fraying, cuts or exposed wiring.
- Visual signs of overheating, such as burn marks on plug casings and power leads.
- Damp or dusty plugs/equipment, or evidence that items have been stored in environments where they could have been exposed to these hazards.
- Ensuring that the power lead of each item of equipment has a separate plug fitted.
- Making sure that all packaging such as labels have been removed from plugs before use.
- Consideration of the environment in which the equipment is located, for example equipment or extension leads that could be damaged by being trapped by furniture.

After initial user checks have been performed and the electrical device is plugged into a power socket and switched on, users should remain vigilant of:

- Any burning smells.
- An intermittent loss of power.
- Any signs of distress such as plugs, sockets or cables that are hot to the touch, or crackling sounds.

Visual inspection

Unlike user checks, visual checks do require some basic knowledge, but you don't need to be an experienced electrician to carry them out. A simple training programme can be implemented to help further educate employees so that they can undertake more detailed visual checks.

Before carrying out a visual inspection, an assessment should be made as to whether:

- The user has previously noticed or reported any issues.
- The electrical equipment is suited for the job it's being used for.
- There have been any changes in how or where the equipment is being used.
- Portable electrical equipment is being used properly as per the manufacturer's guidelines.

The visual inspection should begin with the standard user checks:

- Is the equipment case in good condition and complete without any cracks or missing parts?
- Does the equipment on/off switch and all controls operate freely without sticking?
- If there are signal cables as well as power, for example to a computer screen, are these also in good condition without any damage?

Nowadays much equipment has a 'moulded on plug' in which case only an external visual inspection is possible. If there is a rewireable plug and there is evidence of external damage, such as cracks, pulled cord or exposed wiring, the device should be returned to the workplace for inspection and repaired by a qualified person. Users should not remove the plug cover themselves. Likewise, if a fuse requires replacement, report this defect and contact a suitably qualified person at the workplace about the procedure for replacement.

The visual inspection should check:

- For a properly secured cord/cable grip – the coloured conductors should not be visible.
- For any signs of overheating, water damage, cracks or other plug damage. If you are not sure of anything the device should be returned to the workplace for inspection and any repair.
- That there is no damage to the flexible cable – repairs with PVC tape are unacceptable and if there are any the device should be returned to the workplace.
- That all other plugs and sockets such as data leads and USBs are also in good condition and undamaged.

7. Acknowledgements

We would like to thank the working group responsible for compiling this fact file, under the remit of the Engineering Safety Policy Panel.

The Panel welcomes any comments that you have on the contents of this guide, and your ideas for future work on this theme. Please get in touch by emailing **sep@theiet.org**.

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