

# THE INSPECTION OF PORTABLE ELECTRICAL EQUIPMENT



## Introduction

This document, provides a mechanism by which departments can fulfil their duty to assess and manage portable electrical equipment testing.

This guidance will assist departments in ensuring that their portable electrical equipment is safe to use and complies with the legal requirements of the Electricity at Work Regulations 1989. Departments may use alternative methods to those set out in this guidance but if so will have to show that they complied with it in some other way.

This guidance and Appendices have been drawn up by Safety Services making use of guidance issued by the Health and Safety Executive and other “best practice” where appropriate. The guidance applies to all workers (including students) who use portable electrical equipment in their work as well as to maintenance staff, service engineers, visitors, cleaners etc.

Any reference to a regulation is a reference to the [Electricity at Work Regulation 1989](#).

## Responsibility

The responsibility for any piece of portable electrical equipment connected to the mains supply or any independently powered piece of equipment lies with the Head of Department to which it belongs.

The following are the responsibility of the Estates and Facilities Division:

- Electrical supply insulation up to and including 13 amp sockets, insulators or fused switchboards and
- Fixed installations such as fume cupboards, cold rooms, built-in air conditioning units, etc

# Scope

This guidance aims to:

- set health and safety standards for work with portable electrical equipment.
- give information on identifying levels of risk and control measures, and
- provide practical advice on how the standards may be met and ways in which any significant risk can be reduced to an acceptable level.

# Application

This guidance is relevant to all who work with portable electrical equipment or have responsibility for those who do.

# The Risk

Safety Services has considered the risk to those working with portable electrical equipment and concludes that faulty equipment can cause electric shock, burns and can lead to fires and/or explosions.

This guidance therefore aims to provide a framework for optimum control of the hazards of portable electrical equipment and the risk to all persons using electrical equipment.

## 1 Definitions

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1.1

### Electrical Equipment

*Anything used, intended to be used or installed for use, to generate, provide, transmit, transform, rectify, convert, conduct, distribute, control, store, measure or use electrical energy'. (Electricity at Work Regulations 1989, Regulation 2 1)*

Guidance

1.1

### Categories of Electrical Equipment

All electrical equipment falls into the following categories:

#### Basic Insulation

Insulation applied to live parts to provide basic protection against electric shock and which does not necessarily used exclusively for functional purposes.

#### Class I Equipment

Equipment in which protection against electric shock does not rely on basic insulation only, but which includes means for the connection of exposed-conductive parts to a protective conductor in the fixed wiring of the insulation.

#### Class II Equipment

Equipment in which protection against electric shock does not rely on basic insulation only, but which additional safety precautions such as supplementary insulation are provided, there being no provision for the connection of exposed metalwork of the equipment to a protective conductor and no reliance upon precautions to be taken in the fixed wiring of the insulation.

All class II appliances are marked with this symbol.



#### Class III Equipment

Equipment in which protection against electric shock relies on the supply from a separate extra-low voltage, such as an isolating transformer.

**Portable electrical equipment**

*Equipment that has a lead (cable) and plug and which is normally moved around or can easily be moved from place to place.*

The following equipment types are regarded as portable for the purposes of this guidance.

**Portable appliance**

An appliance of less than 18 kg in mass that is intended to be moved while in operation or an appliance which can easily be moved from one place to another. E.g. toaster, food mixer, vacuum cleaner, fan heater.

**Moveable equipment**

- 18kg in mass and not fixed e.g. electric fire
- equipment with wheels, casters or other means to facilitate movement by the operator as required to perform its intended use, e.g. air conditioning unit.

**Hand-held appliances or equipment**

This is equipment intended to be held in the hand during normal use, e.g. hair dryer, drill, and soldering iron.

**Stationary equipment or appliance**

The equipment has a mass exceeding 18 kg and is not provided with carrying handles e.g. refrigerators, washing machines.

**Fixed equipment or appliance**

This is equipment or appliance which is fastened to support or secure in a specific location, e.g. bathroom heater, tower rail.

**Extension leads**

These should be avoided where possible. If used they should be tested as portable appliances. It is recommended that 3 core leads be used. An extension lead must not exceed 13 Amps.

1.2

**A standard 13A 3 pin extension socket-outlet with a 2-core cable should never be used even if the appliance to be tested is Class II, as it would not provide protection against electric shock if used at any time with an item of Class I equipment.**

**2**

## **Setting up a system**

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*The Head of Department must ensure that a system is set up for the checking of all portable electrical equipment. The elements of such a system are:*

2.1

- *drawing up an inventory of equipment;*
- *user checks;*
- *risk assessment to determine frequency of formal visual inspections;*
- *formal visual inspections.*

**3**

## **Producing an inventory**

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*The Head of Department must ensure that a list is drawn up a list of all portable electrical equipment held by the Department.*

3.1

Guidance

Ideally this should not be the role of one person but a joint effort undertaken by designated individuals in each area of the Department. Each designated person will add his or her findings to a centrally held inventory which is probably best kept electronically. An example of a suitable inventory is at Appendix 2 and Appendix 3.

3.1

**4.**

## **User checks**

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*Before using any electrical equipment for the first time and thereafter at periods determined by a risk assessment the user should look critically at the electrical equipment they intend to use, and visually check that the portable electrical equipment is in good condition.*

4.1

Guidance

**Unplug the equipment from the mains supply and check the following:**

### **(1) The plug:**

Check the following:

- Is it securely connected to the appliance cable?
- Are there any inner wires showing?
- Are all the pins secure?
- Are any of the pins bent?
- Is there any visible evidence of overheating such as blackening of pins or burn marks on the casing?

**(2)The cable:**

Check the following:

- Is it secure at both ends?

Note: It may be impractical to remove the casing of a piece of equipment to verify that the internal connections are correctly clamped. All that is required is an external inspection to make sure the cable is not obviously badly connected or poorly anchored.

- Are any inner wires visible?
- Is it frayed, damaged or broken in any way?
- Are there any taped joints?
- Is outer sheath gripped where it enters the plug or equipment?

**(3)The equipment:**

Check the following:

- Is the equipment suitable for its location?
- Is it being used for its intended purpose as prescribed by the manufacturer; (this should also be addressed in any Risk Assessment).
- Are there any loose parts or cracks in the casing of the equipment?

If you answer no to any of the above questions or you are in anyway unsure about the equipment do not use it and seek further advice from a competent electrician.

## 5

### Risk assessment to determine frequency of testing

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*A risk assessment must be conducted on all portable electrical equipment to determine the frequency of user checks and formal visual inspections. Such risk assessments are to take account of how the equipment is used and the environment in which it is used.*

5.1

Guidance

The following table is for guidance only you must also take into account where and how the equipment is used

Equipment	User Checks	Formal Visual Inspection
Multi-user hand held tools: e.g. Electric drills, Soldering Irons, Hot plates, Extension blocks Vacuum cleaners Floor Cleaners Irons Kettles Hair dryers	Before use	3 Months
Toasters Coffee machines Microwaves cookers Portable heaters Vortex mixers	Weekly	3 Months
Undergraduate laboratory class and test equipment,	Before use	Every Term
Slide projectors Laminators Fans Desk / Table lamps	3 Months	1 year
Sport centre equipment (Running, Step and Cycling machines etc).	N/A (Sport centre staff to check daily)	3 Months
Computers TV/Videos Fax Machines Type writers	1 year	2 years
Floor mounted domestic appliances (Fridges, Freezers etc)	1 year	2 years

5.1

Guidance

#### Frequency of testing

The results of the risk assessment should be kept on a log such as that given at [Appendix 2](#) or [Appendix 3](#) which also acts an inventory of the portable electrical equipment within the department.

5.2

## 6

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#### 6.1

#### Guidance

## Formal visual inspection

*All items of portable electrical equipment must be formally visually inspected at the start of the scheme and subsequently at the frequency determined by the above risk assessment.*

Formal visual inspections should only be carried out by a competent person who has received appropriate training and who has sufficient knowledge to recognise what is unacceptable.

A formal visual inspection involves checking the plug, cable and the outer casing of the equipment in more detail than for a 'user check'

### (1) Unmoulded plugs:

Check the following:

- Are the wires attached to the correct terminals?



A correctly wired plug.

Live (L) \_\_\_\_\_ **Brown**  
Neutral (N) \_\_\_\_\_ **Blue**  
Earth (E) \_\_\_\_\_ **Green** and **Yellow**

- Are any bare wires visible other than at the terminals?
- Are the terminal screws tight?
- Is the plug firmly clamped to the outer sheath of the cable?
- Is the plug fitted with the appropriate fuse?

Note: The appliance plug should be fitted with the correct sized fuse and you should refer to the manufacturer's instructions or appliance rating label for this information. If the manufacturer's label only gives the power rated in Watts, use the following formula as a guide.

Watts divided by Voltage = Amps

E.g. 3 kW (3000W) divided by 240V = 12.5 Amps.

Therefore a Kettle with a 3kW rating will require a 13 Amp fuse.

<b>3 amps or less</b>	<b>Use a 3 amp fuse</b>	<b>Red Fuse</b>
<b>Between 3 and 5 amps</b>	<b>Use a 5 amp fuse</b>	<b>Black Fuse</b>
<b>Greater than 5 amps</b>	<b>Use a 13 amp fuse</b>	<b>Brown Fuse</b>



5 amp Fuse



13 amp Fuse

- Are there any signs of internal damage, overheating or entry of liquid, dirt or dust?
- Is the flex securely attached to the flex-grip of the plug by its primary insulation?

### **Moulded plugs:**

It is only possible to check the fuse in such plugs which should be removed and the rating checked as above.

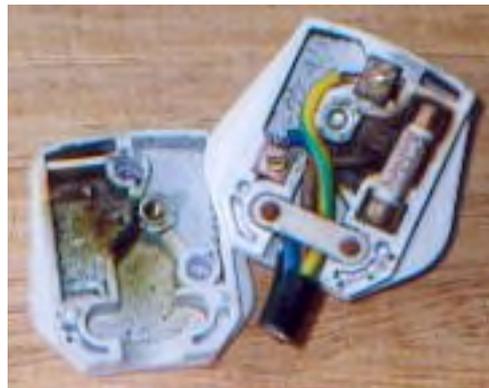
If the answer to any of the above is No the following actions should be taken:

- (1) Rewire an incorrectly wired plug.
- (2) Replace an incorrect fuse with one of the correct rating for the equipment.
- (3) Replace a burnt or scorched plug.
- (4) Replace either a faulty flex-grip or the plug as appropriate.
- (5) Tighten any loose screws.

When replacing a plug ensure that the replacement is of the type where the two shorter pins are both partially insulated.

Guidance on how to wire a plug is at [Appendix 1](#),

**These dangerous plugs were in use until testing was carried out.**



**Overheated plug**



**Broken plug**



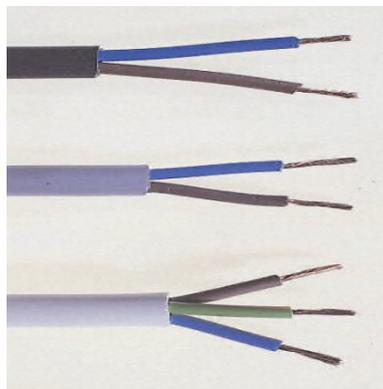
**A badly burnt plug**

**(2) The cable**

Check the following:

- Is the outer insulation undamaged?
- Is the outer insulation gripped within plug (where applicable)
- Is the outer insulation gripped at entry point to the equipment (Where applicable)
- Is the cable of the correct diameter for current rating of the equipment?

Nominal conductor csa (mm <sup>2</sup> )	Nominal conductor Resistance at 20 °C (mΩ/m)	Max current (A)	Approx No of wires in conductor
0.5	39	3 amp	16
0.75	26	6 amp	24
1.0	19.5	10 amp	32
1.25	15.6	13 amp	40
1.5	13.3	15 amp	30
2.5	8	20 amp	50
4.0	5	25 amp	53



Examples of cables

If the answer to any of the above is No remove the piece of equipment from use and either replace or repair it.

### (3) The equipment

Check the following:

- Is there any damage that exposes electrical components?
- Are there any breaks/cracks in casing?
- Are all securing screws or fixing present?
- Is the correct fuse fitted (where applicable)?
- Are cooling vents unblocked (where applicable)?
- Are any connecting sockets undamaged?

If the answer to any of the above is No remove the piece of equipment from use and either replace or repair it.

If you are satisfied with the inspection:

- Label the equipment with a 'Pass Label' indicating when it is next due for inspection.
- Record findings/actions in the inventory

If you are unsure about any of the above, there is bad damage or you cannot reconnect any loose plugs you must **fail** the appliance for the visual test. Apply a '**Do Not Use**' label and seek further advice from a competent electrician.

**Do not continue the electrical test if the appliance has failed the visual inspection until repairs has been made.**

**Under No Circumstances Should Any Appliance That Has Failed Either Test Be Allowed Back Into Service Until It Has Been Repaired.**

6.1

## 7

### Training and information

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*Departments should ensure that all staff and students working with electrical equipment receive information, instruction relevant to the electrical equipment and systems they will use for their work.*

*New staff and students should receive such instruction and information as is necessary for them to work safely.*

7.1

Guidance

Training may take the form of:

- familiarisation with codes of practice, local rules, operational procedures etc
- at the bench instruction
- working under supervision until competence is attained.

7.1

Guidance

The purpose of instruction and training is to ensure that staff and students working with electrical equipment do not put themselves or others at risk.

Instruction and training should include;

- how and when to use electrical equipment
- how to carry out the tests;
- what to do if the equipment fails;

Training should include elements of theory and practice.

Details of the information, instruction and training provided should be recorded and signed for when completed.

7.2

## 8

### Record keeping

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*Written records of this training must be kept covering the individual workers and the topics covered in their training.*

8.1

Guidance

The Head of Department is responsible for ensuring that records relating to staff, equipment and work activities are maintained.

Such records will include:

- significant findings of the risk assessment;
- the results of Inspections and testing;
- maintenance of equipment etc.; routine and as a result of faults;
- the results of inspections that have been carried out;
- the information, instruction and training that has been given to individuals.

Copies of these records may be passed to the Departmental Safety Officer for Departmental Records. The DSO is *not* responsible for maintaining the records which form part of the supervisor's management of the work.

8.1

## 9

### Management responsibility, supervision and other duties

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#### Head of Department

*The Head of Department is responsible to Provost and Council for ensuring that a safe system is in place for the management of portable electrical equipment within the Department in accordance with the UCL Statement of Safety Policy and the Departmental Statement of Safety Policy (DSSP)*

9.1

Guidance

The duties of the Head of Department for ensuring the safe management of portable electrical equipment are the same as those for all other aspects of safety management as described in the UCL Statement of safety Policy. The Head of Department authorises particular staff to work with, or supervise work with electrical equipment, based on that individual's competence. The Head must appoint a Departmental Safety Officer (DSO) to assist in monitoring the department's compliance with this guidance.

9.1

COP

#### Managers and supervisors

*The Head of Department normally delegates the duty to ensure safe working with electrical equipment to research group leaders and/or other senior departmental staff appropriate to the local departmental arrangements. These management duties include assessment of risk and ensuring the implementation of the risk control measures required by their assessments. It is the duty of the person supervising the work to ensure that all staff students and visitors are informed of any precautionary measures they must observe.*

9.2

Guidance

9.2

This delegated duty is the normal pattern for the supervision of work. If the manager/supervisor is absent from the department they should delegate the day-to-day management of the work to a named member of the team who is suitably skilled and experienced to carry out the necessary management duties.

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9.3

### **Staff and students**

*Staff and students engaged in work with portable electrical equipment must co-operate with precautions derived from risk assessments.*

*All Staff and students are responsible for taking sensible precautions concerning their own safety and that of others. (note: This duty applies to occupational visitors to the Department)*

Guidance

9.3

These duties are in accordance with, and do not exceed, the duties imposed on employees under s. 7 of the Health and Safety at Work Act 1974. Graduate students are treated for the purposes of this guidance as if they were employees. Visitors to the Department who are undertaking work should be treated as if they were employees (see also below).

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9.4

### **Departmental Safety Officer**

*The departmental safety officer (DSO) is appointed by the Head of department (HOD) and advises the Department in all matters relating to the safety. Where appropriate (e.g. the department exists on more than one site), it may be necessary to appoint one or more deputies. The DSO is the main point of contact for the departments regarding safety issues.*

Guidance

9.4

The HOD must appoint a Departmental Safety Officer (DSO) to assist in monitoring the department's compliance with this guidance.

It is not the duty of the DSO to conduct risk assessments or Inspections but to ensure that they have been carried out and to bring to the attention of the Head or departmental management any non-compliance with departmental arrangements for safe working with portable electrical equipment.

COP

9.5

### **Visitors**

*Visitors engaged on work involving portable electrical equipment must observe the risk control measures required as a result of the risk assessment, and take due care for their own safety and that of others.*

Guidance

9.5

Visitors are non-departmental employees including contractors, maintenance workers, cleaners, etc. (though they might be UCL employees) who may be permitted to enter the Department.

Visitors (including observers, contractors, etc.) should be provided with relevant safety information including the precautions necessary to ensure their safety while on site

## APPENDIX 1

### How to Wire a Plug Correctly



A high percentage of accidents with electricity are caused by faulty or incorrectly wired plugs. The correct wiring of a plug is extremely important for your own safety and the safety of others. The following guidance covers the two most common types of plug used in the UK - the 3-pin, 13 Amp plug and the 2-pin, 16 Amp side-earth plug.

#### Prepare the plug.

1. Remove the cover and loosen the screws of the cord grip
2. Loosen or remove the screws from the brass terminals

#### Prepare the flex.

1. Measure the flex against the plug and strip the outer covering back as far as the cord grip, taking care not to cut through the coloured insulation on the wire strands.
2. If the coloured cables have to be trimmed, ensure that they are long enough to reach the terminals without straining: allow for a little slack on the green/yellow earth wire.
3. Strip about 10 mm (1/2 inch) of the coloured insulation from each core.

#### Fixing flex to the plug

##### Remember the colour code

**BROWN** to the LIVE (L) terminal;  
**BLUE** to the NEUTRAL (N) terminal  
**GREEN / YELLOW** to the EARTH (E) terminal.

1. Pass the flex under the loosened cord grip
2. Twist the exposed wire strands of each core between the finger and thumb so that there are no loose strands;
3. If the plug has clamp terminals wrap each core around the appropriate terminal; place the washer on top of the twisted wire and tighten the screw nuts firmly. Make sure that the coloured insulation is not pinched under the terminal clamp.
4. If the plug has pillar terminals, then double the twisted bare wire back on itself for about 5 mm and insert it fully into the hole in the appropriate terminal. Tighten the terminal screw firmly on the wire.
5. Tighten the cord grip screws, making sure that the cord grip is clamped on the full outer covering of the cable and not on the inner cores.
6. Replace the cartridge fuse in 13 Amp plugs with an appropriate sized fuse - a blue 3-Amp fuse for lights and small appliances; a brown 13-Amp fuse for larger appliances and heaters.
7. Replace the cover.

**N.B.** If the appliance has a moulded plug fitted this cannot be opened or rewired. If it is damaged or faulty, it should be cut off and a new plug fitted as described above.

#### Appliances with 2-core flexes

The two cores should be connected to the appropriate LIVE and NEUTRAL terminal; the EARTH terminal is not used in this case.

## APPENDIX 2

## Electrical equipment

### Example of an Inventory

Location... *1<sup>st</sup> Floor ...* Room... *102*  
 Inspection date... *March 2003.....*

Building... *Brook House...*  
 Inspected by... *Colin Skeete*

Description or ID code	Plug	Plug /cable fixing	Equipment casing	Switches	No suspect reports
<b>Kitchen</b>					
Microwave (or ID code)					
Coffee percolator					
Kettle					
Toaster					
Fridge					
<b>Main office</b>					
Laminator					
Charger					
Fan 1					
Fan 2					
Fan 3					
Ext. block 1					
Ext. block 2					
Ext. block 3					
<b>X Office</b>					
Fan 4					
Ext Block 4					
<b>Y Office</b>					
Fan 5					
Ext block 5					
<b>Z Office</b>					
Fan 6					
Ext block 6					
<b>Common room</b>					
Television					
Video					
Fan 7					
Fan 8					
Ext block 7					



## APPENDIX 4

### Legislative framework

#### Health and Safety at work Act 1974

Duty of care upon both employers (Section 2, 3 and 4) and employee (section 7) to ensure the safety of **all** persons using the work premises. This includes the self-employed.

**Management of Health and Safety Regulations 1999** (The dangers must be identified and a risk assessment made)

*“Every employer shall make a suitable and sufficient assessment of:*

- (a) The risk to the health and safety of his employees to which they are exposed whilst they are at work and*
- (b) The risks health and safety of persons not in his employment arising out of or in connection with the conduct by him of his undertaking”. Reg. 3(1)*

**Provision and Use of Work Equipment Regulations (PUWER) 1992** (The equipment must be suitable for the purpose)

*“Every employer shall make sure that work equipment is so constructed or adapted as to be suitable for the purpose for which it is used or provided” Reg.4(1)*

*The Provision and Use of Work Equipment Regulations 1998 (PUWER) covers most risks that can result from using work equipment. With respect to risks from electricity, compliance with the Electricity at work regulations 1989 is likely to achieve compliance with PUWER regulations 5-9, 19 and 22.*

PUWER only applies to work equipment used by workers at work. This includes all work equipment (fixed, portable or transportable) connected to a source of electrical energy. PUWER does not apply to the fixed installations in a building.

**Electricity at Work Regulations 1989** (All equipment must be constructed and maintained so that it is not dangerous)

*“As may be necessary to prevent danger, all systems shall be maintained so as to prevent, so far as is reasonable practicable, such danger” (Regulation 4(2))*

*“Systems’ means an electrical system in which all the electrical equipment is, or may be electrical equipment is, or may be electrically connected to a common source of electrical energy and includes such equipment” (Regulation 2(1))*

*“Electrical equipment includes anything used, intended to be used or installed for use, to generate, provide, transmit, transform rectify, convert, conduct, distribute, control, store, measure or use electrical energy”. (Regulation 2(1))*

## **Scope of the legislation**

It is clear that the combination of the Health and Safety at Work etc Act 1974, the Provision and Use of Work Equipment Regulations 1998 and the Electricity at Work Regulations 1989 apply to all electrical equipment used in, or associated with, places of work. The scope extends from distribution systems, be they 400 kV or simply those in buildings, down to the smallest piece of electrical equipment such as a hairdryer, a VDU, a telephone or even in some situations battery-operated equipment.

## **Responsibility**

Everyone at work has their responsibilities including, in certain circumstances, trainees. However, because of the all-embracing responsibilities of all persons this does not minimise the duties of particular persons. Regulation 3 of the Electricity at Work Regulations recognises a responsibility (control) that employers and many employees have for electrical systems.

*“It shall be the duty of every employer and self-employed person to comply with the provisions of these regulations in so far as they relate to matters which are within his control.*

*It shall be the duty of every employee while at work:*

- (a) to co-operate with his employer so far as is necessary to enable any duty placed on that employer by the provision of these Regulations to be complied with and*
- (b) to comply with the provision of these Regulations in so far as they relate to matters which are within his control”.*

The Provision and Use of Work Equipment Regulations 1998 requires every employer to ensure that equipment is suitable for the use for which it is provided (Reg. 4 (1) and only used for work for which it is suitable (Reg. 4(3)). They require every employer to ensure equipment is maintained in good order (Reg. 5) and inspected as necessary to ensure it is maintained in a safe order (Reg. 6)

## **Maintenance**

Regulation 4 (2) of the Electricity at Work Regulations 1989 states:

*“As may be necessary to prevent danger, all systems shall be maintained so as to prevent, so far as reasonably practicable such danger”*

Regulation 5 of the Provision and Use of Work Equipment Regulations 1998 states:

*“Every employer shall ensure that work equipment is maintained in an efficient state, in efficient working order and in good repair”*

## **Inspection**

The Provision and Use of Work Equipment Regulations 1998 include a specific requirement that where the safety of work equipment depends on installation conditions, and where conditions of work are liable to lead to deterioration, the equipment shall be inspected (Reg. 6).