

# Safe use of Work Equipment

The Provision and Use of Work Equipment Regulations (PUWER) 1998 provides the main legal requirements relating to work equipment and are supported by other related specific regulations and guidance. PUWER can be considered as covering two related aspects of safety with work equipment, namely its management aspects and its physical characteristics.

The management aspects of work equipment include selection of work equipment which is suitable for the task, its maintenance and the provision of the users with information, instructions and training to enable them to use it safely.

The physical characteristics to be considered include machinery guarding, protection against a number of other specified hazards and extremes of temperature. There are also requirements relating to operating controls, stop controls and emergency stops, with means of isolation if necessary. Similarly there are requirements for its stability, the level of lighting and the ability for it to be safely maintained. Markings and/or warnings also need to be provided for and residual hazards. In essence, its fitness for purpose for its proposed use.

## Management aspects

### Selection and suitability

The cause of many accidents is attempting to use work equipment for a purpose for which it has not been designed. For example, it is possible to cut a rebate using a circular saw, but this is a highly dangerous operation and the correct equipment for this would be a vertical spindle moulding machine which can be guarded to a better standard. Similarly, a frequent cause of accidents in the University is the inappropriate use of Stanley knives.

Equipment should be used in accordance with the manufacturers'/suppliers' instructions, which should include suitable uses and those foreseeable uses which are unsuitable. Where it is wished to adapt equipment then Departments will need to be satisfied that the adaptation has not weakened it or introduced other hazards, and that it adequately meets the duties to which it will be subjected.

When selecting the equipment the criteria to be considered includes its integrity, i.e. strength, durability and general overall condition; how and where it will be used, i.e. the loads to be imposed upon it and any hazards introduced by the environment, e.g. flammable atmospheres or wet or corrosive conditions.

### Maintenance

The requirement here is that work equipment is kept in a condition whereby failures which could result in a hazardous situation are avoided. This can be achieved at a number of levels.

Firstly the user of the equipment can visually inspect it on a regular basis. For example, ladders could be visually inspected each time before use looking for broken rungs, split stiles etc. and heavy machinery could have its guards or trip devices inspected routinely according to the amount of use to which it is subject - this could be daily for intensively used equipment involving frequent approach to the dangerous parts of it. For high risk equipment the routine operator checks should be formalised, for example, by way of a record card kept in a plastic wallet at the equipment. For lower risk equipment departmental inspection records should be sufficient.

There may also be circumstances where inspections or tests of the safety equipment need to be programmed into the equipment. This would involve those checks which cannot be carried out by the user, for example because access is not available, or special equipment is needed. Furthermore, there may be a need to replace critical components on a planned, preventative basis rather than breakdown; examples include bearings and filters. Certain more hazardous pieces of equipment are also subject to requirements for statutory examinations, e.g. pressure systems, lifting equipment, and fume/dust extraction systems.

There is no requirement to keep a maintenance log although for high risk equipment it would be advisable to do so. This would apply to equipment where its failure during use could result in severe injury. The value of this is to assist in ensuring that preventative safety checks or interventions are made when required, and to demonstrate adequate control of the risks.

A typical maintenance log would include the service history of the equipment, results from programmed inspections or tests and records of the replacement of safety-critical components. This need not be kept in one single document but it would usually be beneficial to keep the information together in a single folder, and for there to be at least a single record sheet to record the dates on which routine examinations and maintenance were carried out.

### **Information, instructions and training**

Health and safety information concerning the hazards involved in the use of work equipment should be available. This may be verbal, although written information should be provided for complicated or unusual situations. This would be most conveniently incorporated into the instructions for the task. Written instructions provided by the manufacturers or suppliers by way of manuals and instruction sheets etc. may need supplementation to cover the actual conditions of use. Taken together the instructions and information would form the basis for training of users.

The information and instructions needs to cover the circumstances in which the equipment may be used, the methods for using it and any foreseeable circumstances under which its use could be hazardous. Any abnormal situations which could occur during the use of the equipment, along with the action to be taken, should also be covered.

As a guiding principle the level at which written information and instructions would need to be provided would be that where the level of hazard could involve serious injury, unless certain precautions are taken to and/or there is a degree of complexity in the way in which the equipment is used, e.g. requiring certain steps to be taken in a specific order, failure to do so resulting in danger.

For dedicated pieces of equipment it is possible to produce specific operating instructions which cover the above points. For mobile or portable equipment which may be used under a range of conditions, the instructions would need to be more general, with the emphasis on the types of problems which could be encountered under the foreseeable conditions of use, circumstances outside of this requiring a specific assessment.

As well as ensuring that the people using the equipment can do so safely, it is important that those responsible for them or for the equipment also know how it should be used to enable the safety procedures to be monitored.

A further consideration is the extent to which the information is comprehensible to those concerned. This is obviously influenced by the level of knowledge, experience etc. of the operatives but linguistic ability is an area which can be overlooked. It is not uncommon for work equipment to be used by people for whom English is not their first language. This need not be a problem in itself, but if it appears that

certain individuals have a poor grasp of English then steps will need to be taken to provide the necessary information and training in another language. This may vary from verbal instruction via an interpreter to the production of written instructions in another language. The choice of approach would depend on circumstances such as the degree of risk, the need for future reference as a reminder and the number of people for whom that language would be appropriate.

## **Content of operating instructions**

The sources of this information would be manufacturers' instructions and health and safety information. Manufacturers and suppliers are under a duty to provide this and that relating to equipment conforming to a Product Safety Directive is likely to be more comprehensive. The instructions may be subject to modification on the basis of an assessment of any risk arising from the particular conditions of use. Use should also be made of any guidance literature available. The following should be clear from the operating instructions:

- appropriate and foreseeable inappropriate uses of the equipment;
- residual hazards of the equipment, e.g. excessive noise, procedures to enable safe handling and movement of the equipment, the nature of any fumes or other hazardous waste by-products likely to be produced and the precautions to deal with these;
- whether the equipment is to be restricted to certain individuals or groups of individuals along with any relevant training requirements;
- operating instructions to cover:
  - pre-use checks by the operator of guards or other safety devices;
  - setting up procedures;
  - normal operation;
  - safe adjustment;
  - normal shut-down procedures;
  - cleaning after use;
  - abnormal situations, e.g. emergencies or freeing of blockages;
  - any personal protective equipment which is needed for the above operations.

## **Physical Characteristics**

Product Safety Directives cover an increasingly larger range of equipment on the market. Equipment which complies with any of these is exempt from the relevant hardware aspects of PUWER. The requirements are relatively straightforward and clearly described in the HSE guidance publication on the Regulations. <http://www.hse.gov.uk/work-equipment-machinery/index.htm>

The machinery guarding provisions re-enact the prescriptive requirements of the earlier legislation and describe the hierarchy from fixed guards through other types of guards such as fixed, distance, interlocked or photo-electric, and other protective appliances such as jigs and holders to information, instruction, training and supervision to enable safe use.

A range of other hazards are also specified for which measures to prevent control or mitigate the consequences of them are required. The hazards specified are falling or ejected articles, rupture/disintegration of parts of the work equipment, work equipment catching fire or overheating, unintended or premature discharges of components or gas, dust, liquid vapour produced, used or stored in the equipment, or unintended or premature explosion of work equipment or articles or substances produced, used or stored in it.

It can be seen that these hazards are essentially those which are not specifically dealt with by other regulations such as noise, COSHH or ionising radiations regulations. Again the emphasis is on control by engineering solutions rather than personal protective equipment.

There is extensive guidance on controls and control systems concerned essentially with accessibility, clarity of function, the avoidance of uninitiated operations and failsafe qualities.

Stop controls for example should have a priority of any operational control and shut down the work equipment in a safe manner (for example it may not be appropriate to switch off a stirred reaction vessel along with everything else). Where residual risks could arise from stored energy, e.g. momentum, hydraulic accumulators, pressure vessels, electrical capacitors or other energy sources, then these also need to be isolated by the stop control if there could be a risk.

Emergency stop controls are required where their provision would provide an additional level of safety in the event of a severe and imminent hazard arising. They would normally be associated with higher risk plant involving close approach to danger areas and requiring rapid intervention to prevent injury from occurring.

It is also important that equipment can be isolated from the energy sources. If this cannot be easily achieved, e.g. unplugging the equipment from the mains supply, then valves or switches which can be locked off are needed.

With respect to stability any work equipment which could inadvertently move and cause danger should be fixed in position. Examples of this include bolting woodworking machinery to floors, securing lighter equipment or tools to a more solid bench (e.g. laser optics) and the use of counter-balances or outriggers etc. with mobile equipment.

With regard to lighting there may be a need to provide additional local lighting for the job involved if the ambient lighting of the workplace is insufficient.

Excessively hot or cold surfaces of the work equipment need to be protected primarily by insulating, shielding, use of barriers etc. to prevent contact. Contact with hot or cold process materials should similarly be prevented by engineering controls to prevent the contact from occurring, e.g. temperature interlocking of doors or deflection systems for hot liquor, e.g. catch pan or spill way. PPE is again a last resort measure to deal with the residual risks.

Work equipment also needs to be designed so that hazardous maintenance operations can be carried out, either whilst the equipment is shut down or from a safe place, e.g. remote location of lubrication points or positioning of adjustment points outside guards.

Markings and warnings need to be provided to indicate any hazardous situations. These include labelling of covers beyond which certain hazards exist and information for safe working conditions, e.g. pressure, lifting, rotational speed. Under some circumstances warning lights or sounders etc. are needed to alert operators to the development of a dangerous situation or to identify the existence of a hazardous zone, e.g. X-ray or laser area. Notices prohibiting or requiring certain actions also fall into this category.

## **Product Safety Regulations and European Standards**

An increasing range of Product Safety Directives are being issued by the Commission of the European Community. These are required to be incorporated into the domestic legislation of the member states. In the UK these are as either Health and Safety Regulations or Consumer Protection Regulations. Although the absolute requirements vary from product to product, the overall the structure is that in order for anyone to supply the product it has to be safe by design and construction as defined by Essential Health & Safety Requirements (EHSRs), undergo a conformity assessment procedure, be supplied with an EC declaration of conformity and bear the EC mark (CE). There is also a final catchall requirement for the product to actually be safe.

It is quite likely that any product may be subject to more than one Product Safety Directive. For example, those relating to machinery and any electrical equipment incorporated into it. Any product bearing the CE mark is presumed to conform with the relevant Product Safety Directives and is entitled to unrestricted movement and sale throughout the European Community. Compliance with a Product Safety Directive circumvents the duty under Section 6 of the Health & Safety at Work act. Previously the Health & Safety Executive could take enforcement action against a supplier of defective equipment and the user could use this to apply leverage on the supplier to have the equipment rectified. Equipment claiming to conform to a Product Safety Directive cannot be acted against in this manner, and except under the most exceptional circumstances requires any information on deficiencies to be channelled back to its country of origin. Such an extended chain is likely to reduce the prospect of rectification by the number of rather remote links and a probably suffocating amount of bureaucracy.

### **The Supply of Machinery (Safety) Regulations 1992**

These product safety regulations are a useful example of the workings of the approach to product safety. The schedule to these regulations lists the EHSRs applicable to both machinery in general and to certain specific classes. A machine is defined as an assembly of linked parts or components, at least one of which moves, with the appropriate actuators, control and power circuits, etc. joined together for a specific application. They apply to all powered machinery with the exception of a few more complex high risk machines such as passenger lifts, fairground rides and pressure vessels. Manually powered machines not used for lifting or lowering loads are also exempt, e.g. hand drills, paper cutting guillotines.

In order for a machine to be supplied it has to have been designed in accordance with the EHSRs to the extent that the hazards exist for that particular machine when used under the conditions foreseen by the manufacturer. The foreseen conditions are specified in the documentation supplied to the user.

The EHSRs covered are:

- general features of wide application;
- control systems, i.e. reliability, accessibility and identification;
- protection against mechanical hazards, e.g. stability and durability of the machine, containment for fragmenting work pieces etc. and design of guards and safety devices;
- protection against a range of other hazards, e.g. energy supplies, errors due to incorrect replacement of parts, temperature extremes, fire and explosion of the machine or process materials, noise and vibration, radiation, lasers and control of dust/gas emissions;
- maintenance, e.g. the provision of safe means of adjusting, lubricating, cleaning, repair and maintenance of the equipment;

- the provision of indicators, e.g. warning lights, audible alarms, signs or markings to indicate fault conditions or the presence of danger. Provision of instructions for safe use is also included in this;
- there are also a range of additional features for specified machinery, namely agri-food stuffs, hand held/guided machinery, machinery for working wood or similar materials, mobile lifting and underground machinery.

Having been designed and built in accordance with the EHSRs the machine will then go through a conformity assessment procedure. For most machinery this is a "DIY" process requiring a responsible person within the organisation to produce a Technical File containing design drawings and specifications, a list of the EHSRs, transposed harmonised standards, other standards which were used during the design of the machine, a description of the methods used to eliminate hazards presented by the machine, a copy of any technical reports from testing bodies and a copy of the instructions for the user of the machine. Series manufactured items also need to be supported by documentation showing quality control systems to be in place to maintain design and construction standards. The manufacturer would keep the file for 10 years after the last unit was made.

There is some specified higher risk equipment such as punch presses and power saws, etc. that require third-party certification by a Notified Body. If constructed in accordance with transposed harmonised standards then the Technical File needs to be submitted to an approved body, e.g. BSI in UK and the manufacturer may elect for the approved body to either verify that these standards have been met or to test an example of the machinery. If no transposed harmonised standards were available then an example of the machine also needs to be submitted for examination.

Having ensured conformity the manufacturer then issues a declaration of this and marks the machine with the CE mark.

Many Departments will be purchasers of equipment, an increasing amount of which will be subject to product safety Regulations. Equipment which has been produced in accordance with these will be marked with the CE mark and the purchasing Department should be issued with the declaration of conformity. It should then be possible to put the equipment into use in accordance with the instructions which would be provided by the supplier. The equipment would then be exempt from the hardware aspects of PUWER to the extent that the product safety regulation covers that aspect of PUWER.

Purchasing Departments should bear in mind that there is now the requirement for new equipment to comply with product safety regulations where they exist. Consequently when ordering work equipment, Departments should, in addition to specifying that it complies with current health and safety legislation, also specify that it should comply with the legislation implementing any relevant EC directive.

However as not all work equipment is covered by product safety regulations and in any case these are not retrospective, so, some second hand equipment and a proportion of new equipment will continue to be subject to the hardware aspects of PUWER.

Manufacturers and suppliers have long been under a duty to provide adequate information to enable the safe use of work equipment. However that produced in accordance with product safety regulations is likely to have more comprehensive information provided with it. This should make it easier to provide operatives with adequate operating instructions.

## Equipment built by the University

A somewhat more complicated area however relates to those Departments which make equipment for use within the University. Product safety regulations tend to include the concept of self supply, i.e. where a manufacturer of equipment puts that equipment into service in the course of their own business and so guidance provided by such regulations is relevant and applicable.

The University of Nottingham must be able to demonstrate that equipment, machinery, rigs or apparatus, constructed, assembled or modified by the University is safe. To achieve this it is advised that the broad principles and requirements of the Supply of Machinery (Safety) Regulations 1992 be adopted, which require the production of a Technical File which documents the design, manufacture and requirements for safe operation of such work equipment.

The suggested contents of such a Technical File are -

- description of the apparatus, usually accompanied by block process diagram
- general Arrangement drawing
- for existing machinery, rigs and apparatus notated photographs should be provided
- wiring and circuit diagrams
- description of control philosophy / logic
- identification of Essential Safety Requirements ESR's associated with machinery (see [Appendix X](#))
- description of function and operating parameters of any safety devices provided.
- description of critical operating pressures, temperatures, speeds etc.
- datasheets for critical sub-assemblies and relevant fluids, gases etc.
- list of any specific standards applied
- records of risk assessments and assessments made against specific standards
- copies of relevant test reports
- copies of quality control & commissioning procedures

[Appendix X \(link required\)](#) provides a checklist to assist in the identification and recording of the various EHSR's of a design that will form a key part of the Technical File. It should be noted the extent of the Technical File should be proportionate to the complexity and relative risks posed by a piece of equipment. Although it is not envisaged that the application of CE certification would normally be sought; departments should bear in mind that any equipment produced for an outside user would in all probability be subject to such certification.

Some Departments may construct prototypes for destructive testing etc. either inside or outside the University. Clearly this type of equipment is an experimental sample and the person performing the tests should have other safeguards in place to control the hazards likely to arise from these. This equipment is not supplied for use as such and would be outside the scope of Product Safety Regulations. Liaison with the testing person/organisation is essential to determine what precautions may be needed and who will be responsible for implementing them.