PROCTER MACHINE SAFETY

WHITE PAPER: The requirements for machinery guarding with respect to PUWER

3rd edition – June 2021

Overview

Steve Allen CMSE, a Member of standards committee BSI MCE/3 (Safeguarding of machinery) and National Sales Manager at Procter Machine Safety, explains the requirements for machinery guarding with respect to PUWER (the Provision and Use of Work Equipment Regulations 1998).

Introduction

The Provision and Use of Work Equipment Regulations 1998, usually abbreviated to PUWER, are UK regulations that are intended to ensure the safety of people at work who are using 'work equipment' – which encompasses everything from scissors to CNC machining centres.

This White Paper focuses on the specialist subject of machine guarding, as this is often not understood fully and the consequences of inadequate machine guarding can be very severe or, in the worst cases, fatal. Power presses, because of their particular hazards, have their own requirements and are outside the scope of this White Paper. Advice on power press is available on the Health and Safety Executive (HSE) website.

When is a PUWER inspection required?

Today, standards and regulations tend to take a 'lifecycle' approach. As far as PUWER and machine guarding are concerned, we therefore need to think about all aspects of the 'use' of the work equipment (machine), from the commissioning, operation, adjustment, cleaning and maintenance, through to the end-of-life decommissioning and disposal.

Clearly if the machine is PUWER- inspected when it is first put to use – which is a legal requirement – the story does not end there. Periodic inspections must be conducted to ensure the safety-related aspects are continuing to perform as required. For example, guards may sustain damage due to impacts from forklift trucks, or they may be the subject of unauthorised modifications that have the unintended consequence of compromising the safeguarding function. Periodic inspections can identify these situations and others so rectifications can be carried out in a timely manner before an accident occurs.

Depending on the type of machine, the hazards present, any history of issues coming to light during inspections, and the likelihood of deterioration, PUWER inspections should generally be carried out every six or 12 months. There are no formal guidelines on this, but 12 months is typical and six months may be more appropriate in some circumstances. On the other hand, little-used, low-risk machines could justifiably be inspected at longer intervals.

At the end of the machine's life, the instructions need to be consulted and a risk assessment conducted prior to decommissioning and disposal. Generally the guards will not pose a significant problem during these phases of the machine's lifecycle, but care needs to be taken if parts of the machine are still hazardous when they are exposed by removal of the guards (such as sharp blades), and the guards themselves can be large, heavy and unwieldy.

What does PUWER require?

Regulation 11 of PUWER addresses the needs relating to dangerous parts of machinery, and this is the regulation of most interest with respect to machine guarding. In essence, regulation 11 (1) requires employers to take effective measures (specified in regulation 11 (2)) to prevent access to dangerous parts of machinery or to stop the movement of dangerous parts before any part of a person enters a danger zone (note that regulation 11 applies equally to a rotating stock-bar extending beyond a lathe headstock). In addition, regulation 11 (3) lays down specific requirements for guards and protection devices, and regulation 11 (4) states which measures in 11 (3) apply to 'protection appliances' such as jigs, holders and push-sticks.

Which standards do machine guards need to comply with?

PUWER does not make any direct reference to standards, and the Approved Code of Practice and guidance (ACOP) published by the HSE (Safe use of work equipment, reference L22, 4th edition), makes little mention of them. However, PUWER Regulation 10 (1) states that 'Every employer shall ensure that an item of work equipment conforms at all times with any essential requirements'; in the case of machinery, the essential requirements are those in the Supply of Machinery (Safety) Regulations. There is no legal obligation to work to the current standards nor, indeed, is there an obligation to follow the ACOP.

Nevertheless, following the ACOP and applying standards is normally sufficient and will be the easiest way to demonstrate that 'best practice' has been applied when conducting a risk assessment, analysing the risks and implementing appropriate risk reduction measures in order to comply with the law. If an HSE inspector visits, he or she will expect to see that the ACOP has been followed. For a guide to machine guarding standards, see the Useful Resources section below.

Which safeguarding measures need to be applied?

For preventing access to dangerous parts of machines, PUWER provides a hierarchical list of measures that can be summarised as follows:

1. **fixed guards;**
2. **other guards or protection devices;**
3. **protection appliances (jigs, holders, push-sticks, etc); and**
4. **information, instruction, training and supervision.**

...Which safeguarding measures need to be applied?

Note that the ACOP states that information, instruction, training and supervision will be needed regardless of the other protective measures implemented. In reality, most machines will need a combination of fixed guards, other guards or protective devices (perhaps an opening guard or a safety light curtain), and information, instruction, training and supervision. Often different types of safeguard will be required at different points on the machine, but this should be highlighted by the risk assessment when each hazard is considered in turn.

For selecting the safeguarding measures, the ACOP advises that the hierarchical order should be applied 'so far as it is practicable to do so, provided that they contribute to the reduction of risk.' For example, it is not necessary to design and install complex guarding if the hazard being safeguarded might only cause a very minor injury and the chance of that injury occurring is minimal. In all cases, the risk assessment plays a crucial role in helping to determine the appropriate measures.

Bear in mind that some of the measures that are appropriate will change according to the circumstances. For example, a combination of fixed and movable guards is usually the most effective way to reduce risks to an acceptable level during machine operation but, during set-up, cleaning, maintenance and repair, it may be necessary to open some of the movable guards or remove some of the fixed guards. At these times, there may have to be a greater reliance on information, instruction, training and supervision. Another option, particularly when maintenance is taking place, is temporary perimeter guarding installed around the unguarded part of the machine so only authorised personnel have access.

What to look for

The following is not an exhaustive list of points to examine during a PUWER inspection, but it provides some tips for things to look for in relation to machine guarding, based on experience of what is commonly missed by people who are unfamiliar with machine guarding inspections.

When carrying out a periodic PUWER inspection, it is important to check that any guards that have been removed for maintenance have been replaced correctly and that all of the fasteners have been used (if they have not, it may be possible to access dangerous parts of the machine through the resultant gap).

...What to look for

Another common issue is that the interlocks on movable guards are defeated so the machine can be operated without the guards being closed. Elsewhere, parts of machine casings (which can provide a protective function by preventing access to dangerous parts) may be cut away so the machine can be adapted or upgraded, and the modification may result in dangerous parts becoming accessible.

If perimeter guards are installed, checks should be made that they have not been moved closer to the machine (perhaps to widen a gangway or install other equipment), nor that the machinery has been modified without the safety distances being confirmed against the requirements in BS EN ISO 13857 (Safety of machinery. Safety distances to prevent hazard zones being reached by upper and lower limbs). Another problem that can arise with perimeter guards is that anything installed outside the guarding – such as low-level barriers to prevent damage from forklift trucks – could be stood on, enabling a person to reach dangerous parts of the machine. If this is considered likely, the height of the guard might have to be increased accordingly. For an easy-to-use Safety Distance Calculator, see the Useful Resources section below.

Any guards that have been repaired since the last PUWER inspection should be inspected carefully to ensure that the correct materials have been used – for example, that acrylic has not been used in place of polycarbonate, and that wire mesh has not been replaced with an alternative having a larger aperture size – and that the correct fasteners have been used. Note that BS EN ISO 14120 makes it clear that quick-release fasteners such as quarter-turn screws should not be used to secure fixed guards from outside the guarded area, and the standard also specifies when retained fastenings should be used. We would not recommend that retained fastenings should be retrofitted to every appropriate guard, but a sensible approach should be taken. For example, if a particular guard or machine type has a history of fastenings becoming lost after a fixed guard has been removed, then it would be prudent to retrofit retained fastenings. Or if an older machine uses quarter-turn fasteners to attach some of the guards, then due consideration should be given to upgrading these.

If a machine is modified it must be risk-assessed, which should result in any necessary guarding modifications being undertaken correctly. However, that may not be the case, so any machine that has been modified or upgraded since the last PUWER inspection should have the guarding checked very carefully. If an outfeed conveyor has been added, for example, the interface between the main machine and the conveyor should be checked – as should the conveyor guarding as well, of course. Or if a machine has been improved to increase throughout, it might be that the hazards are now ‘high’ instead of ‘low’, meaning that the safety distances need to be checked against the requirements in BS EN ISO 13857.

...What to look for

Another subtle point to consider is who uses the machine during operation, setting and cleaning. If there has been a move towards lower-skilled or inexperienced labour, this can increase the risk and render the original safeguards inadequate. Or if instructions are in English and the current users do not have English as their native language, risks can increase.

Similarly, if there has been a change in the material being processed, this can alter the risks. For instance, if a lathe is being used to turn components from magnesium instead of aluminium, there is a significant risk of fire that necessitates very careful handling of swarf. This has implications for operation and cleaning of the lathe, as well as the need to keep the correct extinguishing media close at hand. It may even be necessary to retrofit a fire suppressant system to the machine.

PUWER and UKCA/CE marking

So far we have been assuming that the PUWER inspection relates to a machine that has been operating for some time. But, as the word 'Provision' implies, a PUWER inspection should also be conducted on new machinery before it is put into use. New machinery in the UK should be UKCA marked by the manufacturer or supplier, even if the machinery has been designed and built in-house for the company's own use (UKCA marking has replaced CE marking in Great Britain since the UK left the EU, though the technical requirements are unchanged). Bear in mind that the UKCA/CE mark only indicates a claim of compliance and not all suppliers are as diligent in their UKCA/CE marking procedures as others. A PUWER inspection of a new machine will often highlight areas of non-compliance, so a close inspection of the machine, including the guarding, is essential.

PUWER inspection documentation

Documenting the PUWER inspection is very important, as this provides the evidence to show the inspection has been conducted correctly. If photographs are included, these can help to identify whether a machine or its guards have been modified since the previous inspection or if anything has altered externally that could influence the machinery safety – such as low-level barriers being installed adjacent to perimeter guards.

Machine guarding compliance surveys

Procter Machine Safety offers free Machine Guarding Compliance Surveys of standalone machinery and assemblies of machines, old or new, to support companies' PUWER inspection regimes.

After an initial telephone consultation, Procter's safety engineers can make an appointment to undertake a site visit and inspect the machinery safeguards. As part of the free survey, the safety engineers provide a short written report that identifies areas of non-compliance and actions that can be taken to reduce risk, improve safety and comply with PUWER. Importantly, rather than just leaving a list of 'problems', the company can also provide 'solutions' in the form of a quote and, if requested, work can be carried out to make the machinery compliant.

Useful resources

These are all available free of charge on request or to download.
***Email:** info@machinesafety.co.uk*
***Download:** https://www.machinesafety.co.uk/free-downloads/#208*

Risk Assessment Calculator
Based on the requirements of BS EN ISO 12100 and designed to be simple to use.

Safety Distance Calculator
Establishes machine guard safety distances and heights in accordance with BS EN ISO 13857.

On Your Guard: A Designer's Guide to Machine Guarding Standards
A list of current machine guarding standards and advice for designing standards-compliant machine guards.

Guide to the New Machinery Directive 2006/42/EC
To help companies comply with the Directive that came into force on 29 December 2009.

White paper: Machinery Directive and Fixings for Fixed Guards
Explains the recently amended requirements for fixings for fixed guards. Note that the requirements for guard fixings are the same under the UK's Supply of Machinery (Safety) Regulations.

White paper: CE Marking of Machine Guards
Explains the requirements relating to CE marking of guards under the European Machinery Directive. Note that the technical requirements are the same for UKCA marking guards under the UK's Supply of Machinery (Safety) Regulations.

White paper: EN 349, Minimum Gaps to Avoid Crushing
Explains the requirements in the standard for minimum gaps to prevent crushing.
Note: EN 349 has been superseded by EN ISO 13854 but the contents of this white paper are still valuable.

White paper: Conveyor Guarding
Outlines the hazards associated with conveyors, the relevant regulations and standards, and provides advice for guarding.

White paper: Differences Between BS EN 953 and BS EN ISO 14120
Explains what changes were introduced in BS EN ISO 14120 when it replaced BS EN 953.
White paper: The 2014 Edition of PD 5304
Explains the changes in the 2014 edition of BSI's Guidance on safe use of machinery.

Guide to Workshop Safety
Advice for guarding small machine tools typically used in workshops.

Machine Accident Investigation Kit
Helps companies meet their statutory obligations and prevent future accidents.

Ergonomics guidance
European Commission publication Guidance on the application of the essential health and safety requirements on ergonomics. Note that the guidance is equally applicable to the UK's Supply of Machinery (Safety) Regulations.
Download: https://ec.europa.eu/growth/sectors/mechanical-engineering/machinery

Further information

- **Procter Machine Safety**
  (site surveys, design, manufacture and installation of bespoke machine guards, including electrical integration where necessary, plus access platforms, walkways and fixed ladders)
  Tel: 02920 855 758
  Email: info@machinesafety.co.uk — Website: www.machinesafety.co.uk

- **BSI**
  Tel: 0345 086 9001
  Email: cservices@bsigroup.com —
  Website: https://shop.bsigroup.com

- **Health and Safety Executive**
  Tel: 0300 003 1747
  Website: www.hse.gov.uk

- **HSE Books**
  Note: many publications are now available to download for free as PDF files.
  Tel: 0333 202 5070
  Email: hseorders@tso.co.uk
  Website: https://books.hse.gov.uk

- **European Commission**
  List of standards harmonised to the Machinery Directive 2006/42/EC, official guide to the application of the Machinery Directive and guidance on ergonomics and safety fences used as safety components.
- Website: https://ec.europa.eu/growth/sectors/mechanical-engineering/machinery

- **Department for Business, Energy and Industrial Strategy (BEIS)**
  Tel: 020 7215 5000
- Email: enquiries@beis.gov.uk — Website: www.gov.uk/beis
- Designated standards: https://www.gov.uk/government/publications/designated-standards-machinery

The information contained in this publication is intended as a guide only and is believed to be correct at the time of going to press. However, it is the reader's responsibility to ensure that all applicable legislation is complied with when specifying or designing machinery guarding.

TURNKEY SOLUTIONS FOR A **SAFE** AND
COMPLIANT WORKING ENVIRONMENT

Proud to work with

PROCTER
MACHINE SAFETY

Procter Brothers Ltd.
11 Pantglas Industrial Estate
Bedwas, Caerphilly
CF83 8XD

T: 02920 855 754
E: maintenance@machinesafety.co.uk
W: machinesafety.co.uk