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Target Audience:
FOD Inspectors
Specialist Group Inspectors: Mechanical and Electrical

SAFEGUARDING HOT FORGING PRESSES

This 2-part OC provides guidance to Inspectors on the safeguarding of hot forging presses. It also includes a summary of the HSE's Manufacturing Sector's discussions with the Confederation of British Metalforming (CBM) on the implementation of improvements to presses that are currently in service. The [information document \(ID\)](#) may be copied and given to interested parties outside HSE.

INTRODUCTION

1 Following a number of serious accidents at hot forging presses over recent years the HSE and the Confederation of British Metalforming (CBM)¹ have been considering ways of improving the safeguarding arrangements provided at these machines. These discussions have resulted in the preparation of [HSE Information Document](#) which provides advice to employers using hot forging presses. The guidance has been prepared in conjunction with the CBM's Health, Safety and Environment committee. The CBM represents all the major employers in the forging industry.

2 The guidance applies to work equipment currently in service. New machines should comply with the Supply of Machinery (Safety) Regulations 1992 (as amended). It does not apply to drop forging hammers that operate in free fall, nor does it consider the risks arising from other aspects of the forging process such as musculoskeletal injuries from manual handling during the forging process and related activities.

BACKGROUND

3 It has been industry custom and practice that guards were not normally provided at the operating position for manual loading/unloading of hot forging presses. Safeguarding is normally provided at the sides and rear of presses, where access is not required during normal operation. Until recently the Health and Safety Executive (HSE) has not generally enforced a higher standard.

4 The practice of not providing conventional guards at the operating position has been accepted for a number of reasons. The nature of the process and the availability of practicable solutions have presented difficulties in providing suitable safeguarding arrangements. For example, where progression tooling is used in the forging, the press operator needs to move the component quickly between each stage and conventional guards could compromise productivity and quality.

5 It was also considered that the risks to the operator(s) were reduced because the workpiece is normally placed between the tools using tongs and therefore, presses used for hot work do not present the same level of risk as power presses used for cold metal. However, while power presses used for hot work are 'disapplied' from the requirements of part IV of the Provision and Use of Work Equipment Regulations 1998 (PUWER 98) i.e. daily inspections and thorough examinations and testing, this 'disapplication' may be misunderstood by employers to mean that the requirements of Regulation 11 of PUWER are also 'disapplied' when clearly this is not the case.

ACCIDENT HISTORY

6 A review of investigated accidents that have occurred over recent years has suggested that HSE's view on the safeguarding of these machines needs to be reconsidered. This is because a common feature of accidents was inadvertent operation of the machine while the operator or another person had their hand(s) between the tools. This cause of accidents needs to be taken into account when considering the kind of reasonably foreseeable behaviour that can occur when an operator(s) or other persons are in the danger zone. The risk of inadvertent operation is difficult to control unless some kind of engineering control measures are provided.

7 This issue has been discussed with the CBM and it has been agreed that improvements in the standards of safeguarding at hot forging presses should be introduced.

RISK ASSESSMENT

8 The improvements in safeguarding that can be achieved will depend on the outcome of a risk assessment. The hierarchy of risk control measures, specified under Regulation 11 of PUWER should be applied, taking into account the particular range of applications the machine is used for. The accident history indicates that the risks are higher at manually loaded/unloaded machines (as opposed to those machines where manipulators or other automatic feeding arrangements are provided) and where more than one person is involved in the forging operation. The latter may, for example, include persons removing forged components e.g. at the rear of the machine, or those carrying out cleaning and die lubrication etc.

9 It has been agreed with the CBM that employers should aim to complete the risk assessments by the early part of 2004. The assessment should include an action plan detailing the work that needs to be carried out and include reasonable time scales for implementation of the action plan based on individual circumstances (see [para 11](#)).

SAFEGUARDING

10 A recognised difficulty of providing safeguards at a forging press is that the machine applications vary considerably and there is no single solution that will necessarily suit all situations. Some further guidance on this matter is given in the Information Document. There may be situations where it is not practicable to provide engineering controls to cover all the risks. Where this is the case the arrangements that are provided should be justified within the risk assessment and the means for controlling any residual risks should be identified.

11 Some of the options for safeguarding can involve significant costs. The improvements should be prioritised on the basis of risk and implemented over a period of time taking into account individual circumstances e.g. the number of machines requiring improvements. Inspectors should discuss these time scales taking into account other health and safety

priorities within the company concerned.

TRAINING OF OPERATORS

12 All persons operating hot forging presses, including supervisors and maintenance personnel need to be properly trained and instructed in safe working methods. In circumstances where safeguarding arrangements are or have been modified this should include the correct use of the new guards and/or safety devices and the arrangements for setting, inspection/testing and maintenance.

ACTION BY INSPECTORS

13 This 2-part OC is intended to inform Inspectors about the work carried out by the Manufacturing Sector in conjunction with the CBM. If, during visits to forges, Inspectors encounter machines in use that are not provided with means to reduce risks at the operating position(s) it should be considered as a matter of evident concern. The employer should be provided with a copy of the guidance and appropriate action taken to secure improvements in line with the agreed course of action.

ENFORCEMENT GUIDANCE

14 Enforcement action should be based on the current published version of the [Enforcement Management Model \(EMM\)](#).

FURTHER INFORMATION

15 If Inspectors require further information or technical support concerning this issue they should contact their local specialist groups (SG) in the first instance. Additional advice can be obtained from the Manufacturing (Engineering) sector in Birmingham. The Engineering Sector contact for this topic is Nick Hitchcott or David Arnsby Midlands SG.

Cancellation of Instructions

None.

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1	The CBM is the representative trade association for the majority of companies' carrying out hot forging in the UK. The CBM is based at the National Metalforming Centre, 47 Birmingham Road, West Bromwich, West Midlands, B70 6PY
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INFORMATION DOCUMENT

HEALTH AND SAFETY EXECUTIVE

Manufacturing Sector - Engineering section

GUIDANCE ON THE SAFEGUARDING OF PRESSES USED FOR HOT FORGING

INTRODUCTION

1 This guidance provides advice to users of hot forging presses on reducing the risk of injury to operators and others from the dangerous parts of these machines in order to meet their legal duties under the Provision and Use of Work Equipment Regulations 1998 (PUWER 98). It explains why these presses should be provided with guards or other protection devices and gives some examples of how this can be achieved.

2 The guidance does not apply to drop forging hammers that operate in free fall, nor does it consider the risks arising from other aspects of the forging process such as musculoskeletal injuries from manual handling during the forging process and related activities.

3 This guidance has been prepared jointly and agreed with the Confederation of British Metalforming (CBM).

BACKGROUND

4 It has been industry custom and practice that guards are not normally provided at the operating position of hot forging presses to prevent access to the closing dies of presses. This has been for a number of reasons. These include the practicability of applying traditional safeguarding solutions to forging presses because of the nature of the process. It was also considered that the risk to operator was reduced because the workpiece is normally placed between the tools using tongs and therefore, presses used for hot work do not present the same level of risk as power presses used for cold metal. This is based on the assumption that operators do not place their hands between the closing dies at every cycle.

5 Power presses used for hot work are also exempt from the requirements of part IV of PUWER 98 i.e. the statutory requirements for daily inspections and thorough examination and test which apply to power presses used for work on cold metal. There may be some misunderstanding that this exemption also applies to the requirement to provide safeguards under Regulation 11 of PUWER 98. This is not the case. The exemption only relates to the need for inspections and thorough examination. A similar

situation exists for hydraulic presses working cold metal. However, in all cases dangerous parts of machinery have to be provided with effective measures to control the risks to employees "where or to the extent that it is practicable to do so".

6 Guarding is normally provided where access is not required for the positioning of billets/bars or unloading of forged components e.g. sides and rear. Until recently the Health and Safety Executive (HSE) has not generally enforced a higher standard. This was partly due to the non-availability of suitable safeguarding arrangements.

WHY ARE FURTHER SAFEGUARDS NEEDED

7 A review of accidents that have occurred over recent years has suggested that reliance on the use of tongs or similar 'protection appliances' and systems of work may not be adequate to effectively control the risks to all machine operators. This is because a common feature of accidents was inadvertent operation of the machine while the operator or another person had their hand(s)/arm between the tools. This situation must be taken into account when considering the kind of 'reasonably foreseeable' behaviour that can occur when anyone is working in the 'danger zone'. It should be remembered that 'reasonably foreseeable' behaviour includes operator error and misuse. Therefore the safeguarding strategy which is adopted for these machines should attempt to minimise the risk of injury from this cause. The risk of inadvertent operation is difficult to control unless some kind of engineering control measures are provided.

8 Injuries at the closing tools of hot forging presses tend to be very serious. In one accident, an employee had his right hand amputated while lubricating the dies of an unguarded Massey press; in another, the operator had both hands crushed between the closing tools of an Etchells press. In each case the machine was operated unintentionally and the dangerous parts were not guarded. This meant that safety was dependent solely on the provision of information, instruction and training to operators and others i.e. safe systems of work.

9 The implementation of a system of work as a means of risk reduction at the dangerous parts of work equipment is at the bottom of the 'hierarchy of controls' set out in PUWER 98¹. When consideration is being given to providing safeguarding arrangements it should start from the position that, where practicable, effective protection can be provided at all of the operating positions. Where it is not practicable to provide engineering control measures e.g. because of pre-existing design constraints or some special machine application, this should be justified within the risk assessment. Improvements in guarding technology have now made safeguarding options available that could not previously be applied successfully in a forging environment.

WHEN SHOULD IMPROVEMENTS BE MADE

10 The starting point for any improvements is the completion of a 'suitable and sufficient' risk assessment. It has been agreed in discussions with the CBM that the industry should aim to complete risk assessments and formulate an action plan for improvements by the beginning of 2004. Individual circumstances will determine the actual period of time over which improvements can be implemented. The action plan

should identify priorities, based on risk, and outline proposals for reasonable time scales for remedial work to be completed.

METHODS OF SAFEGUARDING

11 A recognised difficulty of providing safeguards at a forging press is that the machine applications vary considerably and there is no single solution that will necessarily suit all situations. The risk assessment should determine which control measures are suitable depending on the circumstances of use. The following safeguarding arrangements may be applied.

Electro-sensitive protective devices (ESPD's) - light curtains

12 Light curtains can be provided to act as a presence-sensing device (rather than acting as a trip device) at the danger zone of the machine. The device may be used to detect if an operator's hand is within the tool area while the machine is stopped and prevent a stroke being initiated until the area is clear. On occasions it may be necessary to allow, for example, the tongs or a bar to interrupt the light curtain during the forging process. A facility known as 'floating blanking' can be provided which allows this situation. However, it is very important that the *object detection capability* (ODC) of the light curtain is not so large that it will allow a persons hand to enter the danger zone and remain undetected. This would normally be compensated for by adjusting the separation distance from the curtain to the nearest dangerous part based on the OCD. The supplier of the light curtain should be able to provide detailed advice on the selection of a suitable device and its application.

13 Light curtains are manufactured to have a high level of integrity so that they will perform the safety function reliably. The standards which currently apply to these devices are BS EN 61496-1:1998 and BS IEC 61496-2:1997 *Safety of Machinery - Electro-sensitive protective equipment*. The overall integrity of the safety related parts of the control system, including the light curtain, the interfacing arrangements and the press control system need to be considered.

14 In circumstances where older machines are being modified and it is not reasonably practicable to upgrade all parts of the press control system it is recommended that the safety related part of the control system meets, as a minimum, category 1 of BS EN 954: *Safety of Machinery - Safety-Related Parts of Control Systems - Part 1: General Principles for Design*. Category 1 and 2 can be briefly summarised as follows:

- Category 1 - Well tried components designed for safety related applications which are able to withstand the foreseen conditions for their intended use and service conditions. These components have an improved resistance to failure over normal components but a single failure can lead to loss of the safety function.
Proper maintenance of the system is essential to ensure that it continues to perform the intended safety function(s).
- Category 2 - As in 1 above, but incorporating facilities for periodic testing to ensure that the system is functioning correctly. This approach will allow faults to be detected but a single component failure between test intervals can lead to loss of the safety function.

15 Light curtain components are susceptible to mechanical damage so additional protection may need to be provided to prevent impacts e.g. from the workpiece or during tool changes.

16 Further information on the application of light curtains and light beam devices can be found in the HSE publication HSG 180 "*Application of electro-sensitive protective equipment using light curtains and light beam devices to machinery*" this supersedes HSE Guidance note PM 41 which is no longer available.

17 A presence sensing light curtain has been successfully installed at a 1300-ton wide bed mechanical press with progression tooling in the West Midlands. The company involved report that the guard has low maintenance requirements and has caused no loss in production output. The light curtain does not provide total protection in that it will not prevent the upper tool descending once a stroke has been initiated however, it significantly reduces the risk associated with inadvertent operation.

Interlocked guards

18 Interlocked moveable guards can be used to prevent access to the closing tools and would be applied in a similar way to those used on conventional cold-working presses. Detailed information on the design and construction of fixed and moveable guards can be found in BSEN 953:1997 *Safety of machinery - General requirements for the design and construction of guards (fixed and moveable)* and in BSEN 1088:1995 *Safety of machinery - Interlocking devices associated with guards - principles for design and selection*.

Fixed guards

19 Fixed guards can be applied at the operating position to reduce the size of the opening, through which access to the tools is possible, to create a slot or 'letter box' aperture.

20 Where access to the tools of the press is not normally required for production purposes e.g. from the sides and rear fixed or interlocked guards should be provided.

Pressure sensitive mats

21 Pressure sensitive mats have been installed and used successfully on some larger machines - these devices act as a presence-sensing device and prevent the machine operating if a person is in the danger zone. These devices may be unsuitable if there are restrictions on where an operator needs to stand to work at the machine - however they may be used at the rear of machines where a second operator may be working.

Controls

22 The risk of inadvertent operation can be further reduced by the correct selection, design and positioning of start controls (see Regulation 14 and 17 of PUWER). This will include providing shrouding on buttons and/or footswitches and positioning devices so that the operator is not at risk and there is a clear view of the danger zone. Where

more than one operator is involved additional control devices may need to be provided.

PURCHASING GUARDS AND OTHER PROTECTIVE DEVICES

23 When sold separately a guard and other kinds of protective devices, such as light curtains, are classified as '*safety components*'. They are subject to the requirements of the Machinery Directive (Supply of machinery (Safety) Regulations 1992 as amended). This means that they should be provided with a declaration of conformity by the manufacturer to confirm that they satisfy all the relevant essential health and safety requirements. When ordering 'safety components' it may be helpful to specify that they should comply with the Supply of machinery (Safety) Regulations. A reference to the relevant EN Standards in the declaration of conformity is normally an indication that the parts have been manufactured to the correct standards. Section 6 of the Health and Safety at Work Etc Act 1974 places specific legal duties on the installers of the equipment to ensure that it is done correctly. In all cases the equipment should be supplied with adequate information on how to install, use and maintain it safely.

COMPLETING THE RISK ASSESSMENT

24 The purpose of the risk assessment is to determine the steps that are needed to comply with the legal requirements that are relevant to the particular forging press and associated activities. When carrying out a risk assessment the factors which can significantly increase the risk are whether or not the machine is manually loaded/unloaded (as opposed to the use of manipulators or other automatic feeding arrangements) and the number of persons involved in the forging operation e.g. for component removal or cleaning and die lubrication etc.

25 The risk assessment template in [Appendix 1](#) may be used to assist in identifying the steps needed to comply with PUWER 98. Additional guidance on risk assessment is listed in the section on further reading.

26. A number of companies have started work on improving guarding and are willing to share their experience of developing workable solutions. Further information on this matter can be obtained by contacting the CBM at the British Metalforming Centre Tel 0121 601 6350.



(Note: PUWER is amended by the 'Miscellaneous Amendment Regulations 2002. The amendment to Regulation 11(2)(d) makes the requirement for the provision of information, instruction, training and supervision to be in addition to engineering controls and not as an alternative).

APPENDIX 1 **Risk assessment**

The use of this template is not compulsory and you are free to use other means to complete the risk assessment.

MACHINE DETAILS

Machine type and plant/ref no.

Name of assessor/date of assessment

General description of machine, including ancillary equipment

Intended function of machine and suitability for function

PREVENTING ACCESS TO DANGEROUS PARTS

Is access possible to any part that could injure particularly the closing tools? What access is needed during normal operation of the machine?

Machine part	Location	Who is at risk?	Estimated injury

For the parts identified above, what method of guarding or protection will be necessary? Will they be suitable taking into account the operation of the machine?

Machine part	Fixed guard	Other guard	Other protective measures - eg: jigs, tongs

Where guards are provided are they effective? Will they prevent risks from inadvertent operation when more than operator is working at the machine?

Guard/device	Effective? E.g. - of sound construction, not easily by-passed/disabled, adequately distant from danger but allowing a good view of the process where necessary, maintenance access only, etc?

MAINTAINING GUARDS

What maintenance is necessary for the guards and protective devices? What preventative maintenance required for safety related parts of the control system?

Guard/device	Maintenance	Frequency	Responsible person

INFORMATION, INSTRUCTION AND TRAINING

What information must be provided to operators and others working at that machine?	Who is responsible for providing that information?

What instruction and training must be provided to the following:

Operators	Maintenance staff	Supervisors

Who is responsible for providing instruction and training to the following:

Operators	Maintenance staff	Supervisors

References

L22 - Safe use of work equipment - Provision and Use of Work Equipment Regulations 1998 - Approved Code of Practice and Guidance on the regulations

HSG 180 "Application of electro-sensitive protective equipment using light curtains and light beam devices to machinery"

Further reading

BS EN 294 - Safety of Machinery - Safety distances to prevent danger zone being reached by the upper limbs

BS EN 954 Part 1 - Safety of Machinery - Safety related parts of control systems - General principles for design

BSEN 953 Safety of machinery - General requirements for the design and construction of guards (fixed and moveable)

BSEN 1088 Safety of machinery - Interlocking devices associated with guards - principles for design and selection

BS EN 60204 Part 1 - Safety of Machinery - Electrical equipment for machines - Specifications for general requirements

BSEN1050 safety of machinery - risk assessment PD 5304:2000 - Code of Practice - Safeguarding of machinery

HSE Publications

INDG 174 - A Short Guide to the Personal Protective Equipment Regulations 1992

INDG 218(L) - A Guide to Risk Assessment Requirements

INDG 229 - Using Work Equipment Safely INDG 270 - Supplying new Machinery

INDG 271 - Buying New Machinery

INDG 291 - Simple Guide to the Provision & Use of Work Equipment Regulations 1998

HSG 129 - Health & Safety in Engineering Workshops - LOLER/PUWER '98

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visit HSE's website: www.hse.gov.uk

This document contains notes on good practice which are not mandatory but which you
may find helpful in considering what you need to do.

