



Foundry machinery guarding: Introductory sheet

Foundries Sheet No 2

Introduction

This information sheet is one of a set of four on foundry machinery guarding prepared by the Foundries Industry Advisory Committee's Working Group on foundry machinery guarding. It serves as an introduction to the other sheets in the set (Numbers 3-5) which should be read in conjunction with this sheet.

The information is intended to assist manufacturers, suppliers, and users of foundry machinery in determining the type and standard of guarding required for different families of machines and plant.

Standards

The guidance provides an interpretation of the CEN standards for new foundry machinery; prEN 710 is the key 'C' standard. Most of these standards are still provisional (pr). They will form the basis of compliance with the Supply of Machinery (Safety) (SM(S)) Regulations 1993. The standards reflect the accident history and known risks associated with all aspects of operating foundry machinery.

Manufacturers and suppliers have duties under the SM(S) Regulations for machinery first supplied or put into service in the Community after 1 January 1993. Users should meet their duties under The Provision and Use of Work Equipment Regulations 1992. Where the SM(S) Regulations apply, users should ensure that the machinery is 'CE' marked and is accompanied by a Certificate of Conformity.

Exceptions

The document concentrates on those mechanical hazards which are peculiar to foundry machinery. Dangerous parts such as chains and sprockets, drive shafts and belt drives should also be guarded to the required standard, but are not dealt with here.

Essential health and safety requirements

Although the main thrust of the series will be towards machinery guarding standards, the Essential Health and Safety Requirements (EHSRs) embodied in the machinery directive and the SM(S) Regulations also embrace other hazards such as noise, vibration, dust and fume etc. For completeness, these have also been addressed.

Accident history

Total reported accidents on this family of machinery are as follows:

Year	3-day lost time accidents	Major accidents	Fatal accidents
1990	23	6	0
1991	187	40	1
1992	85	21	2
1993	124	16	0

Where accidents have been investigated the following basic deficiencies in operating are highlighted:

- (a) Inadequate guarding
- (b) Poor maintenance of safety devices
- (c) Deliberate overriding of safety devices
- (d) Failure of isolation systems and interlocks

NB Only one investigated accident involved an operator engaged in routine production work.

Example: A damaged hinge guard allowed access between the platens of a jolt squeeze machine - amputation of fingers resulted.

Guarding and risk assessment

General comments which are pertinent to most of the machines under review are:

The type and degree of guarding fitted to machines will be determined by an assessment of the risk involved. The key factors to be considered are:

- (a) the need for access into danger zones created by the mechanical action of machinery and materials;
- (b) the frequency with which that access is required:
 - (i) every cycle;
 - (ii) for setting only;
 - (iii) at frequent intervals to clean dies;
 - (iv) never;
- (c) the potential severity of any injury that could ensue.

The risk assessment will determine which guard is the most suitable from the hierarchy of types available. An analysis of accidents and incidents at foundry machinery suggests that in carrying out the risk assessment certain features peculiar to

this family of machines will need to be taken into account. See the worked risk assessment example below.

Interventions

More than 50% of machinery accidents in foundries occur during maintenance, setting and cleaning operations. It is therefore essential that guarding systems take account of the need for interventions and enable them to be carried out in a safe manner. Some ways in which this can be achieved are:

- (a) Where fixed or perimeter fencing is provided it may be possible to allow limited access to make adjustments, so reducing the risk of injury while keeping the guards in place.
- (b) Where reliance is placed upon interlocking guards, the opening of those guards should disperse all residual power in the system;

Example: An operator received crush injuries to both hands when he attempted to clear a blockage in a core-making machine without isolating. He touched a limit switch and activated the platen close operation.

- (c) Where there are guard override facilities for setting purposes they should be operated only by authorised persons, and persons working on machinery in this state should have direct control over any movement of the machine;
- (d) It will still be necessary for users to ensure that appropriate SAFE SYSTEMS OF WORK are introduced and adhered to.

Maintenance

All foundry machinery operates in a harsh environment. Safeguards should be the subject of formal routine checks to ensure that they are operating effectively. Most machinery accidents in foundries can be attributed to shortcomings in such maintenance procedures.

One method of formalising maintenance of safety devices is to introduce a checklist which can be filled in at appropriate intervals by a responsible person - this could be a machine operator, setter, chargehand or supervisor. A suggested format appears in the next column.

ANY DEFICIENCY SHOULD BE REPORTED IMMEDIATELY TO YOUR SUPERVISOR

Such a checklist should be regarded as a useful adjunct to, but not a replacement for, a preventative maintenance system for all machinery.

Example: Poor maintenance of interlocks led to amputation of three fingers when an operator was lubricating dies at a corebelting machine.

Degree of risk

Many foundry machines are designed to operate automatically. In theory this means that operators will not be required to enter danger zones during the normal course of events. In practice conditions will prevail whether due to sand quality, complexity of job, or reduction in machine efficiency when operators will

Checklist to ensure safety devices are functioning

Machine type:

- 1 Is framework and structure sound?
- 2 Are all fastenings in place and secure?
- 3 Do interlock switches operate freely?
- 4 Are the CAM and switch secure and properly lined up?
- 5 Does opening or sliding door immediately stop machine movement?
- 6 Does operation of switch stop the machine?
- 7 Does emergency stop switch halt the machine?
- 8 With the setter's key in place is movement of the machine restricted?
- 9 Is that movement at slow speed?
- 10 Report any other faults.

Signature

Date

need to make significant interventions for cleaning and adjustment purposes. The standard of guarding fitted should reflect the practical rather than the theoretical operation of the machine.

Worked example - core blower

To give an indication of the way in which risk assessment can be carried out to determine the level of guarding the following example has been prepared using as a basis the nomogram below. This is reproduced with the kind permission of BSI from BS 5304: 1988 - see Useful reading

Please note that this is an example only. For all information necessary for a full risk assessment please refer to Appendix B (pages 148-149) of the standard. NB: this part of the standard will be replaced in the next 12 months by a European standard based on the risk assessment methodology set out in prEN 1050 Safety of machinery-principles of risk assessment.

Hazard: entrapment between horizontally closing platens and vertically moving head.

Access required: Access is required at each cycle to remove cores, and on a regular basis for cleaning and adjustment of dies, as well as occasionally for setting purposes.

Using the Nomograph in BS 5304 we use scale A (amputation of hand) and scale C (probable). Using a frequency of intervention of approximately one minute this gives an intersection at scale D requiring R (ie guard operated power interlocking). Similar exercises should be carried out to determine guarding standards at each machine type.

Example: After removing fixed guards at a core blower, the operator attempted to clean dies without isolating. He struck a limit switch and his arm was trapped.

Training

For a safeguard system to be successful, all personnel engaged in the running of machinery should be properly trained.

Operators should be able to carry out rudimentary but important checks to ensure that guards are in place, working properly, and not showing signs of deterioration. It is particularly important that ANY defect is reported immediately so that it can be rectified. In addition, operators should be aware of what they can and cannot do in relation to clearing, cleaning, adjustment and setting. If their duties involve intervention, then proper systems of work should be established.

Above all, training should ensure that personnel understand why they are being asked to pursue a particular course of action.

Setters, supervisors and maintenance personnel should have more detailed knowledge including a good understanding of how more complex guarding systems operate; how to rectify basic faults; and how to identify when the system has been tampered with. In addition, they should be trained to identify when rectification work is beyond their competence.

Most important of all is the need for such personnel to ensure that all safeguards have been reinstated prior to handing over the machine again to production personnel.

Example: A guard had been deliberately removed by a foreman to make operation of core blower easier. This action resulted in an operator receiving severe crush and burn injuries to his hand.

Scale A

Scale B

Scale C

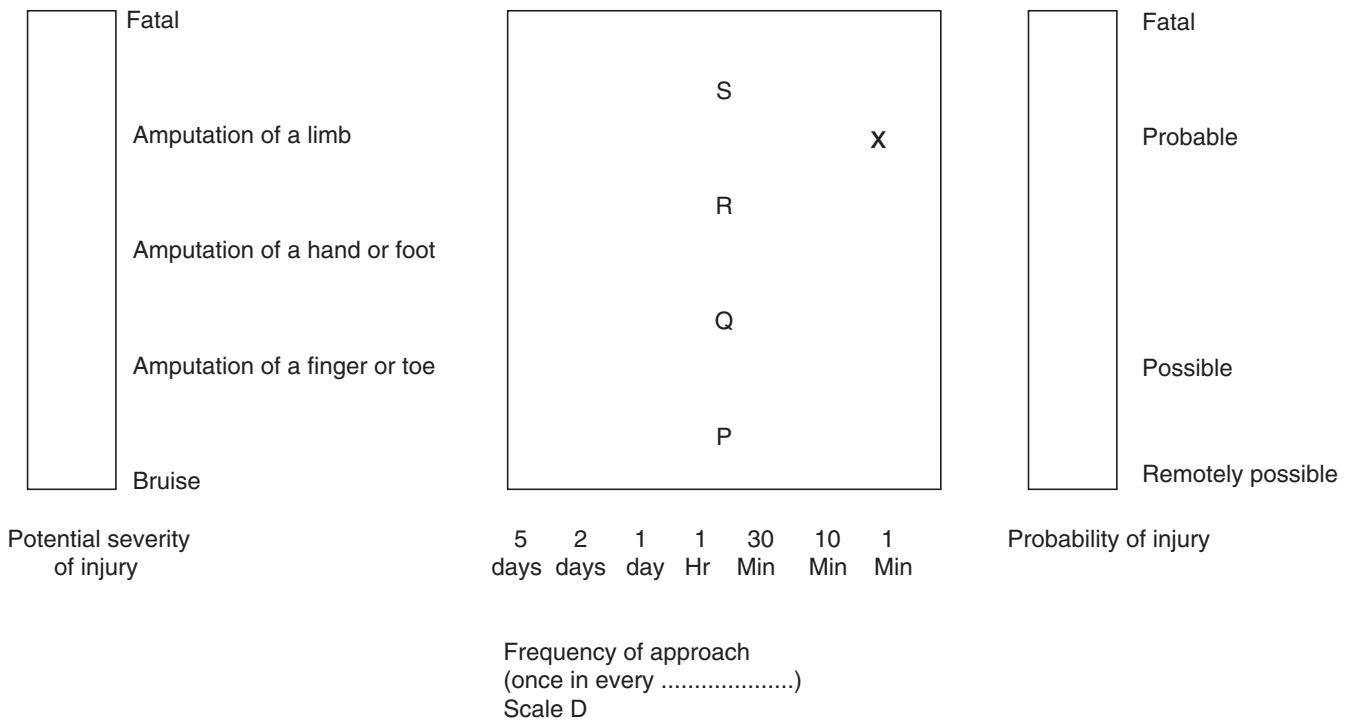


Figure 1: Nomograph from BS 5304 1988 p.149. Reproduced for illustrative purposes only.

Useful reading

Noise control at foundry shakeouts HSE Books 1995
ISBN 0 7176 0720 8

BS 5304: 1988 - Safety of machinery

BS EN 292: Part 1:1991-Safety of machinery. Basic concepts, general principles for design Basic terminology, methodology

BS EN 292: Part 2:1991 - Safety of machinery. Basic concepts, general principles for design - Technical principles and specifications

Copies of British Standards are available from: BSI Customer Services, 389 Chiswick High Road, London W4 4AL
Tel: 0181 996 7000 Fax: 0181 996 7001

Five steps to risk assessment INDG163L HSE Books

Regulations

The Supply of Machinery (Safety) Regulations 1992,
SI 1992/3073 HMSO ISBN 0 11 025719 7

The Supply of Machinery (Safety) (Amendment) Regulations
1994 SI 1994/2063 HMSO ISBN 0 11 045063 9

The Provision and Use of Work Equipment Regulations 1992
Guidance on Regulations L22 ISBN 0 11 886332 0

The future availability and accuracy of the references listed in this publication cannot be guaranteed.

Further information

Foundry information sheets may be obtained from the Foundries National Interest Group, Brunel House, Fitzalan Road, Cardiff CF2 1SH, Tel: 01222 473777, Fax: 01222 473642. There are three other information sheets in this series (numbers 3, 4 and 5). It is intended that the four sheets should be read together. Please ask for the complete series.

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 6FS
Tel: 01787 881165, Fax: 01787 313995.

HSE priced publications are also available from good booksellers.

For other enquiries ring HSE's InfoLine Tel: 0541 545500, or write to HSE's Information Centre, Broad Lane, Sheffield S3 7HQ.

HSE home page on the World Wide Web:
<http://www.open.gov.uk/hse/hsehome.htm>

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

This publication may be freely reproduced, except for advertising, endorsement or commercial purposes. The information it contains is current at 9/95. Please acknowledge the source as HSE.