

Safeguarding of combination metalworking machines

Engineering Sheet No 13

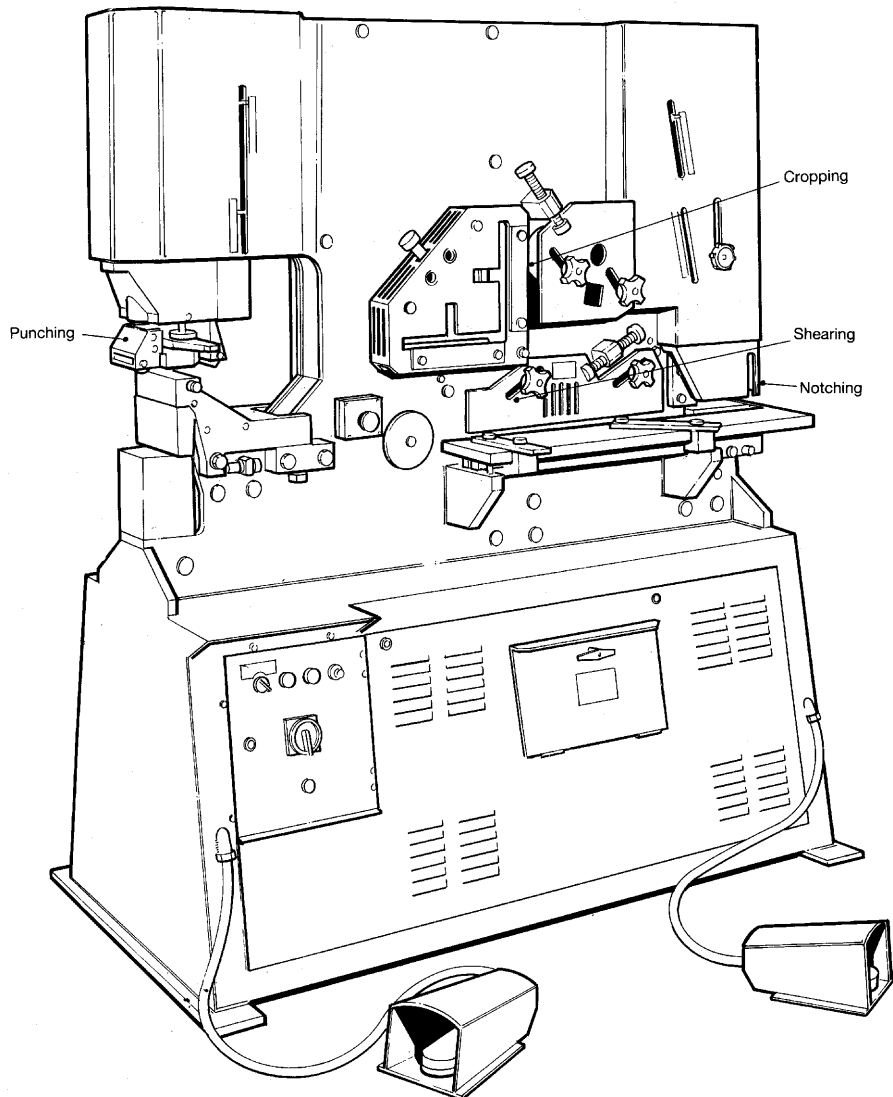


Figure 1

Introduction

This information sheet is one of a series produced by HSE's Engineering National Interest Group. The information given is intended to provide practical guidance to users on the safeguarding of combination metalworking machines (Figure 1) and assist in complying with current legal requirements.¹ These machines are also referred to as 'universal metal workers' or 'steel workers'. Modern machines tend to be hydraulically operated although some older machines may be mechanical, operating via a flywheel and clutch arrangement (exempted from regulations 32-35 of PUWER by Schedule 2).

These machines are versatile and perform a wide range of punching, notching, cropping, shearing and sometimes bending operations.

Hazards and risks

Various mechanical hazards exist at the different work stations on these machines. Trapping or crushing hazards may also arise from unintended or uncontrolled movement of the workpiece and, although uncommon, injuries have also been known to occur from the ejection of broken tooling.

The accident history at these machines shows a fairly even spread of serious injury to the hands of operators when working at any one of the workstations. A high

proportion of the accidents result in amputation injuries. A significant number of injuries are associated with small workpieces. It is important that users recognise the limitations of the machine. The manufacturer's recommendations on limits for workpiece size and geometry should be followed. Similarly, the manufacturer's guidance should be followed if special or high-strength steels are to be worked.

Safeguarding

General

The guards on the machines should be constructed and fitted such that each workstation can be used independently without another workstation presenting a hazard to the operator or any other person. Guards should be designed so that there is no access to trapping points between closing tools, punches or blades from all sides.

In most circumstances it is practicable for workstations to be effectively guarded using either fixed, adjustable or self-closing guards. It may also be possible to eliminate hazards by restricting gaps at potential trapping points, eg punches, to below 4 mm. Where appropriate, enclosed tooling can be used.

All guards fitted to the machine should be of robust construction to withstand the stresses of the expected service conditions. Where a view of the workpiece or tool is required for alignment purposes, suitable slots may be incorporated into guards, or weld mesh or transparent materials may be used.

Workpieces should always be properly supported. In particular, small workpieces being punched, notched, etc should be worked on tables which are properly

designed, incorporating workpiece guide bars and stops. The correct setting of guide bars and stops should minimise the need for operators to interfere with guards.

Punching

Punching stations should be provided with fixed or adjustable guards which prevent finger or hand access to the trapping points. The design of some stripper plates assemblies may provide some degree of protection but any remaining accessible trapping points should be guarded (Figure 2). The construction of the guards will be determined primarily by the range of workpiece sizes and geometry. Feed openings and other apertures should be in accordance with BS EN 294:1992 Table 5.²

Trapping points may be eliminated by setting gaps at under 4 mm, or enclosed tooling may be used with appropriate restrictions on stroke length.

Notching

Similar principles apply to those outlined for punching stations. Fixed or adjustable guards are appropriate for most circumstances of use (Figure 3). Modified guarding arrangements may be necessary if the workpiece, eg channel section, prevents the use of the normal guards.

Shearing and cropping

The feed side of the machine should be provided with suitable guards, workpiece guides or hold-down devices (Figure 4). These devices both restrict access to the tooling and prevent undue movement of the workpiece during cutting. Where finger access to the blades is possible between the workpiece guide or hold-down and the body of the machine, the gap should be infilled with fixed guarding.

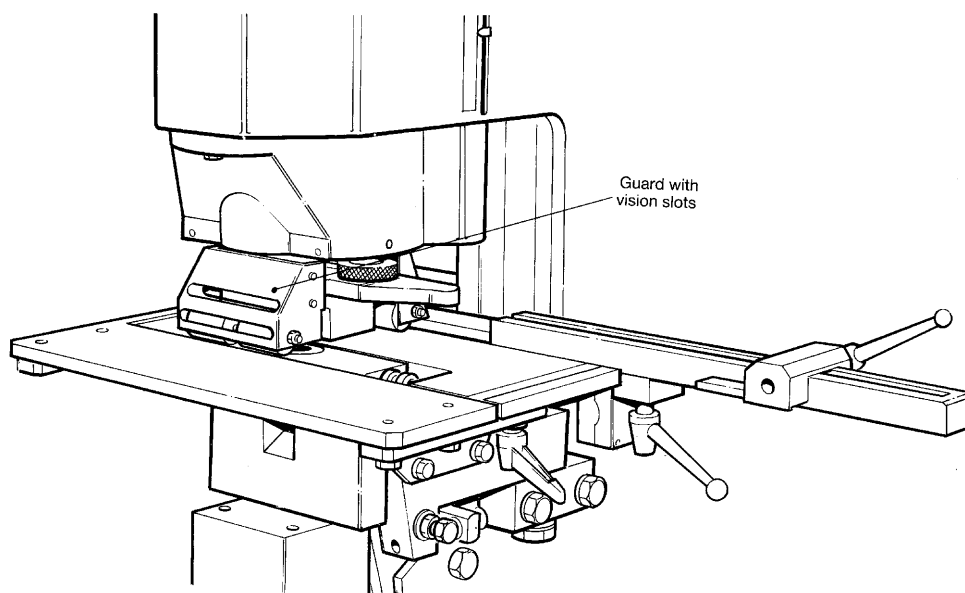


Figure 2 Punching station (work table fitted)

The tooling at the take-off side of the machine should also be guarded (Figure 5). The guards, either fixed, adjustable or self-closing, should prevent access to the tooling to the greatest extent practicable. The guard openings should be restricted to allow only for the passage of the workpiece. Short workpieces should not normally be taken off by hand. A suitably constructed sloping take-off table or chute should be used which discharges into a pan or box. Larger workpieces may be taken off onto a table or roller track. These or similar handling aids should be designed to minimise the need for a second operator to approach the hazardous parts.

Cut-to-length gauging devices will also assist in promoting the safe use of the machine. Such equipment should minimise the need to view the workpiece/tool and therefore any need to disturb the guards.

Bending

Tooling similar in principle to that used on press brakes may be used for bending operations (at the punching station). The gap between the tooling should be set to 4 mm or less. The gap adjustment mechanism should be secured to prevent unauthorised adjustment by the

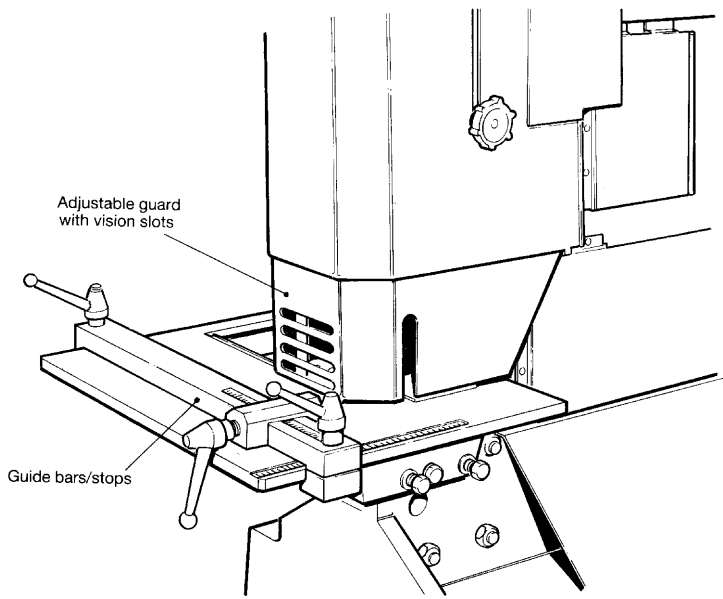


Figure 3 Notching station (work table fitted)

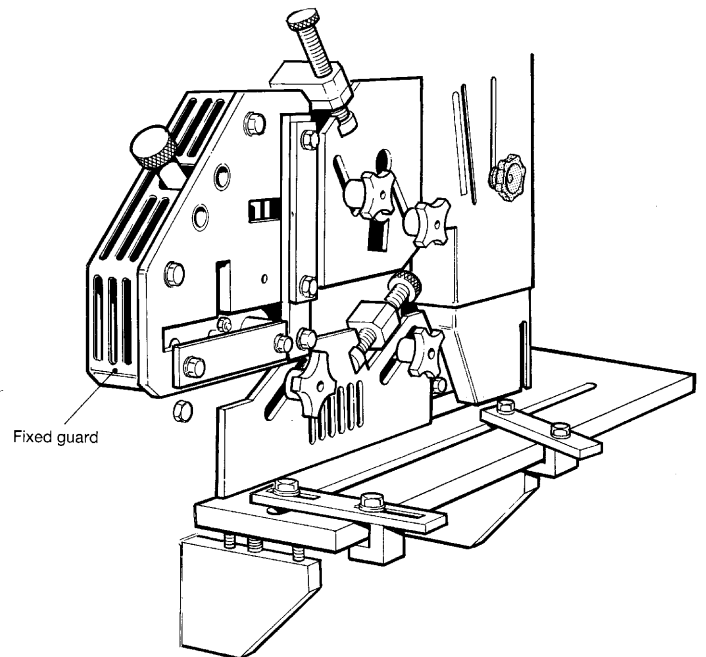


Figure 4 Shearing and cropping station

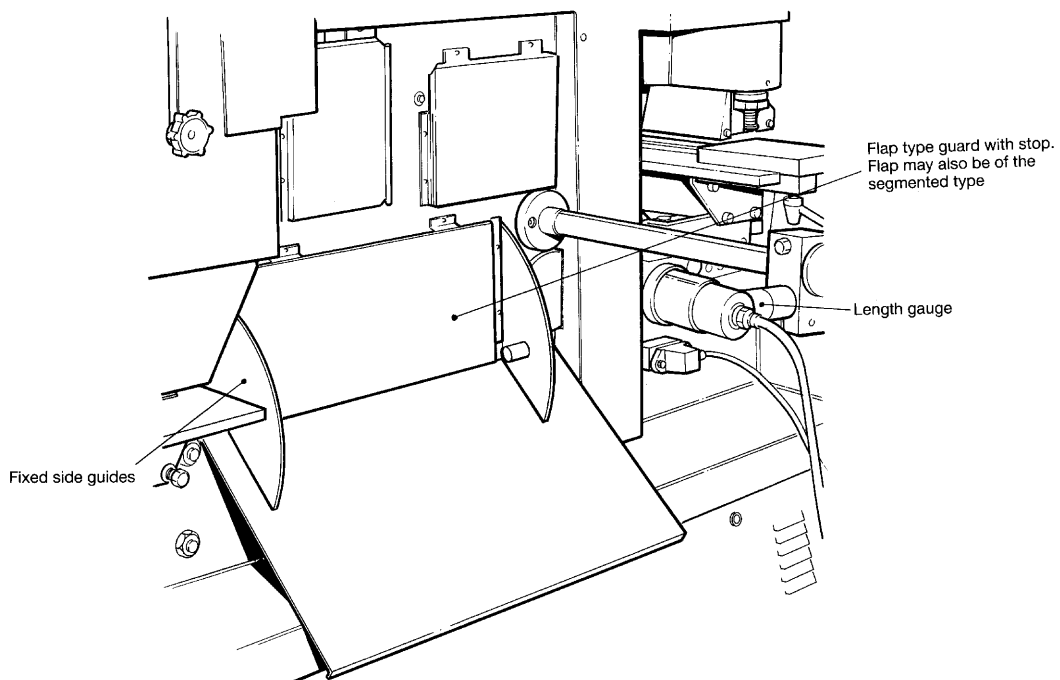


Figure 5 Cropping and shearing rear guards

operator. If gaps greater than 4 mm are required at the tools, additional safeguards are necessary and further advice should be obtained from the manufacturer. Bending should only be performed on machines which have been designed for this purpose.

Machine controls

Foot switches including treadles should be shrouded to prevent accidental operation (BS EN 292-2, Section 3.7.8³).

Emergency stop

An emergency stop button should be provided at the machine control console and at any remote workstation. Emergency stop buttons should be of the 'lock in' type so that the machine cannot be re-started until the buttons have been re-set manually. Release or re-setting of an emergency stop button should not cause the machine to operate - starting should only be possible by operating the normal start control.⁴

Training

All operators who work at these machines should receive careful and comprehensive instruction and training so that they are fully familiar with the machine controls, the safety devices, the dangers and how they are avoided.

References and additional reading

1 *Safeuseofworkequipment.ProvisionandUseof WorkEquipmentRegulations1998.ApprovedCodeof Practiceandguidance* L22 HSE Books 1998 ISBN 0 7176 1626 6

2 BS EN 294:1992 - *Safetyofmachinery- distancestopreventdangerzonesbeingreachedbythe upperlimbs*

3 BS EN 292-2:1991 - *Safetyofmachinery- concepts,generalprinciplesfordesign*

4 BS EN 60204:1997 - *Safetyofmachinery- electricalequipmentofmachines* Part 1: *Specification forgeneralrequirements*

Additional reading

Healthandsafetyinengineeringworkshops HSG129 HSE Books 2000 ISBN 0 7176 1717 3

Further information

The future availability and accuracy of the publications listed in this information sheet cannot be guaranteed.

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