



Safe use of power-operated cross-cut saws

Woodworking Sheet No 35

Introduction

This information sheet is one of a series produced by HSE's Woodworking National Interest Group in consultation with the woodworking industry. Its purpose is to provide practical guidance for users, manufacturers and suppliers of power-operated cross-cut saws on methods of safeguarding and safe working practices.

Key legal requirements covering the supply and use of these machines are contained in the Supply of Machinery (Safety) Regulations 1992,¹ section 6 of the Health and Safety at Work etc Act 1974 (the HSW Act); the Management of Health and Safety at Work Regulations 1999² and the Provision and Use of Work Equipment Regulations 1998 (PUWER 98).³

Scope

For the purpose of this information sheet, a power-operated cross-cut saw is one where the saw blade is moved to and through the workpiece by a power source other than human effort, often hydraulic or pneumatic. Both semi-automatic and automatic power-operated cross-cut saws are covered.

Semi-automatic machines are those that require the manual operation of a control device to initiate the saw blade stroke. On automatic machines the saw blade stroke is initiated by some other means, usually the workpiece itself when it strikes a sensor of some kind.

The most common power-operated cross-cut saws are the horizontal-stroking (eg travelling head) (see Figure 1) and up-stroking (rise-and-fall) (see Figure 2) types. Down-stroking machines are less common. Most machines have only one saw unit, but this guidance is also relevant to machines with two or more.

Saws used for cross-cutting which are fixed in position (ie those where the workpiece is moved to and through the saw blade) during operation are outside the scope of this information sheet. Safe use of manual cross-cut saws (those where the saw unit is pulled through the workpiece by hand) is dealt with in WIS36.⁴

The accident record

Every year power-operated cross-cut saws cause many major injuries. HSE inspectors investigated 78 such accidents over a ten-year period, between them resulting in the amputation of at least 43 fingers and occasionally whole hands or arms, as well as numerous

serious lacerations. Investigated accidents are likely to account for only a proportion of the total number of accidents which occurred on these machines. The guidance in this information sheet is based on an analysis of the reported causes of the investigated accidents and measures which could have been taken to prevent them.

The primary cause of most of the accidents at semi-automatic machines was identified as being unintentional operation of the 'start' control for initiating the saw blade stroke and/or clamping. In at least 36 of the 43 cases of unintentional starting, the start control was a foot pedal or treadle, sometimes one that was shrouded.

On automatic machines, a principal cause of accidents was the saw blade stroke and/or clamping being triggered by a workpiece-operated sensor (stop) while the operator's hand was in the cutting zone. In most cases this was possible because the machines were not properly safeguarded.

With up-stroking saws in particular, there were several cases where the operator's hand was first trapped by a descending clamp and then either partly or completely severed by the saw blade during the cutting stroke.

Other factors contributing towards a significant number of the accidents included poor training, unsuitable use of the machine and failing to properly maintain the machine.

What can you do to stop these accidents?

Many of the investigated accidents could have been avoided by keeping the operator's hands away from the cutting zone during workpiece clamping (where fitted) and/or the saw blade cutting stroke.

You can achieve this with an appropriate combination of the following measures:

- Prevent (or restrict) access to the cutting zone with the use of appropriate guards.
- Provide a two-hand control device as the means of initiating the saw blade stroke and workpiece clamping (which will normally be required when a two-hand control device is fitted).
- Place the operating position far enough from the cutting zone, so that the operator cannot reach the clamps or saw blade during operation.

To determine which combination of these methods is most suited to your machine(s) and/or range of operations, you will need to carry out a risk assessment which should consider factors such as:

- the current method of operation and existing methods of safeguarding;
- whether it is practicable to fit further safeguarding measures;
- whether it is practicable to modify or change the method of operation;
- how often the saw is used;
- the number of workers at risk of injury;
- how severe any injury is likely to be;
- the possible effects on production.

Safeguarding the machines

If you buy a new machine, the manufacturer should have ensured that it is properly safeguarded, in accordance with the relevant essential health and safety requirements (EHSRs) of the Supply of Machinery (Safety) Regulations 1992. This means it should be safe to use, as it is sold. If you buy a second-hand machine the supplier has a responsibility to ensure it is safe to use under section 6 of the HSW Act. When making a purchase you may wish to use this information sheet to check the machine meets an appropriate level of safety.

Methods of safeguarding for existing machines are detailed in the following paragraphs. Alternative methods of safeguarding may be used (such as the use of opto-electronic (photo-electric) safety systems or pressure-sensitive mats), as long as you can demonstrate that they provide a level of safety which is equally as good.

All methods of safeguarding must be regularly maintained so they work efficiently.

Semi-automatic machines

New semi-automatic machines are either fitted with guards which prevent access to the cutting zone or have a two-hand control device as the method of initiating the saw blade stroke and any associated powered clamping. However, on many existing machines which are operated by a foot control or single-button control the saw blade and/or clamps are accessible. Where this is the case, consider fitting suitable guards which prevent (or restrict) access to the cutting zone or, where this is not practicable, replacing the existing control with a two-hand control device.

Workpiece clamping will normally be required where a two-hand control device is used. If you fit a two-hand

control device, think about where it can be positioned so the operator can use it comfortably.

To avoid any malpractice or systems failure leading to a dangerous situation, all two-hand control devices should conform to BS EN 574.⁵ The release of one or both of the controls should cause the saw blade to return to a safe rest position.

Where the risk assessment concludes there is a risk to a person other than the operator (especially where someone is 'taking off'), there will be a need to consider further safeguarding measures even where a two-hand control device is fitted.

The standard of physical safeguarding required on particular types of power-operated semi-automatic machines depends on:

- the saw spindle position;
- whether powered clamping is provided; and
- the type of control used for initiating the saw blade stroke.

The following information should be used to determine what, if any, modifications are appropriate.

Machines where the saw spindle is above the machine table

In all cases, it is appropriate for the upper, non-cutting part of the saw blade to be fitted with a fixed guard covering at least that part of the saw blade down to the saw spindle. In addition, when the saw blade is at the most forward position of its stroke, none of the saw teeth should project beyond the front edge of the machine table. On some machines the table may need to be widened at the saw line to achieve this (see Figure 1).

Where initiation of the saw blade stroke (and powered clamping where fitted) is controlled by a two-hand control device and access to the cutting zone is not prevented, the saw blade should return to a safe position (eg a saw housing) within 3 seconds of the release of the two-hand control device.

Machines operated by means of a foot pedal or treadle, or a single-button control, which are not modified to two-hand control operation will require additional safeguarding arrangements. Access to the cutting zone should be prevented or, as a minimum, reduced.

This can be achieved by fitting fixed or moveable (hinged) interlocked tunnel guards, interlocked with the saw spindle drive motor. These should extend across the full width of the machine table on each side of the cutting line. Where the saw spindle run-down time is greater than 10 seconds, interlocked tunnel guards should be held in place until the saw spindle has come to rest (eg using a motion detector or locked by a time

delay bolt). Alternatively, consider fitting a suitable braking device to reduce the saw spindle stopping time to 10 seconds or less. Where practicable, tunnel guards should be designed to meet the requirements of Table 4 of BS EN 294.⁶

However, if this is identified in the risk assessment as impracticable, because of the nature of the work carried out (eg short lengths are cut frequently), the guards should extend as far as possible on both sides of the cutting line. In addition, wherever practicable, the shrouded foot control or single-button control should be fixed in a position where the operator cannot initiate the saw blade stroke and/or powered clamping while being able to reach the danger zone.

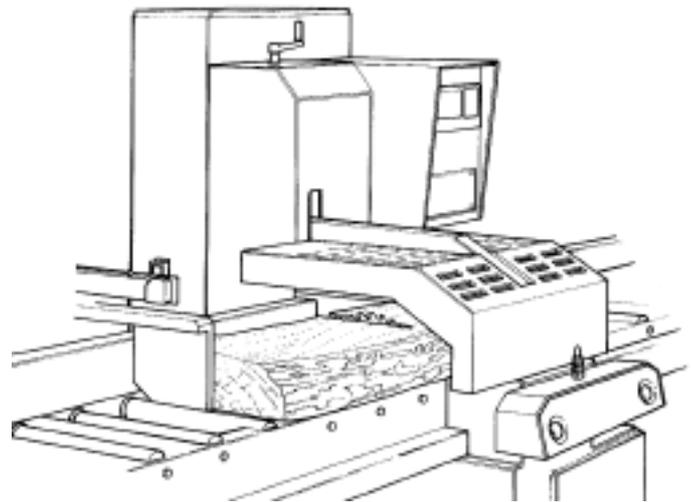


Figure 2 Up-stroking semi-automatic cross-cut saw operated by two-hand control and fitted with a short tunnel guard

Where any type of semi-automatic machine can also be operated in an automatic mode, the standard of safeguarding described below for automatic machines should be achieved when operating in the automatic mode.

Automatic machines

Guards designed to meet the requirements of Table 4 of BS EN 294 should prevent access to the saw blade and any associated clamps. These guards should be designed so they cannot be opened until saw spindle rotation has ceased or the saw blade has returned to a safe position. Access to the saw blade in its rest position should not be possible until the saw spindle is at rest.

Safe working practices

A number of accidents were found to have been caused by the operator adopting unsafe working practices. In some the operator attempted to unblock clogged local exhaust ventilation systems or remove jammed workpieces with the saw blade in motion. There were examples of accidents which happened while machines were 'running down' and others when the operator tried to hold twisted workpieces during cutting and was consequently drawn on to the saw blade. In most of these cases correct safeguarding of the machine would have prevented the accident.

However, suitable appliances to facilitate feeding and removal of short workpieces (eg long-handled tools and/or push-sticks) may need to be provided and used. This is particularly important when guards are not designed to meet the requirements of Table 4 of BS EN 294.

Always consider which machine is the most suitable on which to carry out a particular operation. For example, with the use of an appropriate jig, stake pointing may be carried out more safely on a circular saw bench than on a power-operated cross-cut saw. In the same way it may be more suitable for the cutting of small workpieces to be carried out on another machine.

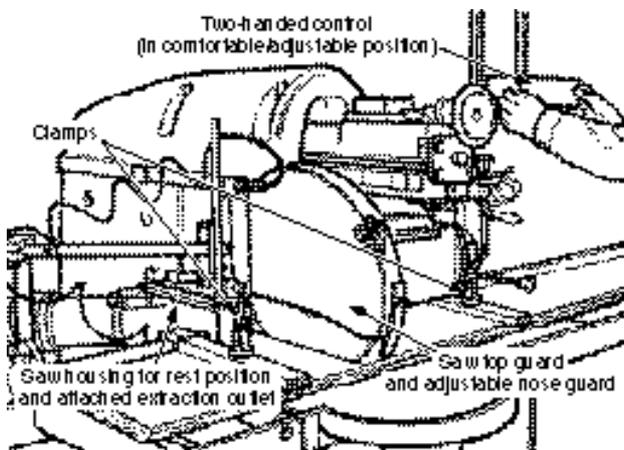


Figure 1 Horizontal-stroking semi-automatic cross-cut saw operated by two-hand control device

Machines where the saw spindle is below the table

In all cases, to prevent access to the saw blade when in its rest position below the table, fixed or moveable interlocked guards, interlocked with the saw spindle drive motor are appropriate. Where the saw spindle rundown time is greater than 10 seconds, interlocked guards should be held in place until the saw spindle has come to rest (eg using a motion detector or locked by a time delay bolt). Alternatively, consider fitting a suitable braking device to reduce the saw spindle stopping time to 10 seconds or less.

Where the initiation of powered clamping and/or saw blade stroke is by way of a two-hand control device, the saw blade should return below the table within 1 second of the release of the device. Measures should always be taken to prevent a second person accidentally contacting the rising saw blade from above, eg a narrow tunnel guard (see Figure 2).

Where the initiation of powered clamping and/or saw blade stroke is not controlled by a two-hand control device, a tunnel guard with dimensions conforming to Table 4 of BS EN 294 should be fitted. It should not be possible to open this guard until the saw blade has returned below the table.

Where this type of operation does have to be carried out on a power-operated cross-cut saw, a suitable jig should be used, which provides workpiece stability, minimises the risk of kickback and keeps hands away from the saw blade.

Training

As is the case with all woodworking machines, it is vital that operators are properly trained to safely carry out the work they are expected to do. In over a quarter of the investigated accidents, inspectors found the serious lack of training of the person injured to be a contributory factor. Only operators who have been authorised, ideally in writing, as properly trained and competent should be allowed to operate machines. Adequate instruction and supervision are also important.

Other hazards

These machines may emit high levels of noise. When fitting new or improved safeguarding, you should favour modifications that are likely to reduce noise emission levels.

All woodworking machines should be fitted with suitable dust extraction equipment to reduce the exposure to wood dust to a minimum.

References and further reading

- 1 *Product standards - Machinery - A guide to the UK Regulations* (May 1995) DTI URN 95/650. Copies available from the DTI's Business in Europe Hotline on 0870 150 2500
- 2 *Management of health and safety at work. Management of Health and Safety at Work Regulations 1999. Approved Code of Practice L21* HSE Books 2000 ISBN 0 7176 2488 9
- 3 *Safe use of work equipment. Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and guidance L22* HSE Books 1998 ISBN 0 7176 1626 6
- 4 *Safe use of manually operated cross-cut saws* Woodworking Information Sheet WIS36 HSE Books 1998
- 5 BS EN 574: 1996 *Safety of machinery - two-hand control devices - functional aspects - principles for design*
- 6 BS EN 294: 1992 *Safety of machinery - safety distances to prevent danger zones being reached by the upper limbs*
- 7 *Health and safety priorities for the woodworking industry* Woodworking Information Sheet WIS34 HSE Books 1997

8 *Health and safety in sawmilling: A run-of-the-mill business?* HSG172 HSE Books 1997 ISBN 0 7176 1402 6

9 *Safe use of woodworking machinery. Provision and Use of Work Equipment Regulations 1998 as applied to woodworking machinery. Approved Code of Practice and Guidance L114* HSE Books 1998 ISBN 0 7176 1630 4

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

Further information

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA Tel: 01787 881165 Fax: 01787 313995 Website: www.hsebooks.co.uk (HSE priced publications are also available from bookshops.)

For information about health and safety ring HSE's InfoLine Tel: 08701 545500 Fax: 02920 859260 e-mail: hseinformationservices@natbrit.com or write to HSE Information Services, Caerphilly Business Park, Caerphilly CF83 3GG. You can also visit HSE's website: www.hse.gov.uk

British Standards are available from BSI Customer Services, 389 Chiswick High Road, London W4 4AL Tel: 020 8996 9001 Fax: 020 8996 7001 Website: www.bsi-global.com

This leaflet 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 is current at 11/98. Please acknowledge the source as HSE.