

Four-sided moulding machine

Safe working practices

HSE information sheet

Woodworking Information Sheet No 40 (Revision 1)

Introduction

This information sheet gives practical guidance on safe working practices when using four-sided moulding machines. This information is aimed at employers and others who have control of how these machines are used. Machine operators will also find this information of use.

Accident history

On these machines, once the workpiece has been loaded (either manually or by a magazine) it is fed through a series of at least four rotating planing or moulding tools (one for each side of the workpiece) by an integrated feed. Many accidents on these machines result in amputations following contact with the cutters. Other types of accident include trapping or entanglement, or coming into contact with the feed mechanism and/or workpiece.

Many of these accidents could have been prevented if the cutters had been properly guarded and had come to rest before being approached for:

- adjustment/setting;
- investigating/unjamming;
- cleaning.

Training issues

The two most common causes of woodworking accidents are missing or inadequate guarding and lack of training. It is therefore important that you train operators, setters, supervisors and managers correctly. Training should include what to do in the event of a problem such as a blockage and never to adjust the guards while the cutters are in motion.

No one should be allowed to work on a four-sided moulding machine unless they have demonstrated competence. It is advisable that competent operators are authorised in writing by a responsible person

(director, senior manager etc). This will then form part of the training records. Anyone who supervises the use of any work equipment should have access to information and where appropriate, written instructions.¹

Legal requirements

Legal requirements covering the use of these machines are contained in *Safe use of woodworking machinery. Provision and Use of Work Equipment Regulations 1998 (as applied to woodworking machinery)*.¹ This document gives practical advice on the safe use of woodworking machinery and covers the provision of information and training as well as aspects of guarding and maintenance (see also Further reading).

When buying a new four-sided moulding machine it should be supplied with a declaration of conformity and have a CE mark. Designers and manufacturers must conform to the essential safety requirements of the Machinery Directive and associated European Free Trade Association (EFTA) regulations. One way of achieving this is by designing and constructing the machine to meet BS EN 12750.² New milling tools should meet BS EN 847-1.³

Safeguards

Guarding the tools

To prevent access to the tools, newer machines have fixed and movable guards which make up an integral enclosure (see Figures 1a and 1b). The enclosure is designed so that no one can stand inside it when the access door is closed. If the enclosure door has to be open, for tool changing or setting, then it should be interlocked with all directly accessible cutting and feeding movements of the machine. The interlocking devices should have guard locking, except for movements in the setting mode. Any interlocks used should comply with BS EN 14119.⁴

Where spindles can operate with the movable guard opened, eg in setting mode, additional guarding is required to prevent access to the tools. These requirements are also necessary on older machines and include:

- hood/extraction enclosures that also provide effective guarding around the cutter blocks, particularly the vertical and horizontal top cutter blocks (see Figures 1a and 2);
- an adjustable bridge-type guard, similar to that used on a hand-fed surface planer, that covers the bottom horizontal heads (see Figure 2).

All guards must be strong and rigid, capable of being adjusted to cover the full width/height of the cutting slot, and be properly maintained.

All transmission machinery, eg belts, pulleys, chains, sprockets, gears and revolving shafts, should be enclosed by fixed guards.

For full details of guarding requirements, including those for the feed rollers and retaining devices, see BS EN 12750.

Safeguards for older machines – fitting a wooden enclosure

Users of old machines should compare the safeguards currently provided on the machine with those detailed in BS EN 12750 and decide if additional measures are required. To do this you should produce a risk assessment that considers the current method of operation and existing methods of safeguarding, including:

- Do the current safeguards actually prevent access?
- Is it practicable to fit further safeguarding measures if they do not?
- Is it practicable to modify or change the method of operation?

Older machines were often supplied without an enclosure and you should build a 'wooden box'-type enclosure around them (see Figure 2). These are normally fitted with simple locks and bolts that do not prevent access to the enclosure with the machine running. Employees should therefore be trained and instructed to operate the brake and stop the machine before entering. In some cases, door interlocks linked to the braking may be beneficial, but this will depend on the machine's characteristics and system of work that must be used with it, particularly for setting – see 'Adjustment, setting and jointing'.

In addition to improving safety, a wooden box enclosure will also reduce noise levels, see 'Noise reduction at four-sided planer moulders'. However, provision must be made to allow 'make up air' into the box so that local exhaust ventilation (LEV) works efficiently. Acoustically designed air inlet are available.

Controlling the risk from ejection

There is a risk of workpiece ejection (kickback), particularly if there are tools fitted for dividing the workpiece, such as a splitting cutter or saw units, and also with multi-profiling units. The powered feed rollers may not adequately control the safe passage of the workpiece and other precautions may be necessary. These include fitting:

- a riving knife;
- extra feed rollers;
- a device such as catching fingers to prevent ejection of the divided parts or splinters.

These should meet the requirements specified in BS EN 12750.

Modern tooling also reduces the risk of kickback as well as the set-up time and seriousness of injury if there is an accident.

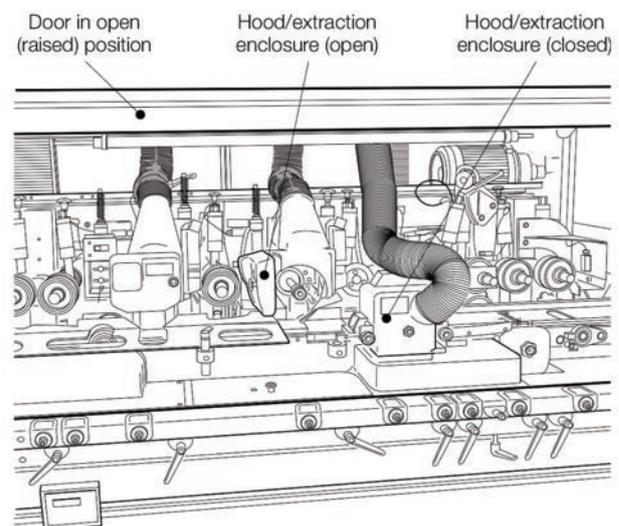


Figure 1a Newer machine with integral enclosure (open)

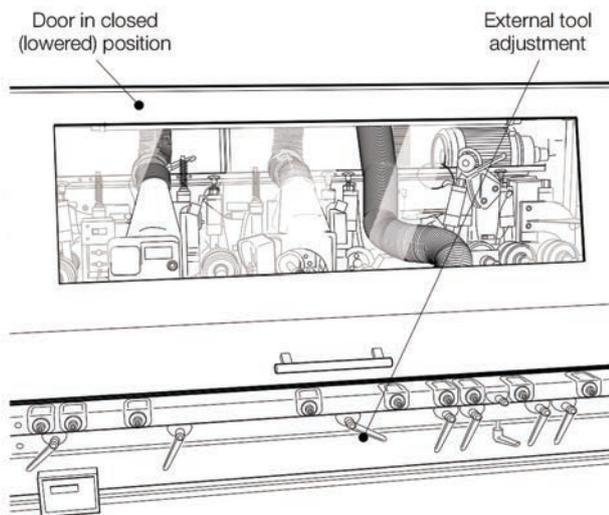


Figure 1b Newer machine with integral enclosure (closed)

Braking

To reduce the risk of contact with the cutter block during run down, newer machines are supplied with a braking device that brings the blade to rest within ten seconds.⁵ However, where the run-up time exceeds ten seconds, the braked run-down time should be less than the run-up time but no more than 30 seconds.

The stopping time for a tool spindle on an older machine can vary between 30 seconds and five minutes. Operators are therefore often tempted not to wait until the cutters have stopped before an intervention – this is often the cause of an incident.

Four-sided planer moulders fall within the group of woodworking machines that required employers to carry out a risk assessment to find out if they needed to fit brakes after the 5 December 2008. However, you do not need to fit brakes if there is no added benefit,⁵ eg if the machine is in an enclosure with interlocked doors, where the interlocks prevent the doors being opened until the cutters have come to rest, using either a time delay or a stop/motion sensor.

In summary, four-sided planer moulders should normally be braked because they will be safer to use as they can be stopped and reset quickly. There will also be less production time lost and if a tool breaks, stopping the machine quickly will reduce the amount of damage.

When retrofitting braking, first consult your machine manufacturer to make sure that potential problems are avoided, such as stopping too quickly and damaging the machine.

Adjustment, setting and jointing

Setting

During setting, it is a requirement for the heads to be running as the trial piece of material is 'inched through' the machine and the pressures/chip breakers are correctly adjusted.

Older machines may not have the remote setting/adjusting mode of newer machines or external tool

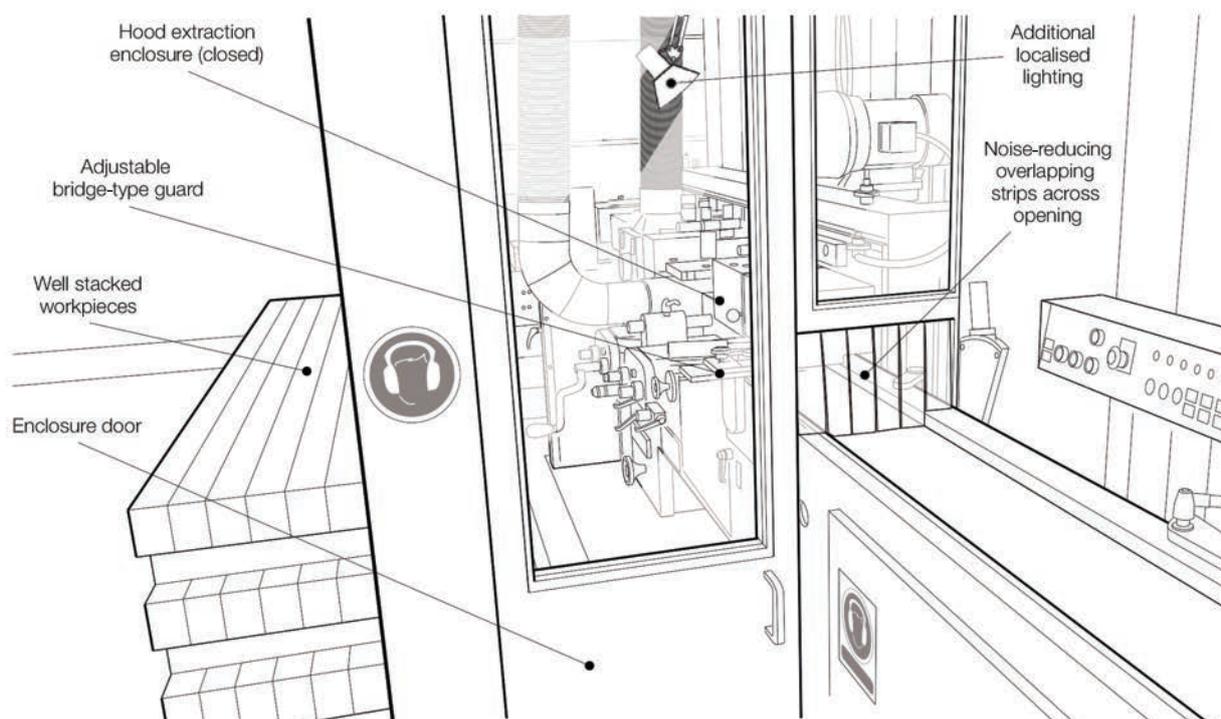


Figure 2 Older machine with wooden box-type enclosure

adjustment (see Figure 1b) and in some cases cutter adjustment must take place locally. Where a 'wooden box' enclosure has been fitted, the setter will have to work inside it. If interlocks are fitted to the doors they will have to be closed to allow the machine to run – the setter would therefore be required to work alone inside the sealed enclosure, a situation likely to increase the safety risk. With the door closed, health risks will also increase as there will be higher levels of noise and dust within the enclosure.

In these circumstances, careful consideration is needed before fitting interlocks on the enclosure doors. Other options, such as a lock with controlled key access, may be more appropriate.

During setting, it is important that all cutters have been effectively guarded, ie by the use of hood/extraction enclosures around the cutter blocks and 'bridge-type' guards covering the bottom horizontal heads, as detailed in 'Guarding the tools'.

You should only remove or open these guards when the machine is stopped and being cleaned/maintained or a cutter block is being fitted to the spindle during a tool changing operation.

Guards are usually fitted and closed during setting and jointing. However, on some of the older machines setters have reported that they need to be able to see the cutters during final adjustment and have the hood/extraction enclosures around the cutters open during setting. If this practice is a requirement for setting, then additional safety measures should be used to reduce the risk. One option could be to fit mesh guards between the hood/extraction enclosure and the cutters, designed to allow observation of the cutters during setting but able to prevent accidental contact. If such guards will block the extraction system then they should only be fitted and used for setting etc and removed before the start of normal machine operation.

Jointing

Jointing is an activity mainly carried out on older machines (see Figure 3a) but is also an automatic option on some new machines (see Figure 3b). It takes place after setting the cutters in the block and its purpose is to ensure that all cutters are in the same cutting circle, ie registering (touching) on the timber and removing the same amount of wood equally. This will ensure a better finish and allow a faster feed rate.

Jointing involves use of an abrasive jointing stone set in a holder, bolted onto the machine. The stone is then moved carefully into the cutters by means of a screw thread until contact has been made, it is then

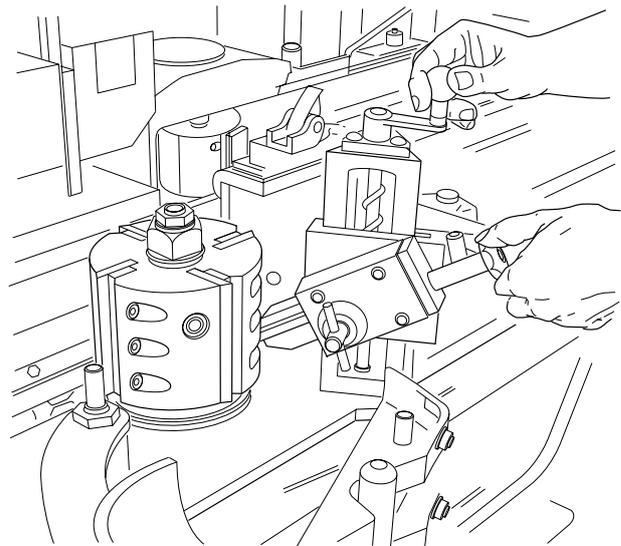


Figure 3a Straight jointing on old machine

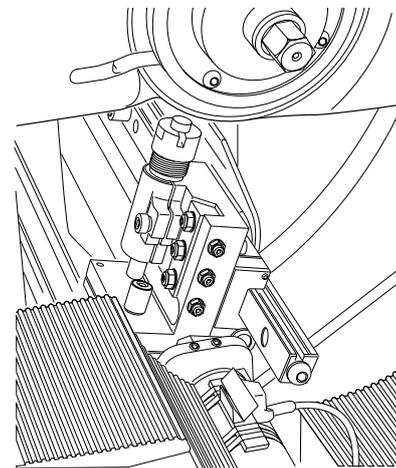


Figure 3b Automatic jointing

traversed along the length of the cutter in the case of straight jointing, normally used for planing operations, again generally by means of a screw thread (see Figure 3a).

Profile (stab) jointing uses a jointing stone that has been shaped into the opposite profile of the moulding cutters. This is achieved by turning the cutter block by hand so that it gently chips pieces off the stone until the profile has been formed. The cutters are then run at full speed and the profiled jointing stone is wound into the cutters until gentle contact has been made, ie sparks are produced. There is no traversing as the stone is only moved into and out of the cutting periphery. For complex moulding cutters, the shape to be jointed is done one section at a time. However, simple moulders can have their whole section shaped in one go.

When jointing, the cutters have to run at up to 6000 rpm for the process to work, not just setting mode. Jointing is therefore a high-risk operation as it involves

working in close proximity to the cutters running at high speed. It is essential that only a trained and experienced setter is authorised to undertake this operation.

Because of the dangers associated with setting and jointing it is essential that you complete a machine-specific setting/jointing risk assessment that considers all the safety and health issues. Include the following topics in your assessment to help you to produce a safe system of work.

Training

Make sure that only:

- adequately trained and experienced employees are authorised to carry out setting/adjustment and jointing;
- the setter is allowed in the working area of the machine during setting/adjustment and jointing operations.

Guarding

Make sure that you have prevented access to the cutters during setting and jointing, reducing the risks so far as possible.

Personal protective equipment (PPE)/clothing

Make sure that the setter is wearing:

- suitable eye, ear and foot and hand protection (see 'Fitting cutters');
- respiratory protective equipment (RPE) if they need to;
- no loose clothing that could cause entanglement.

Tools

Make sure that the setter has the correct tools and equipment they need and that it is located in a safe area, ie tools cannot fall into a danger zone during setting.

Housekeeping

Make sure that the immediate floor area around the setting operation is clean and kept clear of all obstructions and tripping hazards. Make sure offcuts and wood dust can be removed safely.

Stack unmachined and finished workpieces safely, in a position that allows easy feeding to and from the machine (see Figure 2). Use suitable workpiece supports where necessary.

Fitting cutters

Many injuries occur when cutter blocks are being handled, either because of the sharp cutters or the weight of the block. Some cutter blocks can weigh up to 30 kg and may need to be fitted at arm's length, so the risk of injuries can be high.

When handling cutter blocks, make sure that:

- protective gloves are worn, suitable for handling sharp and possibly oily cutter blocks. Gloves should provide a good grip and be able to prevent cuts and abrasions;
- there is a mechanical device such as a trolley for transporting heavy cutter blocks. Mechanical lifting may also be required to lift them on to and off the spindle.

Templates and other setting aids will help minimise set-up time and ensure the set-up is right before the machine is started.

Lighting

Make sure that there is good general lighting. Use extra localised lighting if necessary to illuminate the cutting areas (see Figure 2).

Machine controls

- Machine controls should be clearly marked to show what they do, and in easy reach of the operating position.
- There should be at least one emergency stop at the in-feed end, but more may be needed, eg inside the enclosure or at the out-feed on long-bed machines.
- Make sure all machine controls are routinely tested and properly maintained.
- Where provided, the switch that selects between the setting mode and normal running should be lockable to prevent someone starting up the machine by mistake.

Noise reduction at four-sided planer moulders

Four-sided moulding machines can be very noisy – levels are normally over 85 dB and can be as high as 105 dB at the position where the in-feed operator stands.

The main sources of noise and control measures are:

- idling noise generated by the cutter heads, vibration from the timber and noise from LEV – provide/build a noise enclosure;
- cutting noise from the impact of the knives on timber – helically bladed cutter blocks will significantly reduce noise.

Other options to reduce noise are to:

- use segmented blocks that can make a 5 dB reduction when used at the bottom first head;

- reduce the cutter rotation speed and increase the number of knives – this will reduce noise without affecting the quality of the finish;
- use slotted or perforated tables as these can reduce idling noise by 5 dB.

Full noise enclosures

Full noise enclosures (Figure 2) will only be effective if:

- feed openings are kept as small as possible and acoustically treated. They should be adjustable or no larger than the maximum cross-section the machine can process;
- where possible, the machine controls are outside the enclosure;
- when machining longer and wider workpieces, which will vibrate and transmit noise outside the enclosure, you use larger and longer enclosures;
- the in-feed and out-feed conveyors are not connected to the machine bed;
- vibration is reduced by fitting damping techniques where it is possible to do so. Feed attachments such as sound absorbing tunnels (see Figure 4) can reduce in-feed noise levels by 5 dB.

For information on noise, including how to build a noise enclosure, see 'Further reading'.

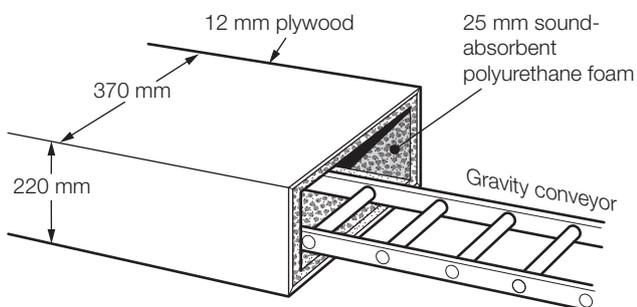


Figure 4 Noise reducing tunnel

Note: The size of the tunnels depends on the maximum workpiece dimensions the machine can process. Tunnels should be a little larger than the maximum size of the timber.

References

- 1 *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* (Second edition) HSE Books 2014 ISBN 978 0 7176 6621 8 www.hse.gov.uk/pubns/books/L114.htm
- 2 BS EN 12750:2013 *Safety of woodworking machines. Four-sided moulding machines* British Standards Institution
- 3 BS EN 847-1:2013 *Tools for woodworking. Safety requirements. Milling tools, circular saw blades* British Standards Institution
- 4 BS EN ISO 14119:2013 *Safety of machinery. Interlocking devices associated with guards. Principles for design and selection* British Standards Institution
- 5 *Retrofitting woodworking machines brakes* Woodworking Information Sheet WIS38(rev1) HSE 2014 www.hse.gov.uk/pubns/WIS38.htm

Further reading

Safe use of work equipment. Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and guidance L22 (Fourth edition) HSE Books 2014 ISBN 978 0 7176 6619 5 www.hse.gov.uk/pubns/books/l22.htm

Information on how to build a noise enclosure can be found in:

Noise reduction at band re-saws Woodworking Information Sheet WIS4(rev2) HSE 2014 www.hse.gov.uk/pubns/WIS4.htm

For more information on noise see:

Noise at work: A brief guide to controlling the risks Leaflet INDG362(rev2) HSE Books 2012 www.hse.gov.uk/pubns/INDG362.htm

Reducing noise at woodworking machines Woodworking Information Sheet WIS13(rev2) HSE 2014 www.hse.gov.uk/pubns/WIS13.pdf

More information on woodworking machinery and other safety and health issues can be found on HSE's Woodworking website: www.hse.gov.uk/woodworking.htm

Further information for suppliers, installers and users of new and second-hand machinery can be found on HSE's Work equipment and machinery web pages: www.hse.gov.uk/work-equipment-machinery/index.htm

More information on controlling noise at work can be found on HSE's Noise website: www.hse.gov.uk/noise/index.htm

Further information

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