Health and safety in sawmilling

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Although standards of health and safety are much improved over recent years, sawmilling remains a high-risk industry.

This revised guidance comprehensively updates and expands the original *Health and safety in sawmilling*, published in 1997. This edition takes into account the higher levels of automation introduced into the industry, with the attendant increase in injuries caused by operator interventions. The guidance was produced in close consultation with the industry and represents current good practice.

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This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance as illustrating good practice.

Contents

Introduction

1 Historically, the sawmill industry has had a poor health and safety record. For many years, rates of fatal and major accidents were about four times higher than the wood industry as a whole. Between 1985 and 1995 there were 19 people killed in sawmills and this prompted a two-year enforcement campaign by the Health and Safety Executive (HSE). Although standards are now much improved, sawmilling remains a high-risk industry.

2 This revised guidance comprehensively updates and expands the original *Health and safety in sawmilling* published in 1997. Since then, the industry has seen much consolidation, various technical innovations and moves to much higher levels of automation to achieve greater productivity. Although fewer people are now employed in the industry there has been an increase in the number of injuries caused during operator interventions on automated lines to clear blockages etc. This has been taken into account in the guidance, which has been expanded in these areas.

3 The guidance is aimed at all managers and supervisors working in the sawmilling industry. It was produced in close consultation with the industry and focuses on issues and problems that are specific to sawmilling. For coverage of more general health and safety issues that apply to woodworking premises as a whole you should consult HSE's woodworking webpages at www.hse.gov.uk/woodworking/index.htm and other topic-specific pages on HSE's main website, for example:

Asthma
www.hse.gov.uk/asthma/index.htm

Falls from height
www.hse.gov.uk/falls/index.htm

Fire and explosion
www.hse.gov.uk/fireandexplosion/index.htm

First aid at work
www.hse.gov.uk/firstaid/index.htm

Preventing slips and trips
www.hse.gov.uk/slips/index.htm

Stress
www.hse.gov.uk/stress/index.htm

Temperature
www.hse.gov.uk/temperature/index.htm

4 Other webpages covering topics such as noise etc are given in the relevant sections of the guidance.

5 Some useful addresses are included in 'Further information'.

Managing health and safety

6 Sawmills have a fast-moving dynamic environment so can be dangerous places. Apart from the obvious dangers from saws and other machinery, there are a range of other risks such as those from conveyors and mobile plant. Occupational health risks also need controlling. Risk assessment is crucial to controlling and managing these risks. It means a careful examination of how people could be harmed by work activities. The aim of this guidance is to provide help in targeting and controlling the risks from some known causes of accidents and ill health. However, the hazards in a particular sawmill will need you to consider the processes carried out there as well as on-site conditions and the workforce competence. When undertaking a risk assessment a 'several heads is better than one' approach should be adopted. Ideally, a small assessment team made up from operators, supervisors and management is the best option.

7 With risk assessment, the level of risk from a particular activity should be balanced against the cost, time, trouble and difficulty of doing something to reduce it. In simple terms, the greater the risk, the more effort you need to make in controlling it.

8 Risk assessment is not a one-off process as it should be reviewed at reasonable intervals and also whenever changes in the process or layout are made. It should also take into account activities that are outside normal production processes, for example operator intervention to resolve blockages etc, troubleshooting or maintenance procedures.

9 Questions to consider when undertaking a risk assessment would include:

- Do minor accidents regularly occur at one place or machine (eg trips at a certain point)?
- Have recent absences from work been linked to workplace conditions?
- Is there evidence of any collisions between vehicles and buildings or plant?
- Have loads or stacks of timber shifted, collapsed or been dropped?
- Have there been ejected workpieces which have missed nearby workers?
- Do operators routinely have to intervene in the production process to clear blockages or make adjustments?
- When contractors come on site, are their activities included within site monitoring and supervision?
- Is there a difficult maintenance job which needs to be managed every year?
- What work at height could take place?
- Are there tasks where personal protective equipment (PPE) (eg hearing protectors, dust masks, wet weather gear) is needed but unavailable, in poor repair or not being used?

Incident investigation

10 The purpose of risk assessment is to stop an incident occurring, but should an incident or near-miss take place a thorough investigation that identifies the cause is also of value. It is also important to develop a culture in which employees are encouraged to report matters of concern or suggest improvements to health and safety.

Contractors

11 It is also important to correctly manage any contractors who come to work on site as the sawmill management will have some responsibility for their health and safety as well as that of sawmill workers who could be affected by the contractors' work. A pre-start meeting should take place that considers:

- the contractors being made aware of any site hazards or safety procedures (including the presence of any asbestos);
- any health and safety risks caused by the contractors' work activity;
- any special procedures, for example changes in the process or vehicle routes caused by the contractors' activities;
- that the extent of health and safety responsibility for each party is clearly understood by all concerned.

12 More detailed advice on risk management can be found at www.hse.gov.uk/risk/index.htm.

Training

13 Many of the incidents at sawmills are caused by a lack of training or competence. Employees must be trained so that they can safely perform all their normal tasks plus any others which they could be required to do. The amount and type of training will depend on what their activities are.

14 Induction training is particularly important for new employees and, where necessary, contractors and other site visitors such as delivery drivers.

15 Managers and supervisors will also need to be trained in health and safety. Formal training courses relevant to their responsibilities are generally considered necessary.

16 When training young, casual or temporary workers you should give particular consideration to:

- their level of maturity;
- their likely lack of experience of the work environment;
- the possible need for tighter supervision than might be the case with a more experienced employee;
- their ability to acquire the competence to operate dangerous machinery at all, ie they may not be suited to the task.

17 Before deciding that adequate training has been provided consider whether the worker:

- is to be provided with regular competence assessments;
- is familiar with the risks to themselves and to others;
- understands the purpose and function of machinery or plant controls;
- knows how to use the safeguards and PPE provided;
- understands safe systems of work;
- has the physical and mental capacity to carry out a particular task (in particular has the literacy skills to read and understand any written instructions);
- knows who to contact if there is a problem or if they are unsure about something.

18 Testing the competence of an employee is important to make sure that adequate training has been given. It is also important to re-test competence for experienced operators at set intervals to make sure that bad habits have not been picked up.

19 New starters are likely to have the greatest training needs. You also need to think about refresher training for trained and experienced operators at least every five years. They can lose some skills if they don't use them regularly.

20 After being successfully trained operators should be authorised for that particular task and this should be recorded. This is particularly important for machine operators so it is clear from the records who has been trained to use a particular machine.

21 Proskills is the Sector Skills Council responsible for the wood industry, including sawmilling. Working with industry, they are responsible for developing national occupational standards which help develop training programmes, qualifications and apprenticeships. Many of these are funded by appropriate government-funding organisations.

22 Other options used by sawmills are:

- IOSH Managing Safely;
- IOSH Working Safely;
- Level 3, 5 and 6 NVQ in Health & Safety;
- Woodwise unitised qualifications (ie training for a specific machine).

23 Employees who have completed formal training should have a good understanding of risks and safe methods of work for specific activities within the industry. However, it is still advisable to assess their abilities and to check if more specific site training is required.

24 General advice on training and supervision can be found on the HSE woodworking webpages www.hse.gov.uk/woodworking/index.htm.

25 More specific information on training woodworking machinists can be found in Appendix1 of the Approved Code of Practice (ACOP) L114 *Safe use of woodworking machinery*.[1] This document also contains advice on training young people.

Safeguarding machinery

How accidents happen

26 Many machinery accidents in sawmilling involve:

- contact with moving saw blades;
- being caught on, or dragged into, feed or transfer mechanisms;
- being struck by ejected workpieces.

27 A large number happen during:

- cleaning;
- removing blockages;
- adjustment and maintenance.

28 This shows that it is important to consider safe methods of working for **all** operations, not just during normal production.

Provision and Use of Work Equipment Regulations 1998

29 Guidance in the ACOP L114 advises that the measures specified under regulation 11(2) that should be taken to prevent access to dangerous parts of machinery and achieve compliance with regulation 11(1) are ranked in the order that they should be implemented, often termed the **'hierarchy of control'**. Where practicable, the levels of protection considered adequate are:

- fixed enclosing guards;
- other guards or protection devices such as interlocked guards and pressure mats;
- protection appliances such as jigs, holders and push-sticks etc;
- the provision of information, instruction, training and supervision.

30 PUWER also requires that:

- only machines suitable for the purpose to which they are being put are used;
- protection against workpiece ejection is provided.

31 Further information on these terms is given in Appendix 2 of the ACOP L22 *Safe use of work equipment*.[2]

Basic principles

32 Whenever possible, people and dangerous parts of machinery should be kept apart. If this does not happen in your mill, ask yourself if more could be done to achieve it.

33 Sometimes a hazard can be 'engineered out'. Always consider this possibility before attempting some form of safeguarding as production can also be improved. For example, if blockages at parts of timber transfer lines, such as cross-conveyors and waterfall-conveyors, can be prevented or reduced there will be less need to enter hazardous areas and production will be less frequently interrupted.

34 If the hazard cannot be engineered out look to see where improvements can be made in safeguarding the:

- cutting hazards, eg band saw blades;
- entanglement hazards, eg rotating spiked feed wheels, roller and conveyor belts;
- drawing-in hazards, eg between chains and sprockets and 'dogs' (cleats) on the chain;
- shearing hazards, eg the legs of a scissor lift;
- puncture hazards, eg ejected off-cuts;
- crushing hazards, eg beneath an automatic stacking machine;
- impact hazards, eg being struck by a log carriage.

35 Here are some basic guidelines for safeguarding machinery:

- Use fixed guards (those with a fixing requiring a tool to remove them) where the need for access is infrequent, ie less than once per shift.

- Use movable guards that are interlocked with the dangerous movement where frequent access is required, ie more than once per shift.
- Isolate the power (electric, hydraulic and pneumatic) to machines and lock off during cleaning, blockage removal, adjustment and maintenance, whenever danger is caused by these operations.
- Where maintenance work can only be carried out with power on, consider the use of hold-to-run controls and limited speed operation.
- Where access to dangerous parts cannot be eliminated completely, reduce exposure to the minimum possible.
- Provide emergency stop systems where they can contribute to safety, but do not rely on them as the only safeguard – check, where appropriate, that machines are supplied with an auxiliary power source for braking systems.
- Always make sure that operators and maintenance staff are properly trained to carry out their designated tasks on machinery they work on.
- If guards are removed for any reason, check that they are always refitted afterwards.
- Keep all safety-related components in good condition and properly adjusted.

36 Remember, safe systems of work are a means of last resort only.

37 Improve the safety of your machines by making sure that:

- there is adequate, unobstructed space to pass between and work at machines;
- access routes do not require people to climb over or go under unprotected machinery – mark exclusion zones on the floor to restrict entry during operation;
- floor areas are kept clean, dry and free from tripping hazards (this is particularly important near to exposed saw blades);
- machines are on a secure base;
- the safeguards provided are functioning effectively, by checking them regularly;
- loose clothing is not worn and long hair is kept tied back;
- work areas are well-lit, with glare kept to a minimum (strip lights are best avoided because they can cause a strobe effect with fast-moving machinery).

Combined solutions

38 Sometimes, particularly where processes are highly mechanised, measures taken to safeguard one piece of equipment or control one hazard, may also safeguard another hazard. It is therefore best to take a step back and take an overall view of hazard prevention. For example, when considering how to prevent access to dangerous parts of a machine, it is important also to take into account hazards such as noise, dust and vibration. More details on the approach to take when safeguarding mechanised log processing lines are provided in the section on ‘Mechanised sawmilling lines’.

Documentation

39 Documentation describing the construction of machinery and its associated electrical, hydraulic and pneumatic systems (as appropriate) must be available for maintenance personnel. When safe systems of work are being produced, or system modifications and upgrades are being considered, then this information is extremely helpful. This is especially true where safety-related systems such as interlocking and emergency stop circuits are involved. You must also make sure that the technical descriptions are kept up-to-date when system changes are made.

40 In addition, make sure appropriate written operator instructions are available.

Buying and selling machinery

41 Since 1 January 1995, manufacturers and suppliers of all 'new machinery' must have complied with the requirements of the Supply of Machinery (Safety) Regulations 2008.

42 Further information can be found in *Buying new machinery*, INDG 271[3] and Machinery guidance notes from the Department for Business, Innovation and Skills.[4]

Safeguarding standards for used machines

43 When buying a second-hand machine the supplier has a responsibility to make sure it is safe to use under section 6 of the Health and Safety at Work etc Act 1974.[5] When making a purchase you may wish to use the applicable BS EN standard to check the machine meets an appropriate level of safety. Refer also to the PUWER **'hierarchy of control'**.

44 For machines already in use, it is advisable to compare the safeguards currently on the machine with those detailed in the relevant standard and see if additional measures are needed. This can be achieved by a risk assessment that considers 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 machine is used;
- the number of workers at risk of injury;
- how severe any injury is likely to be;
- the possible effects on production.

45 All methods of safeguarding must be regularly maintained to make sure they work efficiently. If you sell an item of second-hand machinery it must be sold with all the necessary safeguards and instructions for safe operation.

46 Sometimes, a purchaser might ask you to sell a machine without all the necessary safeguards, perhaps because it is going to be incorporated into a production line. In these circumstances, you need to obtain written confirmation from the purchaser that they will not allow the machine to be used until it is properly safeguarded. You are strongly recommended to send the purchaser a list of the required safeguards in writing and to keep a copy for your records.

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

Braking

48 Many accidents happen when a machine is running down or when it is left unattended under power. Where there is a risk of contact with the saw blade or other tool during run down, machines must be fitted with a form of automatic braking by the manufacturer to reduce this risk.

49 The only exceptions to this are:

- where the tool stops very quickly without the aid of braking (normally in less than ten seconds);
- if there is zero speed detection that ensures the machine has stopped before access is allowed.

50 Regulation 15 of PUWER 98 requires braking to be fitted to woodworking machines, with further guidance provided in paragraphs 130 – 135 of *Safe use of woodworking machinery*. See also Woodworking Information Sheet No 38 *PUWER 98: Retrofitting of braking to woodworking machines.*[6]

51 By now, all specified woodworking machines should be braked.

52 For some woodworking machines it is accepted that stopping within ten seconds is not possible and it may even be dangerous to attempt to do so. This is because of the amount of energy dissipated during braking, and also because blades could break. The most important thing is that the machine is stopped safely. However, the run-down time should be less than the run-up time, with an overriding maximum of 35 seconds for larger machinery.

Saws

How accidents happen

53 An analysis of machinery accidents in sawmilling, investigated by health and safety inspectors over a five-year period, showed that the most commonly involved machines were:

- band saws (all types) – 18%;
- cross-cut saws – 14%;
- other circular saws – 11%.

54 Sharp, revolving saw blades present a very obvious hazard. Even so, people can be distracted or may trip and fall on to a saw blade. Cleaning, removing blockages or unsafe maintenance practices can also cause accidents. These have resulted in severe lacerations, amputations and deaths.

Cleaning and blockage removal

55 Traditionally, it has been common within the industry to clean machinery and the surrounding work area by hand, as well as to free jammed timber, with dangerous parts of machines still in motion. This practice still takes place but should be strongly discouraged unless pinch bars or other timber handling aids have been provided.

56 Certain woods which have high resin content, such as larch and pine, are known to cause a resin build-up which can lead to uneven cutting. Band saw blades and/or band wheels, in particular, have been cleaned by hand, using some form of scraping tool, when the machine is running. The manual cleaning and removing of blockages with machines under power have led to numerous serious accidents, mostly amputations. Some examples of real accidents are described below:

A sawyer received serious lacerations to his hand when he was cleaning with a wire brush the running saw blade of a band re-saw.

A sawyer had his index finger amputated by the running saw blade of a log band saw he was cleaning with a hacksaw blade.

A machinist received serious injuries to his left hand as he was trying to free jammed timber on a double-band re-saw. He didn't isolate the machine and the saw blade was still running.

57 The following measures should be taken to phase out the dangerous practice of cleaning running saw blades by hand:

- Properly maintain and adjust the machine felt pads and scraping device – Figure 1.
- Adequately lubricate the saw blade and/or band wheels, taking into account the species of wood being sawn.
- Consider fitting a simple automatic lubrication system – Figure 2.

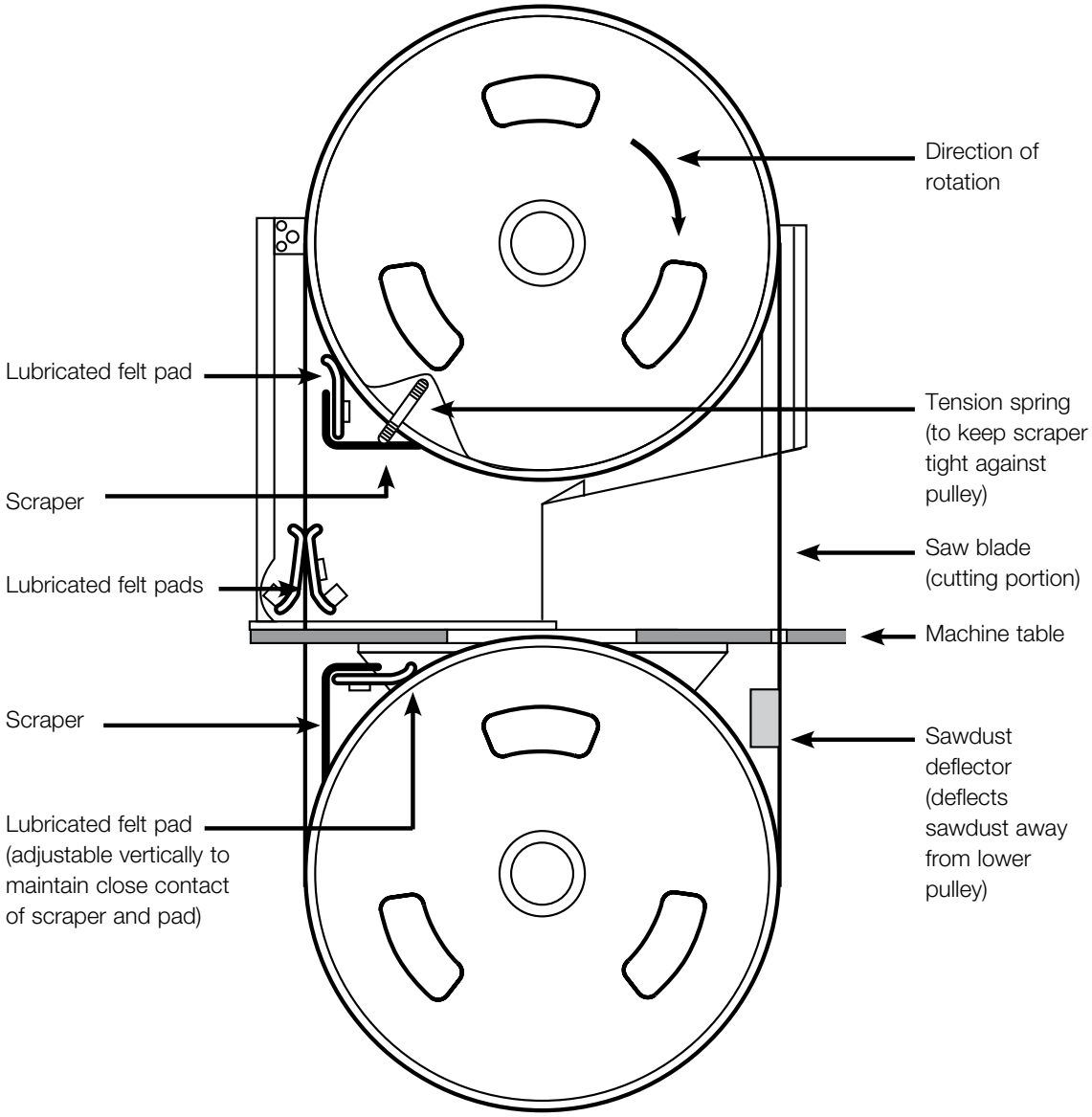


Figure 1 Band saw cleaning system (guards and machine detail not shown for illustration purposes)

Figure 2 Automatic lubrication system

58 As a general rule, make sure saw blades of all kinds – and associated feed mechanisms – are stationary and isolated when they, or the area surrounding them, are being cleaned or blockages removed.

Manual feeding

59 On machines where workpieces are fed to the saw blade directly by hand, it is necessary to keep the timber pressed against the machine fence. It is common practice to do this by hand. This means that operators' hands often come within a few centimetres of moving saw blades, see Figure 3.

60 Consider why this practice takes place; often it will not be necessary as using a power feed is a much safer option. Even if it is, you should devise a safer system of work that keeps hands away from the danger zone. This could involve training employees not to apply pressure to the workpiece by hand, past a particular point of the fence. Alternatively, a push stick could be used to apply pressure to the tail end of the timber as it passes through the saw blade. Support rollers can also be provided.

61 Hand-fed operations where there is a need for well-constructed jigs and fixtures for cutting include pointing pegs and cutting Aris fence rails. See the woodworking webpages for details, particularly on rip saws (www.hse.gov,uk/woodworking/ripsaw.htm) and cross-cut saws (www.hse.gov.uk/woodworking/crosscut.htm).

62 Where the timber is fed to the saw blade by a power feeding system, such as powered rollers, there is not normally a need to hold the workpiece against the fence manually. For an example of correctly guarded powered rollers, see Figure 10.

Requirements for safeguarding band saws

63 There are several types of band saw designed for primary and secondary cutting of timber:

- either a vertical or horizontal configuration;
- 'stand-alone' with a manually controlled feed – Figures 3 and 4;
- 'in-line' with a mechanical or automated feed – Figure 6.

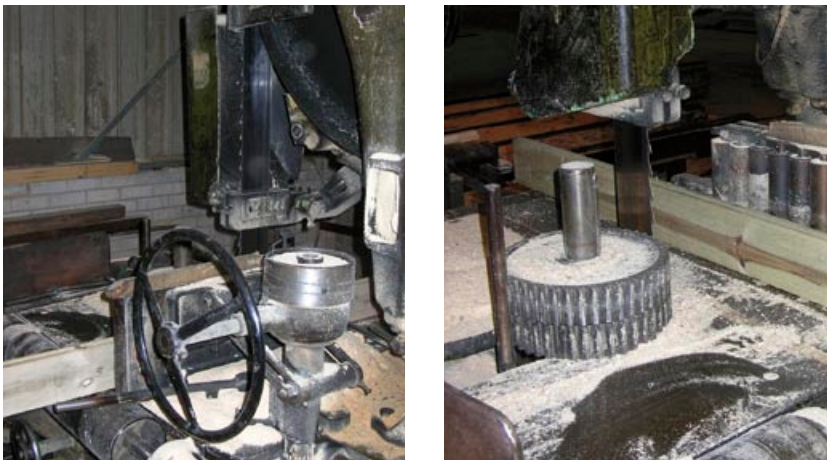


Figure 3 Stand-alone band saw with manual feed and optional power feed without guard fitted

64 For specific requirements refer to the relevant standard for band saws in BS EN 1807:1999 *Safety of woodworking machines – Band sawing machines*.[7]

65 As a general principle, position the controls required for the normal processing operation of log band saws at least 1.2 m from the cutting area. Alternatively, controls can be separated from the cutting area by a deterring/impeding device that creates a reach distance of 1.2 m to the saw blade.

Guarding of the cutting area of log band saws under manual control (where each individual cutting stroke is under the control of the operator)

66 The guarding required for the cutting area of log band saws that have a saw blade with a single cutting edge is a guard enclosing the saw blade on at least the cutting edge and outer side. This applies to reciprocating carriage, moving head rig or conveyor-fed log saws. Where the saw blade has two cutting edges the guard must enclose the saw blade on at least three sides, ie the cutting edges and the outer side.

67 There must also be a control for opening and closing the adjustable guard situated at the operator's position. When the operator leaves the operating position the guard shall automatically close by means of, for example, a hold-to-run control of an interlocked seat.

68 The guard should have reached the adjustable saw blade guide before the reciprocating carriage has started moving. An alternative option is to use a 1.8 m perimeter fence that meets the same requirements as a mechanised line (see below).

69 For a travelling table log saw under manual control, Figure 4a, there is also an option to guard the cutting area of the saw blade with a deterring/impeding device not more than 100 mm below the travelling table height and sited at least 1.2 m from the saw blade, which prevents access to the saw blade's cutting area.

Figure 4a Travelling table log band saw (manual control) with inadequate safeguarding (top) and travelling table log band saw (manual control) after additional safeguarding has been fitted (below)

Guarding of the cutting area of multi-cut log band saws (hand-fed or automated/ mechanised lines)

70 Multi-cut band re-saws incorporate a number of in-line re-sawing units and are used as a fast way of converting squared timber into boards. When safeguarding hand-fed machines, Figure 4b, you are advised to follow the same safeguarding principles as for single-cut band re-saws. In addition, prevent access to dangerous traps or nip points created by drive rollers between saw units when the machine is operating.

71 For all machines where movement of the head rig, reciprocating carriage and/or any other feed mechanism, for example a conveyor, is not under manual control – ie where each individual cutting stroke is **not** under the control of the operator – access to dangerous moving parts must be prevented until all dangerous parts have come to rest. For new machines this should be by means of perimeter fencing of minimum height 1.8 m, Figure 5, or other equally effective measures for older lines, Figure 6.

72 All access gates within this fencing must be interlocked with guard locking. The safety-related control system for interlocking must be conditional unlocking according to Table 1 of BS EN 1088:1995 *Safety of machinery. Interlocking devices associated with guards. Principles for design and selection*.[8] All other openings in the perimeter fence, eg in-feed and out-feed, must conform to BS EN ISO 13857:2008 *Safety of machinery. Safety distances to prevent hazard zones being reached by upper and lower limbs*.[9]

Figure 4b Hand-fed multi-cut band re-saws

Figure 5 1.8 m perimeter fence and access gate with interlocked guard locking – this is the standard for new mechanised/automated lines

Figure 6 Older mechanically-fed six-in-line horizontal band saws with retrofitted interlocked hinged gate between machines

73 *Note:* See 'Mechanised sawmilling lines' section for further requirements for mechanised/automated lines.

74 For machines where the saw blade is accessible, there should be an automatic brake on the driven band wheel where the unbraked run-down time is more than ten seconds. The braking requirements are that the braked run-down time should be less than ten seconds or, where the run-up time exceeds ten seconds, should be less than the run-up time but should not exceed 30 seconds.

Guarding of the non-cutting area of log band saws under manual control

75 BS EN 1807:1999 requires that the non-cutting area of log band saws under manual control is guarded to the same standard required for those of table band saws. This means that the top and bottom band wheels of the machine – and the whole of the saw blade in the non-cutting area – is enclosed by fixed and/or interlocked movable guards, Figure 7. An exception is when the bottom band wheel is located in a pit, where it need not be fitted with guards, but the pit cover should be interlocked to the same standard as the guard for the top band wheel.

76 In addition, the manufacturer should:

- design the control circuit to provide interlocking to the pit cover – so the machine will not operate unless the pit cover is closed;
- provide the interlocking device and electrical connection points;
- provide information in the instruction manual to enable the installer to fit the above device. Operators should be trained to set adjustable guards to suit the depth of the workpiece, and this adjustment should be possible without placing the operator in danger.

77 During saw blade changing, if it is necessary for the saw blade to be run under power for tracking, a safe system of work needs to be followed. This should take into account the manufacturer's instructions for this operation.

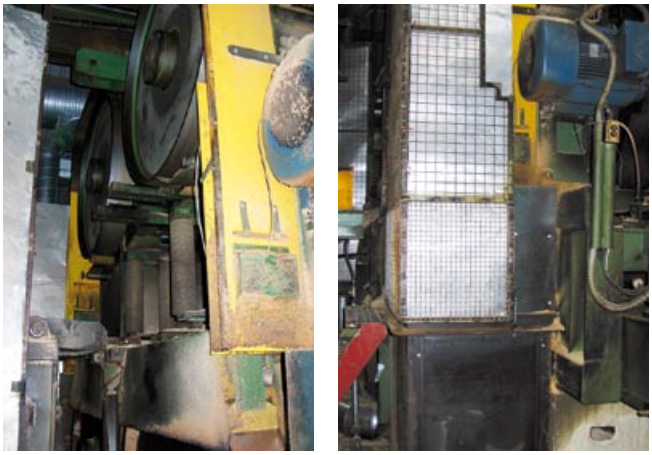


Figure 7 Open and closed fixed guarding around non-cutting area of band saw blade

General band saw information

Travelling table band saw

78 On these types of saws, logs are placed on a table which can be fed to the saw blade manually or under power. Some form of log gripping device, such as removable log hooks, is normally required to maintain logs in the aligned position for cutting.

79 Hazards for table saws include:

- contact with the running saw blade;
- entanglement in the drive for travelling table (cables etc);
- being struck by the travelling table and/or log positioned on it;
- entanglement with the gripping devices;
- trapping between the travelling table and the fixed machine bed;
- high noise levels.

80 In addition to the previously mentioned guarding standards, to improve the safety of this type of machine:

- Safeguard all traps by fixed guards.
- Fit a limit switch or mechanical restraint to prevent the travelling table going beyond its extreme limits.
- Automatically lock the travelling table in its loading position by a brake or clamp.
- Arrange for the control for operating the travelling table to be of the hold-to-run type.
- Do not operate the hold-to-run control unless the dogging system has been initiated.
- Make sure that log hooks (hook dogs) do not protrude beyond the vertical plane of the table on the operator's side when in their rest position (ie when not in use).

Reciprocating carriage log band saw (vertical band mill)

81 Typically, this is a machine where the log is held on a carriage which travels to one side of the saw unit, Figure 8. The log carriage is mounted on rails and is powered either mechanically, using steel cables, or hydraulically. Logs can be loaded on to a carriage by fork-lift, via a separate log conveyor or manually. Log-turning devices may be fitted to align the log for the first cut. Once aligned, a log is held in position to prevent movement during the cut.

Figure 8 A reciprocating carriage log band saw – feed on to carriage and carriage approach to band saw

82 The log is supported against adjustable head blocks and held securely by gripping dogs positioned manually or under hydraulic or pneumatic power. These dogs hold the log above and below, the number of dogs dependent on the length of the log.

83 Cut timber is normally removed by conveyor. The operator is usually positioned at the feed-end of the track, in line with the saw or slightly off-set, so as to have a clear view of the saw blade and the cut face of the timber.

84 Hazards include:

- contact with the running saw blade;
- entanglement within the carriage drive;
- being struck by the moving carriage;
- tripping over parts of the track;
- being trapped by powered dogs and/or turning devices;
- high noise levels.

85 To improve the safety of this type of machine, in addition to the previously mentioned guarding standards for the feed of the travelling table saw:

- Prevent access to the path of the reciprocating carriage by a deterring/ impeding device between 1.0 m and 1.2 m, sited at least 1.4 m from the danger zone. This should be around the track of the reciprocating carriage as far as possible, taking account of the need for loading and unloading. Also avoid site walkways crossing the track.
- Prevent access to in-running nips at cable drives etc.
- Place the operating position in a suitably designed acoustic cabin because operators are exposed to high noise doses. For more detail see 'Occupational health and the workplace/Noise'. An acoustic cabin also provides a fixed barrier between the operator and the dangerous parts. The control for operating the reciprocating carriage should be hold-to-run.
- Where the carriage is loaded and/or unloaded by conveyor, prevent access to dangerous parts of the conveying system. Where it is loaded and/or unloaded manually, or by vehicle, it may be useful to provide a gate in the rigid barrier.
- Prevent noise spreading to other work areas by the use of an acoustic screen.

Moving head-rig log band saw

86 There are both horizontal-cutting and vertical-cutting moving head-rigs (gantry log saws). In either case, the saw unit (head-rig) containing the saw blade moves through stationary timber mounted on a fixed platform. The head-rig normally moves on rails under mechanical or hydraulic power, Figure 9.

87 Less common are saws where the log is fed by a slow-moving track through a stationary horizontal head-rig log band saw. This may be termed a 'through and through' machine.

88 The same safeguards as those detailed for the feed of the reciprocating carriage log saws are applicable.

Figure 9 Moving head-rig log band saws

Other log band saws

89 If your mill has a design of log band saw not specifically covered by this section, you are advised to follow the principles described in paragraphs 66–88 when assessing risks from your machine. Where the saw is part of a mechanised line, the guidance in the 'Mechanised sawmilling lines' section may be more applicable.

Band re-saws

Single-cut band re-saws

90 Single-cut band re-saws, Figure 10, are used for secondary breakdown of timber. They may be used to cut slabs from partly-sawn logs or boards from squared timber. The workpiece is normally presented manually to a power feed of some kind which passes the timber into the saw blade. Users of automatically fed re-saws, more common in highly mechanised mills, may find the guidance in 'Mechanised sawmilling lines' more appropriate.

91 Hazards include:

- entanglement at the power feed rollers;
- contact with the moving saw blade;
- trapping or entanglement at additional feed or drive mechanisms;
- high noise levels.

92 Where workpieces are of a more uniform nature the provision of noise enclosures for these machines is often reasonably practicable. For more detail see 'Occupational health and the workplace/Noise' and *Noise reduction at band re-saws*.[10]

93 For the cutting area, there should be an adjustable guard, attached to the saw blade guide, which encloses the saw blade on three sides (the cutting edge and two others). This should have sufficient adjustment to enable movement down to the power feed. Guard the band wheels and the non-cutting portion of the saw blade as described for log band saws.

94 Stand-alone re-saws can be fitted with a wide range of feed rollers, Figure 10. Accidents have occurred where operators have become entangled on rollers, particularly those which are spiked. Sometimes parts of the body, normally fingers/hands, have been drawn in between rollers and workpieces.

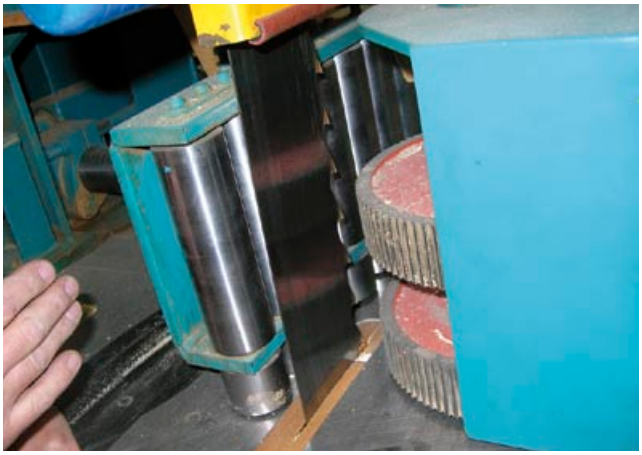


Figure 10 Single-cut band re-saw – details of feed rollers

95 Some accident details are described below:

A labourer suffered multiple wrist and arm fractures when he became entangled on an unguarded spiked 20 cm diameter feed roller.

A 17-year-old trainee had three fingers amputated when his glove caught in the feed wheel and dragged his hand on to the saw blade.

The operator of a horizontal re-saw had part of his left foot amputated when his bootlace got caught in the feed conveyor and dragged him in to the saw blade.

96 Make sure that the in-running nip point created by a power feed roller and the timber has been properly safeguarded. Also, keep the operator a safe distance away and fit emergency stops, which can be operated in the event of a person becoming entangled or drawn in to the feeding device.

97 Where re-saws are fed by powered roller tables and there is a risk created by traps between powered rollers and the workpiece, this can be dealt with by in-filling the gaps between the rollers, Figure 11. Powered roller table re-saws are not suitable for primary cutting of round timber because there is no form of gripping device to keep the log stable as it is fed to the saw blade. Workpieces should have at least one flat surface.

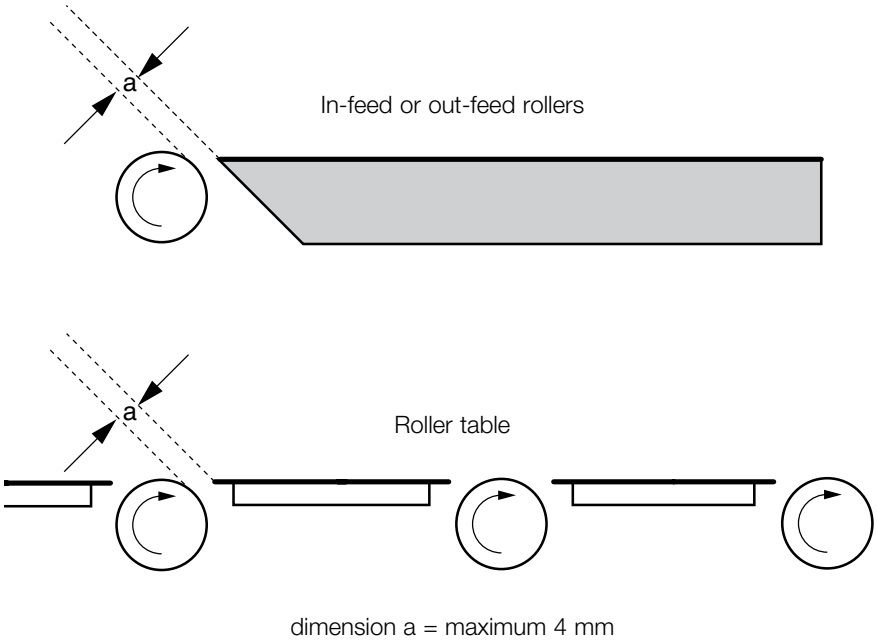


Figure 11 In-filling gaps between rollers and fixed parts in roller table

Frame saws

98 Frame saws are another type of primary breakdown saw for round timber, Figure 12. They consist of a fixed rectangular frame into which are fitted a number of reciprocating saw blades, allowing for single or multiple ripping operations. Heavy log feed rollers may be fitted at the in-feed and out-feed of these machines. The log is normally fed to the saw on a powered carriage. Sawn timber may be removed by conveyor.

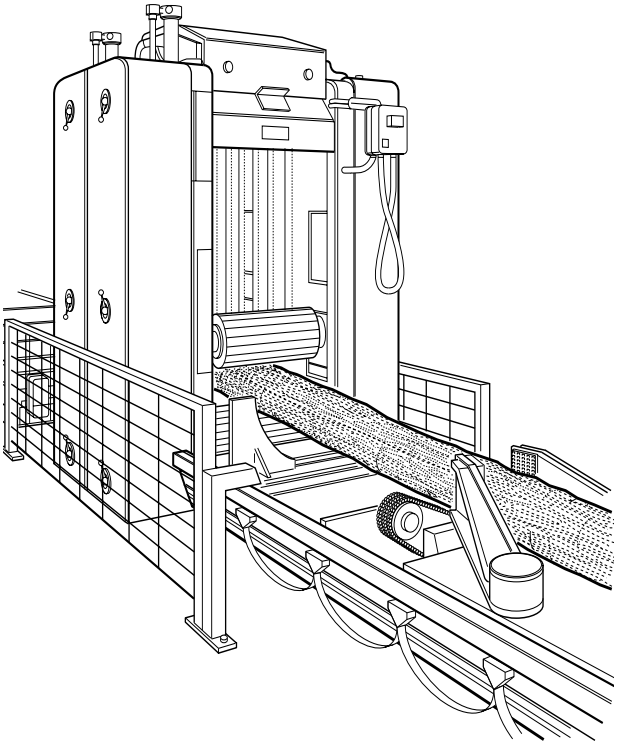


Figure 12 Frame saw (barrier along feed track not shown)

99 Hazards include:

- contact with reciprocating saw blades;
- being drawn into or crushed at feed rollers;
- tripping and entanglement hazards at carriage drive;
- being struck by the moving carriage;
- very high noise levels.

100 Safeguard the hazards along the length of the in-feed and out-feed tracks of these machines in a similar way as is described for reciprocating carriage log band saws. Control positions will normally be best sited in an acoustic cabin. The most appropriate way of preventing access to the saw blades and power feed rollers will have to be assessed in each mill. Where these machines are part of a mechanised line the guidance under 'Mechanised sawmilling lines' may be useful.

Circular log saws

101 Some sawmills have a primary breakdown saw fitted with one or more circular saw blades. Single blade saws should be designed to meet the requirements of BS EN 1870–7:2002 *Safety of woodworking machines – Circular sawing machines Part 7: Single blade log sawing machines with integrated feed table and manual loading and/or unloading.*[11]

102 Hazards include:

- contact with revolving saw blade;
- entanglement or trapping in machine feed mechanism;
- being struck by ejected workpieces or off-cuts;
- high noise levels.

103 Access to the cutting area of the saw blade should be prevented by a deterring/impeding device (wire mesh with maximum gaps of 30 mm x 60 mm or equivalent). This should have a minimum height of 1.4 m measured from the floor level and be sited at a horizontal distance of at least 1.1 m from the saw blade. Where frequent access to the saw blade is necessary – ie more than once per shift – for saw blade changing or maintenance, the deterring/impeding device should have hinged or movable section(s) interlocked with the motive power supplied to the machine.

104 The braking time should be less than ten seconds or, where the run-up time exceeds ten seconds, less than the run-up time but not exceeding 30 seconds.

105 See BS EN 1870–7:2002 for full details of the safety requirements.

Travelling table circular log saws

106 A common type of circular log saw is the travelling table circular log saw (circular rack saw), Figure 13. Machines of this sort can be either:

- stationary machines, designed to be located on or fixed to the floor or other parts of the structure of the premises, and to be stationary during use; or
- transportable machines, located on the floor, stationary during use, and equipped with a device – normally wheels – which allows it to be moved between locations.

107 A heavy top guard/holding down device positioned above the saw blade can also help to prevent access and may also reduce the risk of kickback. The use of a hold-to-run control for controlling the travelling table is a standard fitting on newer machines.

108 All circular saws used for ripping operations require a suitable properly adjusted riving knife to prevent cut timber binding on the saw and causing kickback.

109 Risks from traps and in-running nips created by the travelling table should also be considered.

110 As the ejection of heavy chips is common during the use of travelling table circular log saws, eye protection is essential.

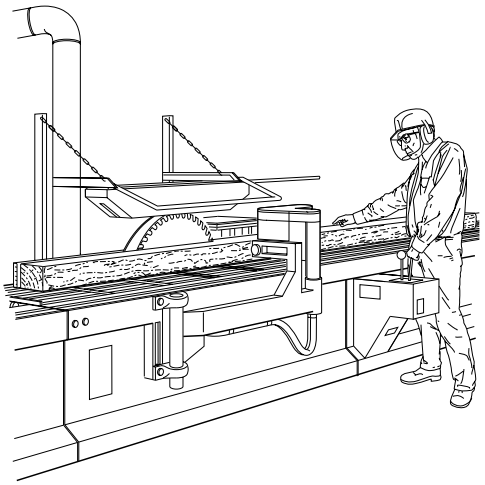


Figure 13 Travelling table circular log saw

Double slabber circular saws (dual circular rip saws)

111 These machines have two circular saw blades mounted on either a single horizontal shaft or separate shafts, which can be adjusted towards or apart from each other, Figures 14a and 14b. They are designed to cut small diameter logs and are often used in fence post manufacture.

112 Normally, a dogged chain conveyor is the feed mechanism used.

113 Hazards include:

- ejection of workpiece or parts of it;
- contact with rotating saw blade(s);
- entanglement on chain conveyor;
- crushing of fingers during positioning of workpiece at in-feed;
- high noise levels.

Figure 14a Double slabber

Figure 14b Anti-kickback arms for double slabber

114 The best option is to position circular double slabbers in an enclosure, such that access to the saw blades is prevented by designing the enclosure in accordance with reach distances set out in BS EN ISO 13857:2008. Keep openings to and from the enclosure to a size no more than 100 mm greater in height or width than the largest workpiece for which the machine is designed. Where access to the saw blade is required, the best option is to use a movable interlocked guard (with guard locking where the run-down time exceeds ten seconds).

115 Also safeguard in-running nips and entanglement hazards from the feed mechanism.

116 Serious injuries and deaths, like those described here, have resulted from the kickback of workpieces on these machines. This can be caused by cutting across the grain, causing the timber to bind on the saw blades, or lateral movements of the saw blades during cutting.

A sawyer was killed when one of the partly sawn workpieces he was stacking next to the saw blades of a double slabber fell on to the saw blades. He was struck by the workpiece after it was violently ejected and later died of internal injuries.

A saw operator making fence posts was hit in the face by an off-cut ejected from the in-feed of a double slabber. It caused severe lacerations, eye injuries and a broken jaw.

117 It is therefore important to take action to prevent ejection from any part of the in-feed opening.

118 These could include some of the following measures:

- central anti-kickback arm(s), Figure 14b;
- anti-kickback fingers that are functional whenever the machine is in operation, Figure 16;
- provision of suitable, correctly adjusted riving knives;
- a heavy top guard over the saw blade;
- a shielded operating position (never rely on this as the only protection measure).

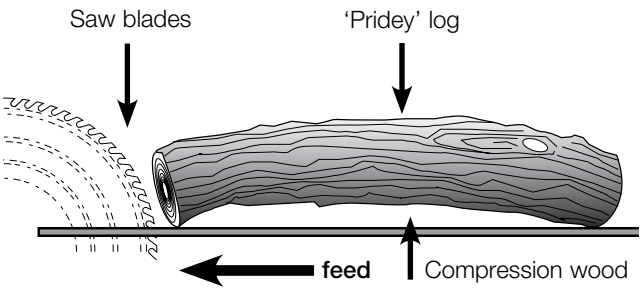
119 In addition:

- Never stack partly sawn workpieces in a position where they could fall onto a saw blade.
- As a rule, avoid passing timber back through the enclosure for further sawing. If, however, a conveyor is provided for this purpose, make sure that the timber cannot touch the saw blade as it is returned.
- Trained operators should recognise logs which are likely to cause kickback, such as those with a pronounced curve (‘sweep’). These can bind more than usual on the saw blade because of the greater degree of cross-grain cutting and are termed ‘pridey’ logs. Operators should know how to cut such logs in a ‘hog’s back’ manner to reduce the risk of kickback, Figure 15.

120 The combination of a top guard, central anti-kickback arm(s) and durable curtains is likely to provide a good level of protection.

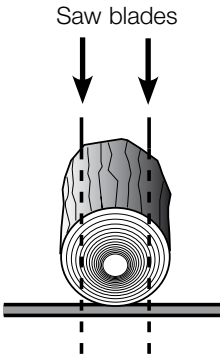
121 The ejection of heavy chips is common during the use of double slabbers, so eye protection is essential.

a) Side view of first cut



Saw 'pridey' logs in a 'hog's back' manner for the first cut

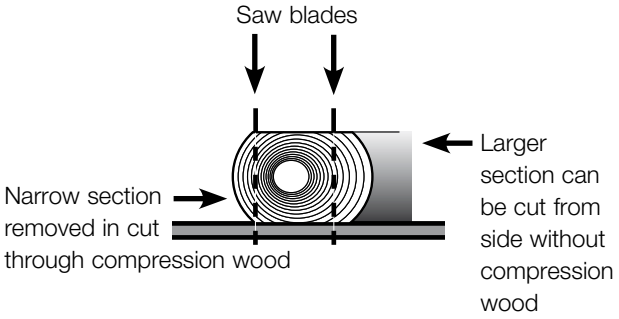
b) View from feed end of first cut



In this way, most of the compression wood, which occurs usually on the shorter curve and is most likely to bind, is between the saw blades

c) View from feed end of second cut

The first cut produces a slab which should be cut, so that only a small section is sawn through the compression wood side, reducing the risk of binding on the saw blade.



NB Suitable methods of preventing timber ejection are essential. This method of cutting reduces the risk of kickback, but must never be relied upon alone.

Figure 15 How to cut 'pridey' logs on a double slabber

Multi-rip saws/straight-line edgers

122 Designed to break down timber along its length, these machines can be manually or automatically fed.

123 Hazards include:

- ejection of a workpiece or parts of it;
- contact with rotating saw blades;
- high noise levels.

124 Multi-rip saws and straight-line edging machines should always be fitted with suitable safeguards to minimise the risk of workpiece ejection. Normally, these safeguards will consist of the provision of anti-kickback fingers, fitted both above and below the feed table, Figure 16. Further details of safeguards are given in BS EN 1870–4:2012 *Safety of woodworking machines – Circular sawing machines – Part 4: Multiblade rip sawing machines with manual loading and/or unloading*.[12]

125 Anti-kickback fingers fitted above the work table are designed to grip the timber as it passes into the saw blade. Those fitted in the work table provide a second line of defence, filling the feed opening as the timber completes the ripping operation.

126 You should also consider whether measures need to be taken to reduce the risk of ejection from the out-feed opening of these machines. Regular maintenance of the anti-kickback and ejection devices to make sure they are operating effectively is essential.

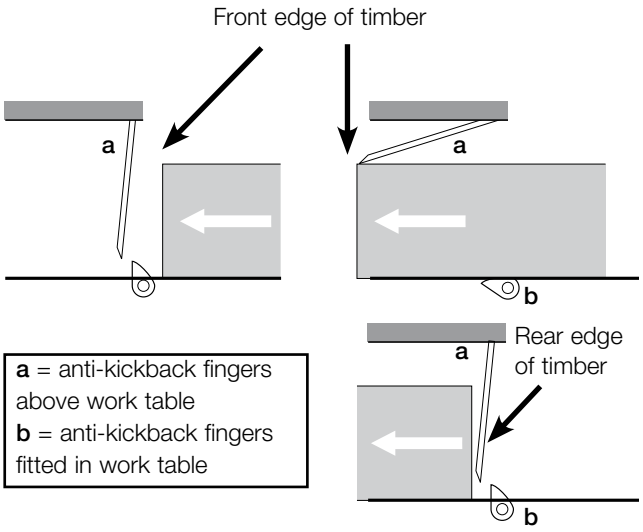


Figure 16 Anti-kickback fingers on multi-rip saws

127 Sometimes blockages can occur at multi-rip saws. When clearing them, never lift the anti-kickback devices with the saw blades in motion.

128 The machine should be enclosed during normal operation and access to the saw blades should be via fixed and/or movable interlocked guards.

Circular cross-cut saws

129 A variety of types of circular saw used for cross-cutting are found in the sawmilling industry.

130 They fall into five main categories:

- *Manual stroke of saw blade* – manual feeding of the saw blade(s) through the workpiece, eg manual radial arm cross-cut saw.
- *Manual feed to fixed saw blade* – manual feeding of the workpiece to a fixed saw blade(s), eg logging (firewood) saw.
- *Semi-automatic stroke of saw blade* – manual operation of a control which enables a single stroke of the saw blade(s) to take place, eg semi-automatic travelling head cross-cut saw.
- *Automatic stroke of saw blade* – automatic operation of a control by the workpiece which enables a single stroke of the saw blade(s) to take place. These machines may be automatically fed, allowing for continuous batch production, eg workpiece-initiated rise-and-fall cross-cut saw.
- *Automatic feed to fixed saw blade(s)* – automatic feeding of the workpiece to saw blade(s) fixed in position during cutting, usually by chain conveyor, eg chain-fed trim saws.

131Hazards include:

- contact with rotating saw blades;
- being trapped by machine clamps (where applicable);
- entanglement in feed mechanism (where applicable);
- high noise levels.

Manual cross-cut saws

132 This book does not deal in any detail with machines where the saw blade is manually fed through the workpiece and reference should be made to WIS36 *Safe use of manually operated cross-cut sawing machines*,[13] which contains information on guarding standards and safe working practices.

Logging (firewood) saws

133 These machines are a particular type of circular cross-cut saw where the workpiece is manually fed to the saw blade. The saws can be fitted with either a pivoting log carriage or a sliding table which are moved past the saw blade with the workpiece on it. Some types of saw are designed to be dual purpose and can also operate as a traditional circular sawing machine. Logging (firewood) saws should be designed to meet the requirements of BS EN 1870–6:2002 – *Part 6: Circular sawing machines for firewood and dual purpose circular sawing machines for firewood/circular saw benches with manual loading and/or unloading*.[14]

134 For saws fitted with a pivoting log carriage, access to the part of the saw blade not needed for cutting should be prevented by a fixed guard that encloses the outside diameter of the saw blade covering the saw teeth, saw flanges and lock nut. To prevent access to the part of the saw blade exposed for cutting when it is in the carriage rest position, there should be a guard on both sides of the blade that extends 50 mm beyond the outside diameter of the saw blade, covering the saw teeth. This guard should then open by being either part of, or connected to, the movement of the pivoting log carriage.

135 For saws fitted with a sliding table – when the sliding table is in the loading position – access to the saw blade above the table should be prevented by a fixed guard, with a front opening attached to the table. The workpiece-holding device

should also be fitted with a deterring/impeding device that prevents direct access to the saw blade from the operator's side. This should extend over the whole height of the holding device and have a minimum width of 50 mm on both sides of the cutting line.

136 If using this type of saw for pointing stakes it will produce small off-cuts and a push stick should always be used for removing these from the saw table. Also, the clearance between the saw blade and its guides should be kept to a minimum to prevent the off-cuts getting into the gaps.

Semi-automatic cross-cut saws

137 These saws are normally manually fed and may be a horizontal travelling head, Figure 17, rise-and-fall (up-stroking), Figure 18 or, less commonly, the pendulum variety.

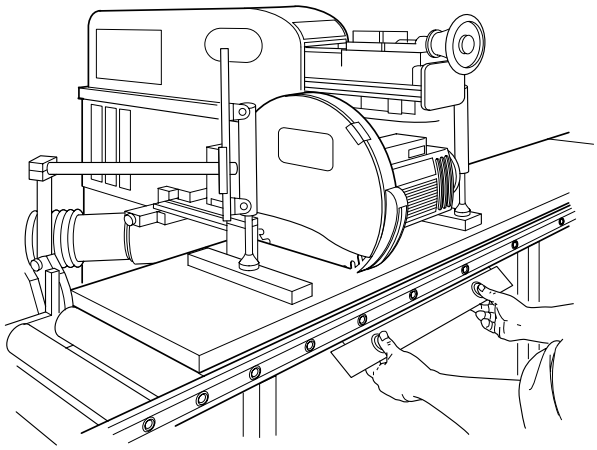


Figure 17 Semi-automatic horizontal cross-cut saw

Figure 18 Semi-automatic rise and fall cross-cut saw with two-hand control

138 Operation of these types of saw by means of a foot pedal or treadle has been common in the past. However, because both of the operator's hands are then free, many serious accidents, often involving amputation, have occurred. It has been known for both hands to have been clamped then severed.

139 CE-marked machines are not now permitted to have a foot control to operate the stroke of the saw blade, unless access to the rotating saw blade is prevented, for example by a tunnel guard.

140 Existing machines operated by foot pedal or treadle or a single button control need particular attention when it comes to risk assessment, with access to the cutting zone prevented or, as a minimum, reduced. You can do this by fitting fixed or movable (hinged) interlocked tunnel guards, ie interlocked with the saw spindle drive motor. When such machines are used on a regular basis for production operations, methods of improving machine safety could include the fitting of:

- a two-hand control device as the means of initiating the saw blade stroke and tunnel guards meeting the requirements of BS EN ISO 13857:2008;
- for up-cutting cross-cutting saws, suitably positioned and regularly maintained pressure-sensitive mats or light guards.

141 If clamps are also fitted, the associated risk of trapping needs to be addressed when the machine is modified.

Automatic cross-cut saws

Automatic saw blade stroke

142 Where the saw blade cutting stroke is initiated by workpiece contact with a sensor, access to the rotating saw blade should be prevented by fixed guards. Any openings should be designed to meet reach distances set out in BS EN ISO 13857:2008.

143 Where access to the saw blade is required to remove blockages or change the saw blade, for example, it should be via a movable interlocked guard, fitted with guard locking such that it cannot be opened before the saw blade has stopped rotating.

Automated workpiece feed

144 Circular cross-cut saws which are fixed during cutting and fed automatically, for instance by means of a chain conveyor, are often termed ‘trim saws’, Figure 19. Access to the saw blades should be prevented in the same way as saws with an automatic saw blade stroke. Consideration should be given to risks from above and below the feed table.

145 Further details of guarding requirement on power-operated cross-cut saws can be found in WIS35 *Safe use of power-operated cross-cut saws*.[15]

146 More specific information can be found in the following BS ENs:

- BS EN 1870–3:2001+A1:2009 *Down-cutting cross-cut saws and dual purpose down-cutting cross-cut saws/circular saw benches*.[16]
- BS EN 1870–9:2000 *Double blade circular sawing machines for cross-cutting with integrated feed and with manual loading and/or unloading*.[17]
- BS EN 1870–10:2003 *Single blade automatic and semi-automatic up-cutting cross-cut sawing machines*.[18]
- BS EN 1870–11:2003 *Semi-automatic and automatic horizontal cross-cut sawing machines with one saw unit (radial arm saws)*.[19]
- BS EN 1870–12:2003 *Pendulum cross-cut sawing machines*.[20]

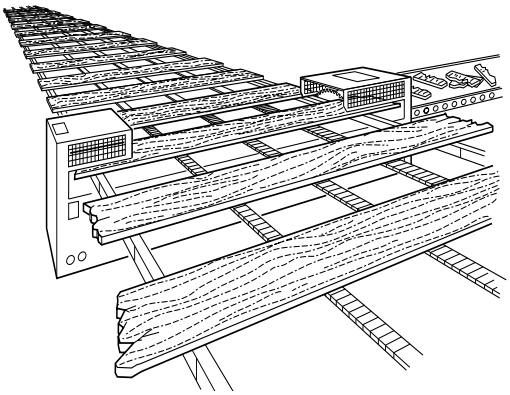


Figure 19 Trim saws fed by chain conveyors

Static cross-cut chainsaws

147 Static chainsaw machines are sometimes used in the sawmilling industry for trimming operations on logs or to cross-cut pre-positioned timber packs at a purpose-designed platform, Figure 20. The length of chainsaw guide bar used can vary from about that commonly found in a portable chainsaw to as much as 2 m or more.

148 Where operation of the cross-cutting movement is either automatically triggered by the timber or controlled remotely by the operator, access to the cutting area from the operating position and from beside the feed table should be prevented by guards. These should meet the safety distances detailed in BS EN ISO 13857:2008. If the process is a stand-alone one, consider providing a specifically designed acoustic cabin.

149 On machines where the chainsaw stroke is manually controlled, consideration should be given to what PPE is required, necessary safe systems of work and preventing other workers entering the danger area.

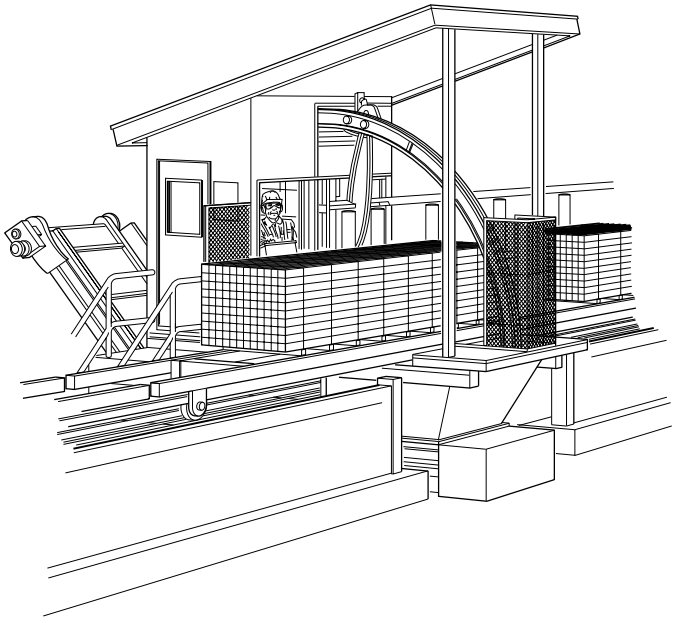


Figure 20 Static cross-cut chainsaw

Portable (hand-held) chainsaws

150 Most sawmills have a portable chainsaw used, for example, to trim individual logs prior to processing. Chainsaws are potentially very dangerous machines. Ensure that anyone who is going to operate a chainsaw at your mill has been properly trained for the jobs they are going to do. Nobody should assist a chainsaw operator by holding the timber to be sawn because of the risk to them from the chainsaw.

151 When you assess the risks from working with chainsaws they should include:

- fitness to operate a chainsaw;
- chainsaws and young people;
- health risks;
- training and competence;
- selecting a chainsaw;
- maintaining a chainsaw;
- personal protective equipment;
- lone working;
- first aid;
- working with chainsaws;
- working with chainsaws off the ground.

152 Detailed advice on these and other topics can be found in INDG317 *Chainsaws at work*.[21]

153 Further information on the use of chainsaws can be found on the HSE agricultural webpages www.hse.gov.uk/agriculture/forestry.htm.

Log debarkers, peelers and splitters

154 There are two types of debarking machines used in sawmills:

- through-feed debarker;
- floating-head (rosser-head) debarker.

155 In both cases these machines are used to remove bark from round timber prior to further processing. Where these machines form part of a mechanised line, refer to the guidance in the section 'Mechanised sawmilling lines'.

Through-feed debarkers

156 Hazards of through-feed debarkers, Figure 21, include:

- entanglement, drawing in and crushing at the feed works;
- high noise levels.

157 Prevent access to the feed works, when they are in operation. Guards designed to meet the safety distances in Table 4 of BS EN ISO 13857:2008 are appropriate, unless the debarker is safe by virtue of its position. Where frequent access to the machine is required, to remove blockages for example, interlocked guards are the best solution. If remote control of the debarker is possible when blockage removal occurs, a safe system of work should be devised. Ideally, a key exchange system (see the example in 'Mechanised sawmilling lines') should be incorporated.

Figure 21 Through-feed debarker (guards not shown)

Floating-head (rosser-head) debarkers

158 Hazards of floating-head debarkers, Figure 22, include:

- contact with debarking head;
- high noise levels;
- entanglement in feed;
- entanglement with the rotating log.

159 These machines may be fed by chain conveyor or reciprocating carriage. In either case, prevent access to the debarking head from any normal working position. Where the machine is carriage-fed, a similar level of safeguarding of the carriage track to that described for a reciprocating carriage log band saw is appropriate.

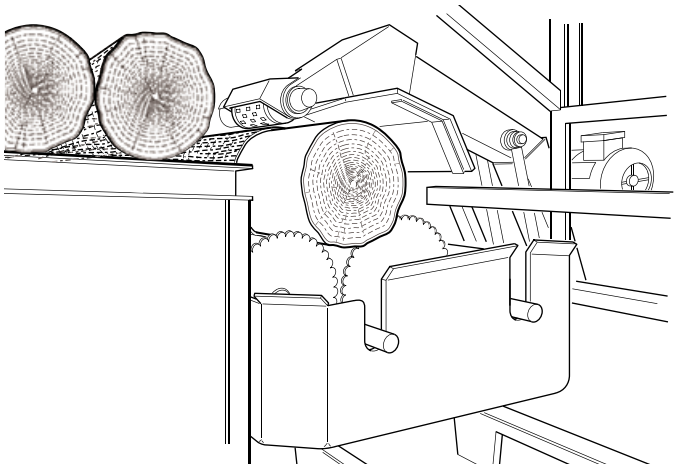


Figure 22 Floating-head debarker

Log peelers

160 These power-driven machines are, like debarkers, used for removing the outer layer of bark from timber. They are fitted with a system of guards that protect the operator from the high-speed cutters. Precautions include:

- always keeping the guards in place during operation;
- properly maintaining the guards at regular intervals;
- always working on the feed side of the machine;
- directing the discharged material into a safe area.

Log splitters

161 These machines either use a rotating mandrel or a hydraulically operated wedge to split logs.

162 Precautions include:

- the use of a two-hand control to reduce the risk of injury;
- making sure the timber is firmly positioned before starting to split;
- if possible, avoiding splitting into knots;
- keeping well clear of dangerous parts when in use;
- not holding the log in place with your hands or feet;
- not having an assistant holding the log.

Stacking and strapping machines

163 These machines are designed to stack timber, Figure 23. They usually comprise:

- an in-feed conveyor;
- a section where a layer of timber is formed;
- a transfer section incorporating a reciprocating fork carriage, which moves a formed layer onto a table;
- the table itself, which increments downwards as each layer is transferred to it and in which a stack of timber is formed from the individual layers.

164 The formed stack is either taken off the table directly by lift truck or is transferred to an outgoing conveyor. The machinery may form part of a mechanised line, or may operate as a stand-alone system.

165 The stacking process often includes strapping of the timber using banding made of either steel or man-made fibre. The timber may be banded in small bundles before being stacked; this is often done automatically. Alternatively, the fully-formed stack may be banded; this is mostly done manually.

166 Hazards include:

- crushing by reciprocating layer transfer mechanism;
- impact with moving machinery;
- entanglement on power feed mechanism and conveyors;
- trapping by automatically-applied straps.

Figure 23 Automatic stacking machine

167 Two typical accidents are described below.

The operator of an unguarded automatic machine that strapped bundles of timber and then stacked the bundles was crushed to death. The machine was malfunctioning so he climbed into it to adjust the position of a photocell that controlled the positioning of the rise/fall table. He accidently triggered the control system to move the transfer carriage forwards and his neck was crushed between the carriage and the fixed structure of the machine.

The operator of a stacking machine on the end of a mechanised production line had his head caught in the machine. He was refilling a cartridge of steel strapping tape while production was still in progress. The transfer carriage indexed forwards while he was refilling the cartridge and trapped his head between the carriage and the fixed structure of the machinery. He suffered facial injuries and his head was very nearly crushed.

168 Accidents happen when people enter dangerous parts of the machinery to carry out adjustments, clear blockages, or replenish consumables. Prevent access to the reciprocating carriage and associated machinery during normal operation. This can be achieved by:

- fixed-distance guarding on the sides of the machinery;
- close guarding designed to meet the reach distances in BS EN ISO 13857:2008;
- a combination of these or other suitable measures.

169 Consider placing a fixed guard over the area of the machine where the crushing hazard exists. The design will need to allow timber to pass underneath the guard, but the ingoing and outgoing apertures should be small enough to prevent human access to the dangerous parts. If access to the dangerous parts is required for any reason, it should be through an interlocked access gate.

170 Safe isolation procedures should also be in place where necessary to prevent accidental start-up with the operators still in the danger area.

Butt reducers

171 These are high-energy cutting machines whose purpose is to produce round logs with broadly uniform cross-section. They usually feed mechanised lines, but do not form an integral part of the plant. Frequently, the machinery is installed above ground level, but with access platforms alongside, Figure 24.

Figure 24 Butt reducer

172 Hazards include:

- contact with cutting tools;
- entanglement in the in-feed machinery;
- impact from ejected chips.

173 Prevent access to the cutting heads, when they are in operation, from any position where a person could normally be working. Prevent open access to the platform by, for example, installing an interlocked gate on the access route using a key exchange strategy or interlocking devices with guard locking.

Mechanical strength grading of timber

174 This is used to assess the structural properties of a piece of timber for use in the engineering design process. This ensures the timber is fit for purpose when used in construction. Strength graded timber must meet the requirements of:

- BS EN 140811–Parts1–4:2009 *Timber structures. Strength graded structural timber with rectangular cross-section. Machine grading*.[22]

175 The strength of timber is assessed using an indicating property. Typical methods of measuring the indicating property are: applying a known bending stress; using X-rays to measure density and assess knot patterns; and acoustics to measure density. These methods can be used individually or in combination. There are other methods of measuring an indicating property but these are less common.

176 Some accidents are known to have occurred on these test machines as hands and arms have been drawn into the in-running nips created between the timber and the feeding system so safeguarding this area is important. With X-ray machines, they must also comply with the Ionising Radiation Regulations (1999).[23]

177 If modifications to improve safety are required you may need to confirm that they are acceptable. You should therefore contact the machine manufacturer/ supplier, a third party auditor (any notified body within the EU), or the UK Timber Grading Committee for advice. Providing the modification has no effect on the machine function there should not normally be a problem.

Multi-spindle planing and moulding machines

178 These machines, which are also commonly referred to as ‘four-siders’ or ‘multi-cutter moulders’, are used for secondary processing of sawn timber. They may be fitted with four or more cutter blocks designed to plane and/or mould timber as it passes through the machine. Powered rollers convey the timber past the cutter blocks. On most machines, each cutter block will be fitted with a manually adjustable guard.

179 Hazards include:

- contact with the rotating cutter blocks;
- entanglement at the power feed devices;
- high noise levels.

180 Most accidents occur during adjustment and setting of cutter blocks, fences and guide pressures, un-jamming of timber and cleaning of the machine. This is because operators have, in the past, often carried out these operations when the cutter blocks are rotating.

181 The high noise levels resulting from the use of these machines mean that it is often reasonably practicable to site them in an acoustic enclosure and new machines are now generally provided with an integral noise hood. Further information, including a number of frequently asked questions about moulders and *Safe use of four-sided moulding machines* (WIS40),[24] can be found on the HSE woodworking webpages www.hse.gov.uk/woodworking/index.htm.

Chippers/hoggers

182 The processing of timber residues is a common sideline in the sawmilling industry. Machines designed to break timber down into wood chips are variously termed 'chippers', 'hoggers', 'reducers', 'granulators' or 'shredders'. 'Chipper-canters', large discs with teeth which cut and chip the sides of a log, are normally installed as part of a mechanised line and the guidance in 'Mechanised sawmilling lines' may be more applicable.

183 Hazards include:

- contact with chipping tools;
- entanglement at feed mechanism;
- very high noise levels.

184 Horizontally-fed and vertically-fed fixed machines exist.

185 In either case, prevent access to both the powered in-feed device, where there is one, and the chipping tools, when these dangerous parts are in motion, by safeguarding in accordance with BS EN ISO 13857:2008. Any access required for maintenance should be via an interlocked door, which cannot be opened until the chipping tools have stopped rotating.

186 Separating these machines from the main work area can help to control the high noise levels common with their operation.

187 If a mobile chipper is used:

- to clear a blockage, always reverse the feed mechanism, where fitted, and stop the machine – never reach into a working machine;
- use a long wooden push stick if the machine does not have a powered feed;
- always wear suitable hearing protection;
- use a chock to prevent chipping components moving when carrying out maintenance.

188 Newer CE-marked mobile chippers should be manufactured with improved safeguarding of the feed chutes compared to older machines.

189 If there is a risk of chip ejection instruct employees to wear eye protection when approaching all types of chipper.

Conveying (transfer) and transmission (drive) machinery

190 Hazards include:

- being drawn into in-running nips created by chains/sprockets, belts/pulleys;
- entanglement at rotating shafts, sometimes with keyways and/or bolts etc.

191 Regardless of the type of machine, hazards arising from conveying systems and drive mechanisms are likely to be present. Many accidents in sawmills occur due to poorly safeguarded conveying systems in particular.

192 Prevent access to hazards of this sort by means of fixed or interlocked guards, depending on the frequency of access required to the dangerous parts. Examples of common safeguarding methods for chain and sprocket hazards are illustrated in Figure 25.

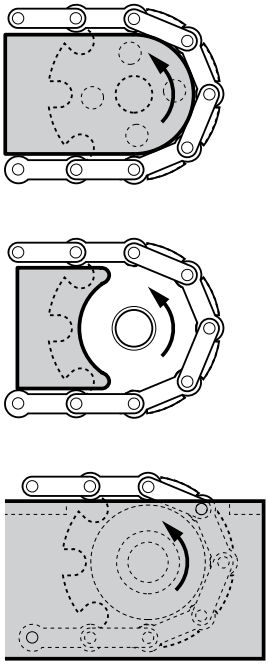


Figure 25 Example of chain/sprocket guard

193 Other examples of safeguarding methods for conveying equipment can be found in BS EN 618:2002[25] and BS EN 620:2002.[26]

194 Identify where parts of conveying and drive mechanisms cause danger and choose an appropriate safeguarding method in each case.

Mechanised sawmilling lines

195 The number of highly mechanised sawmills in the UK is increasing. Some mills are mechanised to the extent that the degree of human intervention in the normal production activity is very limited. Operatives are physically separated from the risk during normal operation, Figure 26.

Figure 26 Auto log processing + safety barrier

Figure 27 Chipper/reducer and covers

196 In the more highly mechanised mills (around 25 in 2009) logs enter the mill and immediately have a 3D image taken by a Class 2 laser. This scan ensures best usage of the log as it is turned to get the best profile before cutting.

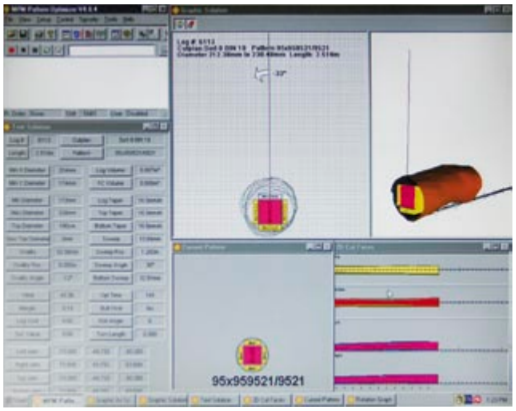


Figure 28 Display screen image of scanned log

197 The log is normally turned and cut several times as it proceeds through the plant, with the boards cut from the log sorted and stacked as part of the process.

198 A typical mechanised sawmilling line is shown in Figure 29.

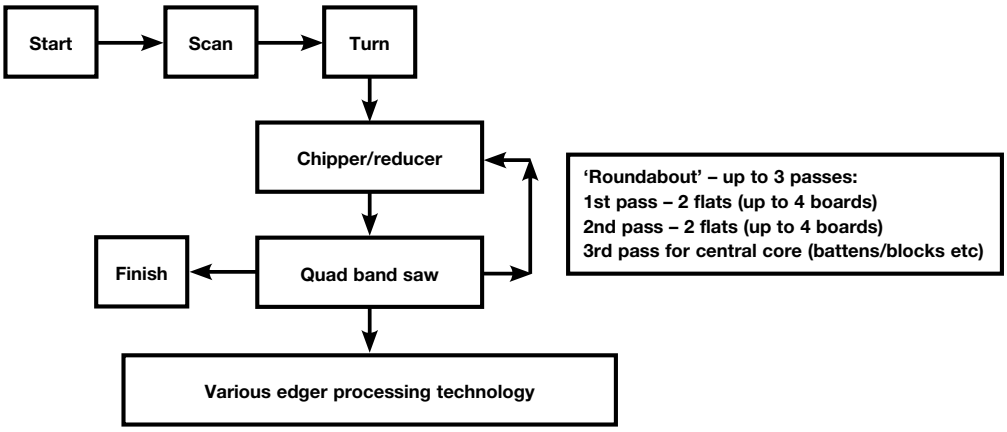


Figure 29 A typical mechanised sawmilling line

199 Because of the physical separation of operators from machinery, exposure to danger is far more likely when there is a need to access unsafe areas. Many serious accidents occur when an operator intervenes to recover the product, as well as during general maintenance. It is therefore important that any interventions are first subject to an effective risk assessment.

Guide for completing a risk assessment on a mechanised sawmill

200 Dealing with the safeguarding of individual machines may not be appropriate for a mechanised line because the machines are interdependent. It is therefore better to look at the process rather than a machine.

201 Where there are electronic control systems, linked to programmable logic controllers, then safe plc logic components must be used if there is a safety component present.

202 It is important to have a strategy in place before starting the assessment. Sawmills operate as a production process, so when considering safety each component within that process will have to be carefully examined – operators as well as machinery. This should take into account the part they play in the process.

203 Start by looking at the whole of the sawmill as well as the processes and break each process down into suitable sections. Next, decide on a logical sequence to assess these sections.

204 An example of a section that could be part of one assessment is log sorting. This would include machines such as the debarker and butt reducer as well as the conveying system etc.

Gaining knowledge of the process and hazards

205 Pick a team of competent people. **This should include at least one experienced operator for each of the sections under consideration.** Then follow these points:

- Start with a 'hazard spotting' exercise with the process shut down.
- Next, observe the process running until all possible eventualities have been covered, for example:
  - normal running of the machine(s) during production;
  - manual intervention when a malfunction occurs (product salvage) – *this is very important in mechanised sawmills as it is one of the main causes of injury*;
  - changing of saws, knives, cutters etc, and filling lubricators;
  - cleaning and maintenance requirements.

Completing the assessment

206 Follow these points to complete the assessment:

- Look at the design of the machinery within the section being assessed, including the way in which it is controlled and the way in which it relates to other parts of the plant within the production cycle. *Note:* It is important to understand the sequencing arrangements in the control system. For example, if one part of the process stops, what will be the knock-on effect on other parts of the system?
- Identify which parts of the machine/process have a safety-related function and which are purely production-related. Find out what the hazards are from the machinery/process, for example crushing, shearing, entanglement, impact and ejection of materials. **Next, decide if the existing safety-related precautions are adequate or if anything more needs to be done to control the risk to the point that harm is unlikely.**
- Complete a task analysis/work study to find out how often and for how long operators are exposed to the hazards when they have to access the machine during use, setting, intervention and maintenance. The following information should be recorded and assessed:
  - Who is accessing the machinery? Are they authorised to do so?
  - Why do they have to gain access?
  - What are they actually doing when they gain access? Do they actually need to?
  - What is their understanding of the machinery and the process? Is it adequate?
  - What is their level of knowledge and use of the safety precautions? Are they adequate?
  - What is the level of supervision? Is it adequate?
- Decide for each of the risks identified if the hazard is being controlled (adequate safety precautions **and** knowledge of how to apply them). It is important to identify exactly what training is required for a specific machine/process and records of that training should be maintained for all personnel involved. This part of the assessment must also take into account the possibility of failure modes or inadvertent start-up of the machinery while operators are still inside the danger zones.
- Record any actions required, together with an appropriate timescale and named individual to complete the action. *Note:* The assessment should be reviewed periodically or if there are any changes made to the process, such as new machinery being installed.

Safety precautions

207 Because interventions for a process malfunction are not likely to be as well planned as for a more controlled intervention, such as for planned maintenance, the chances of an incident occurring will increase. It is therefore important to try and engineer out the problem(s) that causes malfunctions, as eliminating the need for operators to access danger areas will not only improve safety but will also increase production flow and the economic viability of the plant.

208 **When safeguarding is necessary, the basic principle is that dangerous moving parts of the machinery and operators must be kept separate until equipment is in a safe condition.**

209 A variety of approaches will achieve separation, for example:

- perimeter fencing with interlocked access to the plant, with no internal access to adjacent danger zones;
- close guarding of individual machines using fixed fences, trip devices, photo-electric safety systems etc.

210 Consider answers to the following questions when assessing if safety precautions are adequate:

- Is distance safeguarding of a section of the line ('a cell') more practicable than close guarding?
- In which areas can the need for frequent access be predicted?
- Will the person in the danger area be in sole control of the risk?
- Have all the failure modes been identified?
- What special maintenance requirements are in use, eg wander leads, permit-to-work systems, power isolation/lock-off procedures?

211 When looking at the hierarchy methodology for safety precautions, safe electrical isolation procedures should always be the first option. This should be prioritised before consideration is given to the options detailed in BS EN 1037:1995+A1:2008 *Safety of machinery. Prevention of unexpected start-up*[27] or other standards or methods to prevent unexpected start-up.

212 **Safe electrical isolation means that there needs to be not only a way for electrical energy to be switched off, but also suitable precautions available to ensure that it remains switched off. Inadvertent reconnection must be prevented – for example by breaking the 3-phase by mechanical means and also having a locking-off facility.**

213 Further details of cutting off the supply and isolation are given in the *Memorandum of guidance on the Electricity at Work Regulations 1989* (HSR25).[28]

Locking devices

214 BS EN 1037 advises that locking devices include:

- facilities to apply one or more padlocks;
- trapped-key interlocking devices, one of the locks of which is used to lock (secure) the isolating device;
- lockable covers or enclosures.

215 The use of trapped key interlocks are many and varied. The number of keys used will depend on the machine and the number of people you are trying to protect.

216 If there is a separate isolation procedure (and isolation point) that allows the person accessing a particular area to lock off the power/energy supply then, in these cases, one key would suffice. This is because, even if the gate was closed inadvertently, the other isolator would ensure safety and the line couldn't start nor the equipment move. If there isn't a secondary point for isolation, and if there was a 'foreseeable risk' that someone might close a gate with someone inside and out of sight (doing maintenance or cleaning), then the two-key system would need to be implemented as a matter of course.

217 This operates by having an isolation key (key 1) located in the operator's panel. There is also a safety panel, which contains separate keys (key 2) for each safety gate. The machine is isolated by removing key 1, which is then inserted into the safety panel to release key 2. This will allow the safety gate to be opened. Key 2 remains the responsibility of whoever has opened the safety gate and is working within the danger area on the machine. The machine cannot be started until key 2 has been reinserted into the safety panel, and key 1 removed and reinserted into the operator's panel to release the isolation. *Note*: The system traps each key in the mechanism until the other key has been returned.

218 If you have a machine where there is more than one person entering the guarded area and they may be working out of sight of each other you may require a number of keys. If each person working in the danger area has their own key, it means that when the job is completed and the gate is closed you cannot restart the machine until everyone who has taken a key has returned it to its respective location. This would prevent the following scenario:

There is a blockage in the storage line bins.

The gate to the storage bins is protected by a single key.

It requires four men to enter the bins and clear the blockage.

The team leader removes the key from the gate and puts it in his pocket.

The four men enter the area to clear the blockage.

One man climbs into a storage bin to clear a piece of timber while the other three clear the main blockage.

After clearing the main blockage, the three men leave the guarded area and the team leader locks the gate with his key, not realising that the fourth man is still inside the bins.

The bin line is restarted and the fourth man is trapped inside a bin by timber falling on him.

219 If the four men entering the area each had a key the team leader would have known there was one man missing and been unable to start the machinery as the fourth man still in the danger area would have the remaining key.

Figure 30 Safety lockout station

220 Table 1 gives examples of risk reduction measures, in a descending order of hierarchy, for parts of a mechanised line. It assumes that the risk assessment has concluded that entry into the danger area, ie for blockage removal, is foreseeable. Some examples of **unacceptable options** have also been included.

221 More information on key exchange systems can be found in BS EN 1088:1995+A2:2008 (incorporating corrigendum January 2009) *Safety of machinery. Interlocking devices associated with guards. Principles for design and selection*.

222 *Note:* Where isolation and energy dissipation – **pneumatic, hydraulic or gravity** – are not appropriate for an intervention, the design must take into account the measures considered necessary to prevent unexpected start-up. For example, component design, selection and location should prevent the accidental generation of start commands from either external or internal influences. In addition, the safety-related parts of the data storage and processing equipment should be designed, and their components selected, so that there is a sufficiently low probability of the equipment generating start commands which may lead to an unexpected start-up.

Table 1 Risk reduction measures on a mechanised line

Hazard	Examples of risk reduction measures	Comment on reliability of risk reduction measures
Possibility of fatal or very serious injuries from contact or entanglement with cutting heads or crushing injuries from rollers during an intervention to clear blockages etc	Safe isolation procedure	Safe electrical isolation is the most reliable way of preventing an unexpected start-up, provided that there are suitable means to ensure accidental reconnection is prevented – for example, breaking the 3-phase by mechanical means and a locking-off facility This should be prioritised before considering the options detailed in BS EN 1037 *Note:* Safe electrical isolation normally refers to 'high power' isolation rather than power to the control circuit, unless this has been justified as an acceptable option in the risk assessment
	Key exchange interlocked on perimeter fencing	The gate can only be opened by a key taken from the control panel of the operator's cabin, allowing removal of a second key from the gate. The control panel key, which is required to restart machine operation, is then trapped in the mechanism until the gate key is returned. The operative in the danger area is therefore in control of the risk at all times *Note:* See examples of variations on key exchange systems in 'Locking devices' section. When maintenance work is undertaken the machine isolator should be locked off because 'power interlocking' at the control panel is not practical unless a suitable safety plc system is in place to prevent unexpected start-up *The only exception for not locking off would be for releasing a jam from a position of safety with a bar etc*
	Interlocked guard with zero-speed detection or time-delay unlocking	Entry into the danger area is prevented until the dangerous movement has stopped. Zero-speed detection is considered to be more reliable than braking associated with time-delay unlocking. Where whole-body access is required the risk of re-start when in the danger area is not entirely avoided *The machine isolator should be locked off*
	Interlocked gate with guard locking on perimeter fencing	The gate can only be opened once the lock is released following the shut-down of the plant and opening the gate ensures that power cannot be reapplied. This has the advantage of ensuring that plant comes to a controlled stop under operator control before the gate is opened. However, the gate could be inadvertently closed allowing machinery to be started while someone is still in the danger area, so this operative is not in control of the risk *The machine isolator should be locked off*

Hazard	Examples of risk reduction measures	Comment on reliability of risk reduction measures
	Simple interlocked gate on perimeter fence	The operation of the machine is automatically interrupted when someone opens the gate and enters the danger area (a system of 'control interlocking'). However, as before, the gate could be inadvertently closed allowing machinery to be started with someone in the danger area, so this operative is not in control of the risk *The machine isolator should be locked off*
	Photoelectric safety systems	This may be an option to prevent access to a crushing hazard. However, the stopping performance, safety integrity standards, separation between photoelectric curtain and hazard, integration into machinery control system and the likelihood of spurious tripping etc will need careful consideration *If the photoelectric curtain is muted for maintenance work the machine isolator should be locked off*
	Fixed guard	Used as a close-in guard, this is acceptable so long as the apertures underneath the guard for the passage of material comply with the reach distance standards of BS EN ISO 13857 *If guards need to be removed for maintenance work the machine isolator should be locked off*
	Padlocked access gate	Reliance on personnel entering danger zone following a safe system of work, including isolating power before opening padlock *Compliance with system unlikely to be absolute* ***so unacceptable***
	Movable barrier	*This does not meet the requirements of a fixed guard and is likely to be removed* ***so unacceptable***
	System of work	*This relies on an operator and control systems to keep machine stationary while someone is in the hazardous zone* ***so unacceptable*** *(reasonably practicable to provide more appropriate safeguarding solutions)*

Human factor and ergonomic considerations at automated sawmills

Human factors

223 Although automated sawmills have much higher levels of engineering controls it is impossible to engineer out all of the risks. Safety-critical tasks such as maintaining machinery and clearing blockages still have the risk of human error. This can be made worse if bonus schemes are in place as they can encourage a culture of 'production over safety' with quick-fix maintenance.

224 It is therefore important that:

- all safety-critical tasks are identified;
- the core competences required for these tasks are identified;
- training is provided that delivers these competences;
- assessment of the training takes place;
- actions are taken to address any sub-standard performances.

225 More information on human factors can be found on HSE's human factors webpages: www.hse.gov.uk/humanfactors/index.htm.

Control room ergonomics

226 Automated sawmills require an increase in use of monitoring and display equipment in the control rooms. However, the operator's visual field is limited and attention can only be given to a number of screens at any one time. The most frequently used or most important (safety-critical) displays should therefore be placed in the operator's natural line of sight. Locate lower priority displays more towards the edge of the field of vision. Involving the operator in the design of the control room will generally have benefits.

Figure 31 Automated sawmill control room

227 The time an operator spends monitoring in a control room can vary but should take into account how safety-critical or intensive the tasks are. After time in the control room there is normally a period on the shop floor before returning to the control room. Care should be taken to maintain the operator's alertness, particularly when they return to the warmth and comfort of the control room or after a break for a meal.

228 Information on the management of fatigue can be found in HSE publication *Managing shift work* (HSG256).[29] This can be downloaded at www.hse.gov.uk/pubns/books/hsg256.htm.

Workplace design and building maintenance

229 Production priorities will always need to be given strong consideration when planning a new mill or making changes to an existing one. However, the potentially far-reaching effects that planning can have on health and safety should not be overlooked. Time spent on planning will be rewarded as a well laid out, uncluttered mill with designated safe access routes will make managing safety simpler. There can also be additional benefits such as improvements in stock control.

230 Trips, slips and falls continue to be a major source of days away from work. Many of these are likely to be caused because normal access ways pass over, or are too close to, parts of machinery. Access from one working position to another in a mill can often be unsuitable and sometimes even dangerous. This is because mills grow over time or the process changes.

231 If the answer to any of the following questions is 'yes', you need to consider how you can improve your mill layout. You may be able to think of others.

- Do employees regularly have to cross areas where there could be moving machinery, eg the path of reciprocating carriage?
- Are dangerous parts easily accessible from normal access routes?
- Where raised walkways and platforms are provided, do they lack suitable guardrails? Also, do they allow access to dangerous parts which would otherwise be out of reach?
- Are there areas in your mill which create clear tripping or slipping hazards, eg permanently trailing cables, piles of sawdust, or floors that are often oily or wet?
- Are there places where logs or other heavy objects are known to sometimes fall from height, eg from conveyors, and, if so, are these areas safeguarded?
- Can more be done to isolate noisier processes from quieter ones? See 'Occupational health and the workplace' section for information on noise.
- Are there places where pedestrians and vehicles are often in close proximity? See 'Safe use of transport' section .

232 Safe access for building maintenance is another important consideration. When seasonal repairs or one-off maintenance jobs are to take place, you need to assess possible risks to those involved and anyone else who might be affected. This applies whether your own employees or those of a contractor are going to do the work. When employees of other firms are working on your site everyone needs to be clear about who has control of the work to be done. You will always have an element of responsibility for the actions of non-employees working on your premises.

233 Think about the risks arising from the examples of maintenance jobs in Table 2:

Table 2 The possible risks arising from some maintenance jobs

Example of job	Some possible questions (not exclusive)
Roof repair	Is there safe access to the roof? Is any of the roof area fragile? How will the working position be safeguarded (eg edge protection, safety harness)? How will safe removal of debris from height be achieved? Should a hard hat zone be designated?
Light replacement	Is there safe access to the light? Is a safe system for electrical isolation required? Does temporary absence of lighting cause hazards elsewhere?
Yard surfacing	Is transport and pedestrian re-routeing necessary? Is reflective, high-visibility safety clothing required? Will service pipes be affected?

Safe working in confined spaces

234 A confined space is a place which is substantially enclosed, though not always entirely, and where serious injury or death can occur from hazardous substances or conditions within that space, eg lack of oxygen.

235 A number of people in the UK are killed or seriously injured every year in confined spaces. These occur across a wide range of industries, from those involving complex plant through to simple vessels such as those used during timber treatment.

236 Further information on confined spaces can be obtained from:

- HSE's confined spaces webpages www.hse.gov.uk/confinedspaces/index.htm.
- The Confined Spaces Regulations 1997.[30]
- HSE booklet *Safe work in confined spaces* (INDG258).[31]

Safe use of transport

237 Every year over 4000 accidents involving transport in the workplace are reported. About 60 of these result in death, when people are knocked down, run over, or crushed or dragged along by vehicles. There are also falls from vehicles – either getting in or out of a cab, or working at height (sheeting), or when loading or unloading. Moving materials mechanically is also hazardous and people can be crushed or struck by material when it falls from a lifting or moving device or is dislodged from a stack.

238 A wide variety of vehicle movements take place in a sawmill yard. Large mobile plant, such as log grabs and lorries used to transport timber, can cause serious accidents during manoeuvring and reversing. Minimising the risks from all types of vehicle needs to be given a high priority and should be included in the site risk assessment for all of your workplace activities.

239 You can reduce risks by having safe working practices as well as a safe working environment. To achieve this:

- look carefully at all the vehicles and people moving round your workplace;
- mark the traffic and pedestrian movements on a plan so you can see where pedestrians and vehicles interact;
- identify improvements that will reduce the interaction between pedestrians and vehicles;
- remember to include even the less frequent tasks, eg waste skip changes;
- make sure you consider delivery drivers, as they are particularly vulnerable;
- make sure that all site workers are trained to recognise these dangers.

240 The following areas should be covered in your assessment.

Safe site

241 Actions should include

- Plan your workplace so that pedestrians are safe from vehicles.
- Provide a one-way system if you can.
- Provide separate routes for pedestrians and vehicles where possible (pay particular attention to avoiding narrow gaps and blind corners).
- If pedestrians have to work close to moving vehicles make sure that they wear high-visibility clothing.
- Avoid reversing where possible and provide assistance for drivers if it is required.
- Provide appropriate crossing points where pedestrians and traffic meet.
- Use 'Highway code' signs to indicate vehicle routes, speed limits, pedestrian crossings etc.
- Make sure lighting is adequate where people and vehicles are working.
- Make sure road surfaces are firm and even.
- Take precautions to avoid contact with overhead cables if there are any on site.
- Make sure there are safe areas for loading and unloading.
- Try to provide separate car parking for visitors, as they may not know your site. There should be easy, safe, well-signed access to the company offices from the visitors' car park.

Safe driver

242 Actions should include:

- Train lift truck operators as detailed in HSE's Approved Code of Practice L117.[32]
- Re-assess lift truck operators at regular intervals, eg every three to five years, or when new risks arise such as changes to working practices.
- Train drivers of other vehicles to a similar standard.
- Make sure all drivers are supervised, including those visiting the site – make sure they know the site rules!

243 Properly trained drivers will be clear about:

- which vehicles they are authorised to drive and which they are not;
- the safe working loads (SWL);
- angles of maximum tilt;
- other safe operating limits of the vehicles they drive.

Safe vehicle

244 Contract drivers and sawmill staff sometimes climb on to the back of a vehicle or trailer during unloading and loading operations so are exposed to dangers of rolling logs and falls from height. There is no simple way of safeguarding someone who has to work at height on a vehicle, but ideally an unloading/loading method should be used which does not require access to lorry trailers, eg log grab, self-contained hi-ab crane etc, with controls at ground level. Where access is required, reduce the risk of falling by providing well-constructed ladders, non-slip walkways and guardrails. If frequent access to high loads is required then consider providing a permanent gantry, with safety lines and harnesses as necessary.

245 Vehicles should also be suitable for the purpose for which they are used. For example, when transporting logs, flat-bed trailers should have metal bolsters on the trailer body secured in place. Never load the logs higher than the height of these supports.

246 Anyone not involved in the loading or unloading process should be kept well away from the area.

247 Other general vehicle precautions include:

- Switch off unattended vehicles and remove the keys to prevent unauthorised use of the vehicle.
- Maintain vehicles in good repair, particularly the braking system, steering, tyres, mirrors and other specific safety systems.
- Provide reversing aids such as CCTV (closed-circuit television) and reversing alarms as appropriate.
- Fit roll-over protective structures and use seat belts where necessary.

248 There is further information on HSE's workplace transport webpages (www.hse.gov.uk/workplacetransport/index.htm) and a Workplace transport site inspection checklist is available at www.hse.gov.uk/forms/transport/wtchk1.pdf.

249 For examples of good practice in controlling the risks of falls from vehicles in various industries see www.hse.gov.uk/fallsfromvehicles/casestudies.htm.

250 There is further guidance on workplace transport safety in the following HSE publications:

- *Safety in working with lift trucks* HSG6;[33]
- *Workplace transport safety: An employers' guide* HSG136;[34]
- *Workplace transport safety: An overview* INDG199(rev1).[35]

Safe stacking

How accidents happen

251 Many fatal and serious accidents are caused by timber or people falling from stacks or by falling boards/sheets. These accidents highlight the need to observe sound principles when constructing stacks or storing sheet material and to devise and follow safe methods of working in storage and stacking areas, particularly when de-stacking or removing selected pieces of timber. Summaries of accidents caused by falling material are given below.

A sawmill proprietor was killed when a log fell on his head. The log, which had been left propped against a pile of tree trunks, was knocked by a second piece of timber supported by a hoist, which swung round as it was lifted. The proprietor was not wearing any head protection.

An employee was crushed when heavy timber from a stack, near where he was standing, was knocked over. A sideloader driver drove his truck with the forks extended. The forks caught a corner of the stack and pulled part of it over on to the employee.

An employee was killed while he was helping to remove a board from a stack leaning against a wall. He lost control of the weight of the boards and they fell on him causing serious head injuries.

Public protection

252 Timber yards can be attractive but dangerous playgrounds and children have been hurt when climbing on log stacks. Where there is a risk of public access to the stacking area appropriate fencing should be used and any site visitors should be directed to the reception area by clear signs. The reception area should ideally be close to the main entrance.

Safe stacking of logs

253 The most effective control measure to reduce the risk of injury from a log stack collapse is to locate log storage areas well away from pedestrian and vehicle routes. The use of a loader with grab attachments is the safest method of stacking, de-stacking and transporting logs as this avoids any need for workers to be on or near the stacks for slinging, Figure 32.

254 Log stacks should not normally be higher than the length of the log that they contain. The height should also be limited to within the safe range of the grabber. The maximum stacking angles should be 45° but, if it is not possible to keep stacks separate from workers, then the angle should not exceed 35°. In addition, wedges should be used to fix the logs and prevent them from rolling.

Figure 32 Feeding a sawmill by grabber

255 The following factors will increase the risk of a stack collapsing:

- Sloping ground, causing logs to slide from the stack or roll down the slope.
- De-barked logs which are slippery, particularly if recently cut.
- Logs stacked with their butt ends to one side of the stack so that the angle across the top of the stack causes logs to slide off, particularly if de-barked, Figure 33.
- Logs stacked on soft ground sinking on one side and becoming unstable.

Figure 33 Logs stacked with their butt ends to one side of the stack

256 Where any of these conditions are present you should reduce the stack height or prevent movement of the logs by containment, either in bunkers or by the use of stanchions.

Building stable sawn timber stacks

Pack quality

257 Good quality packs are needed to build a stable stack. Packing the same type of timber together to remove internal air space and using suitable sticks to bind layers of timber together will improve pack stability. Signs of broken or loose banding, lozenging, balling and internal collapse are all signs of poor practice when producing packs. Any out-of-shape or collapsing packs should be identified before being placed in a stack, otherwise they will need to be safely removed before being rebuilt.

Pack access

258 Packs should not contain any varying lengths of timber as these can provide footholds for climbing the stack, a practice which should be prohibited. Protruding timber can also be a danger to people or vehicles. If access to the top of stacks is required then it must be done safely. If no appropriate plant is available a secured or footed ladder can be used, provided the stack has been checked for stability and the area has been coned off. Any de-stacking should be carried out from the top down, tier by tier, with care taken to maintain stability and check for any signs of movement. Stacks should not be allowed to lean on each other as, during de-stacking, forces will be exerted on the adjacent stack/s and may cause a collapse.

Stack heights/quality

259 To remain stable the packs must stay intact and not be subjected to any forces caused by wind or unstable ground conditions. As a general rule, calculations have shown that stacks with a height to base ratio of up to 4:1 will remain stable where these factors are not present. This is provided that:

- the packs are banded to a high quality;
- they are on hard standing or on stable ground;
- they are located in an area where risks from impacts and other external forces are low.

260 If such forces cannot be eliminated then the height to base ratio of the stack should be reduced to 3:1 for an indoor stack and 2:1 if external.

261 Packs should be square or rectangular in cross-section, with centres of gravity directly over the centre of the bottom pack. Larger heavier packs should be placed at the bottom. Packs should not be placed so that they cause bridging between stacks.

Banding quality

262 Packs can become unstable if there is:

- the wrong type of banding;
- incorrect band tension;
- incorrect application (out of square).

263 Banding should be in good condition and placed as close as possible to the columns of sticks within the pack, Figure 34. Regular checks should identify any damaged bands, clips or buckles so they can be replaced. If this requires the removal of a pack from a stack, then this should be done safely. Eye protection should also be used when any banding material is cut. Recurring problems should result in a review of banding methods.

Figure 34 Well-built stacks of banded sawn timber packs

Ground conditions

264 Storage areas should ideally be flat, with any slope not exceeding 2° (a slight slope along the length of the stack will allow water to drain off). Concrete, asphalt and hard standing are the best ground for stacks. The ground surface should be strong enough to avoid cracking or breaking up under load or with wear. It should also be well drained.

Bearers and separating sticks

265 Bearers and separating sticks should be square or rectangular in section, uniform, and in good condition. There should also be a good supply as unsuitable ones often end up being used. The bearer's cross-section should allow access for the forks of a fork lift truck (FLT) or side loader. The length of the bearers and sticks should be the same as the width of the packs in the stack. Enough bearers and sticks should be placed along the packs' length to prevent the timber sagging. As with the banding, there should be a procedure for identifying and replacing poor or damaged bearers.

Yard management

266 Packs should be transported a minimum number of times as internal stability can deteriorate when a pack is moved. The yard layout should allow safe access and egress for FLTs to each stack. This requires clear routes and good visibility which you can improve by the use of mirrors around the site and/or on vehicles and by ensuring that there is adequate lighting. Site layout should also take into account the prevailing wind directions and any micro-climate issues, for example, where buildings or geographical features may be relevant.

Safe stacking of wood-based sheet materials

267 Wooden sheets generally have a standard size of 2440 mm x 1220 mm (or divisions of) and can range in thickness from 3–35 mm. A single 18 mm thick plywood sheet of this size weighs approximately 30 kg. It is easy to lose control of such a large heavy sheet when they are being moved. This problem is made much worse when they are stored together in a stack leaning against a wall and several sheets fall at once. Purpose-designed storage racking should be used; this is relatively easy to construct and can often be made 'in-house', Figure 35. Appropriate handling aids should also be provided as part of a safe system of work for the retrieval and movement of sheets.

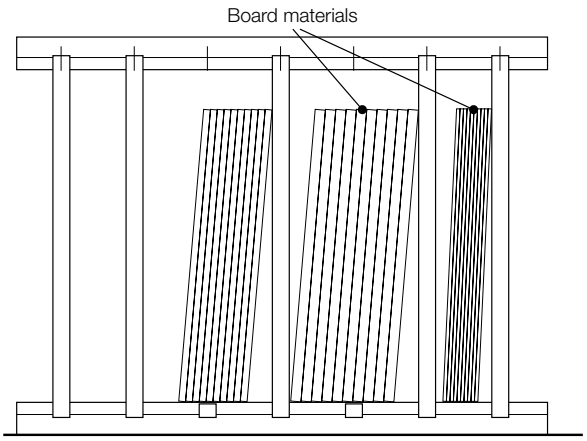


Figure 35 Wooden sheets/boards placed in a purpose-designed storage rack

Slinging/lifting of loads

268 Further information can be found in the following HSL reports, available on the HSE website www.hse.gov.uk/research/hsl/engineer.htm:

- *Stability of stacked logs* ME/98/25;[36]
- *Safety of timber stacks – Stability of sawn timber* ME/99/25;[37]
- *Safety of timber stacks – Banding of sawn timber packs* ME/98/21.[38]

269 Also see:

- Videos showing good practice when handling boards www.hse.gov.uk/woodworking/manualhandling.htm;
- *Safe stacking of sawn timber and boards* WIS2.[39]

270 Many sawmills have a crane to move logs and sometimes sawn timber around the site. Only allow individuals who have been specifically trained as operatives and slingers to carry out such tasks.

271 The nature of round timber means that determining the centre of gravity will never be an exact science, but it is important to determine how a log can most safely be moved, for example:

- use a lifting beam or a two-loop cradle to help improve safety;
- make sure that the weight and distribution of any load is within the SWL, ie within the design capability of the equipment used;
- where a log is being lifted from a pile, take care to ensure that adjoining logs are not disturbed;
- always plan how lifts will be carried out;
- keep people not involved in a lift away from the danger area;
- make sure that people exposed to danger wear hard hats.

272 There are legal requirements for you to have your lifting equipment regularly maintained and examined in the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER).

273 Guidance on these Regulations can be found in:

- *Safe use of lifting equipment. Lifting Operations and Lifting Equipment Regulations 1998. Approved Code of Practice and guidance* L113;[40]
- *LOLER: How the Regulations apply to forestry* AIS29.[41]

274 Examinations must be carried out by a competent person (your insurance company will often be able to provide a competent person). Maintenance is crucial to ensuring that the crane operates safely and the manufacturer of the crane will advise on the setting of appropriate maintenance and examination schedules for each constituent part. This should include daily and weekly checks undertaken by the operator.

Occupational health and the workplace

Manual handling

275 Manual handling causes over a third of all workplace injuries. These include work-related musculoskeletal disorders (MSDs) such as upper and lower limb pain/ disorders and joint and repetitive strain injuries of various sorts. Manual handling covers a wide variety of tasks, including lifting, lowering, pushing, pulling and carrying. Moving large workpieces and machine tools is an everyday occurrence in the sawmilling industry and, if any of these tasks are not carried out appropriately, there is a risk of injury. Many injuries, such as muscle strain and back pain, are caused by people lifting loads which are too heavy or require an awkward posture. Previous or existing injuries can increase the risk.

276 With sensible precautions, many of these injuries can be avoided, for example by using a lifting aid, such as a fork lift truck, electric or hand-powered hoist, or a conveyor. However, where it is not possible to avoid handling a load, employers must look at the risks of that task and put sensible health and safety measures in place to prevent injury.

277 Always consider:

- individual capability;
- the nature of the load;
- environmental conditions;
- training;
- work organisation.

Practical tips for good lifting technique

278 Further advice on manual handling can be found on the woodworking and MSD webpages www.hse.gov.uk/woodworking/index.htm and www.hse.gov.uk/msd/index.htm.

279 There is also advice and guidance on how to prevent manual handling risks at work in the following publications:

- *Manual Handling Operations Regulations 1992 (as amended)* L23[42] www.hse.gov.uk/pubns/books/l23.htm;
- *Upper limb disorders in the workplace* HSG60[43] www.hse.gov.uk/pubns/books/hsg60.htm;
- *Getting to grips with manual handling: A short guide* INDG143(rev2)[44] www.hse.gov.uk/pubns/indg143.pdf;
- *Aching arms (or RSI) in small businesses: Is ill health due to upper limb disorders a problem in your workplace?* INDG171(rev1)[45] www.hse.gov.uk/pubns/indg171.pdf;
- *Manual handling assessment charts (MAC)* INDG383[46] www.hse.gov.uk/pubns/indg383.pdf;
- *Are you making the best use of lifting and handling aids?* INDG398[47] www.hse.gov.uk/pubns/indg398.pdf.

Control of Substances Hazardous to Health Regulations

280 The Control of Substances Hazardous to Health Regulations (COSHH) require employers to ensure exposure to hazardous substances is prevented or, where this is not reasonably practicable, adequately controlled.

281 Exposure to hazardous substances most frequently occurs in sawmilling when:

- processing wood, particularly during sawing, machining etc;
- compressed airlines are wrongly used to blow down wood dust;
- maintaining dust extraction equipment;
- treating timber with preservatives;
- lubricating and cleaning machinery and saw blades;
- grinding saw blades and adding 'stellite' tips;
- factory cleaning.

282 Control of wood dust, timber preservatives and other hazardous substances will minimise the risk of adverse health effects.

283 See HSE's woodworking webpages for general advice on COSHH, including wood dust, at www.hse.gov.uk/woodworking/index.htm.

284 More detailed advice on COSHH can be found on the COSHH and workplace health advice webpages www.hse.gov.uk/coshh/index.htm and www.hse.gov.uk/workplacehealth/index.htm.

285 See also the local exhaust ventilation systems (LEV) webpages www.hse.gov.uk/lev/index.htm.

Timber treatment

286 Many sawmills have plant used for the impregnation and/or immersion of timber with various types of preservatives and fire retardants. Industrial treatment of timber involving the use of wood preservatives comes under the scope of the Control of Pesticides Regulations (COPR) and the Biocidal Products Regulations (BPR). Only products approved under these Regulations should be used.

287 Plant operatives may be exposed to wood preservatives through:

- inhalation of dusts, aerosols or solvent vapours;
- ingestion of chemicals;
- contact with or absorption through skin.

288 Possible ill-health effects include skin disorders, respiratory irritation and sensitisation (resulting in occupational asthma). In addition, some compounds are classed as human carcinogens.

289 Further information can be found on HSE's woodworking webpages, see www.hse.gov.uk/woodworking/hazards.htm.

290 Other general guidance on compliance with health, safety and environmental matters and good operating practices can be found in the fifth edition of *Timber treatment installations: Code of Practice for safe design and operation* available from the Wood Protection Association.[48]

Asbestos

291 Asbestos is the single greatest cause of work-related deaths in the UK and asbestos-related diseases currently kill around 4000 people a year in Britain.

292 There is now evidence to show that repeated occupational exposures, such as those that could occur during routine maintenance and repair work, can lead to asbestos-related cancers.

293 For more information on asbestos see:

- Control of Asbestos Regulations 2006.[49]
- Duty to manage – HSE's asbestos campaign.[50]
- *A step-by-step guide to the duty to manage asbestos* HSE e-tool.[51]
- *A short guide to managing asbestos in premises* INDG223(rev3).[52]

Noise

294 Sawmills are noisy environments in which to work. Hearing loss and sometimes the discomfort of ringing in the ears (tinnitus) is likely if suitable precautions are not taken. The first thing to do is assess what the noise exposures and risks are by recording:

- who is at risk from noise and what is the cause;
- what the noise exposure levels are;
- what noise control measures are needed;
- which employers need to have health surveillance.

Table 3 Personal noise exposure values by machine type

Machine type	Common operator exposure level without engineering controls (dB(A))	Common operator exposure level with engineering controls (dB(A))	Possible engineering controls	Personal hearing protectors likely to be required?
Mechanised saws, chipper canters, board separators etc	95–115	75–90	Remote control of machinery from acoustic cabin	Only when leaving cabin
Carriage-fed log band saws	95–100	80	Operation of carriage from acoustic cabin positioned at saw in-feed	Only when leaving cabin
Travelling-table log band saws	100–105	It may be possible to partly enclose or shield the machine but noise reduction data is not available	Partial acoustic screening, especially at the saw out-feed	Always
Manually-fed re-saws	95–105	85–90	Enclosure of the machine where workpieces with at least two flat faces are normally being sawn	Most of the time
(Other sawmill workers)	90–105	85–95	Where noise from the major noise-emitting machinery is poorly controlled other workers will receive high noise doses from the overall noise level in the mill	Almost always

Note: Where cabins are provided or machine enclosures installed, it is very important that doors are kept shut (self-closing doors are best) and there is no damage to the fabric of the cabin or enclosure. Otherwise the noise reduction (attenuation) will be less effective.

295 Health surveillance consists of regular hearing checks, undertaken by an occupational health professional, for all employees who are likely to be regularly exposed to above the upper exposure action values or are at risk for any other reason. This will then:

- warn you when employees might be suffering from early signs of hearing damage;
- give you the opportunity to do something to prevent the damage getting worse;
- check controls are working.

296 Once you have completed your assessment use it to create an action plan setting out what needs to be done, ideally with timescales.

297 These are some of the main points to consider when assessing and controlling noise exposure:

- Can very noisy processes be kept physically separate from other work areas?
- Is the use of acoustic screens or barriers within a work area possible?
- Are acoustic cabins provided for operators of mechanised machinery?
- Are there suitable quiet areas or noise havens and do those exposed to high noise levels spend sufficient breaks in them?
- Are personal hearing protectors suitable, periodically checked for wear and stored in a clean, dry place?

298 Experience has shown that in most sawmills the majority, sometimes all, of the workers are exposed to daily personal noise exposures in excess of 85 dB(A). Assess which machines give rise to the most noise and consider how noise emission levels can be reduced. Equally important is the need to look at the working patterns of each individual. Table 3 provides examples of personal noise exposures of operators of some common machines and the possible improvements you can make.

299 Because noise levels are still likely to remain high, even when engineering controls have been implemented, the choice of suitable hearing protectors and consideration of other necessary measures is very important. Measures include:

- marking hearing protection zones with notices;
- supervising the use of hearing protectors;
- site machines such as chippers – which emit high noise levels and require infrequent operator access – in separate rooms or acoustic enclosures.

300 Noise levels at many machines can be reduced by adopting proper maintenance procedures. This will often have the added benefit of lengthening the life of machine parts. For instance, a well-maintained band re-saw may have an 8–10 dB(A) difference between idling and cutting noise levels. In comparison, a poorly maintained machine may exhibit minimal difference.

301 Saw blade condition too can have a marked effect on noise radiation. Hammered saw blades, and those containing many welds, radiate significantly more noise than well-doctored saw blades. Make sure that your saw doctor maintains saw blades correctly.

302 Further advice on noise is available from the HSE woodworking webpages www.hse.gov.uk/woodworking/index.htm.

303 More detailed information can be found on the noise at work webpages www.hse.gov.uk/noise/index.htm.

Vibration

304 Exposure to vibration from tools such as chainsaws can cause hand-arm vibration syndrome (HAVS). This is a painful and disabling condition, which affects the nerves, blood vessels, muscles and joints of the hands and arms. It causes tingling and numbness in the fingers, reduces the sense of touch, and affects the blood circulation (vibration white finger).

305 Whole-body vibration mainly affects drivers of all-terrain vehicles, such as dumpers, excavators, tractors and some lift trucks, and is associated mostly with low back pain. Back pain can also be caused by other factors, such as manual

handling and postural strains. Although exposure to whole-body vibration and shocks may be painful for people with back problems, it will not necessarily be the cause of the problem.

306 For further guidance and information on controlling vibration and conducting a workplace risk assessment see www.hse.gov.uk/vibration.

Electricity

307 The legal requirements are given in the *Memorandum of guidance on the Electricity at Work Regulations 1989 – Guidance on Regulations*, HSR25.

308 Among other requirements, employers must:

- ensure the electrical systems are constructed and maintained so as to prevent danger, so far as is reasonably practicable;
- ensure that the installed equipment is suitable for the environment of its use;
- ensure that safe isolation procedures are implemented;
- only allow live working when it can be fully justified and precautions are taken against injury;
- ensure that only competent people work on the electrical systems.

309 Electrical installations and equipment must be suitable for the arduous environments that can be found in sawmills. The build-up of wood chips, dusts etc on electrical machinery, in particular motors and transformers, can be a fire risk because it prevents the equipment from being adequately cooled. Similarly, the electrical equipment must be adequately protected against the ingress of water and from mechanical impact, eg from timber, fork lift trucks etc.

310 Regular inspection and maintenance of the electrical system is essential to ensure that the installation and equipment remains free from damage. Records of maintenance include test results and these should be kept throughout the working life of the electrical system. This is because it will allow the condition of the equipment and the effectiveness of the maintenance policies to be monitored. Without effective monitoring, dutyholders cannot be certain that the requirements for maintenance have been complied with.

311 Further information on electrical safety can be found at www.hse.gov.uk/electricity/index.htm, and in HSE publications HSG85 *Electricity at work. Safe working practices*[53] and HSG230 *Keeping electrical switchgear safe*.[54]

312 Further advice on inspection and testing of fixed installations can be found in:

- BS 7671:2008 (as amended) *Requirements for electrical installations* (also known as the *IEE Wiring Regulations. Seventeenth Edition)*;[55]
- BS EN 60204-1:2006 +A1:2009 *Safety of machinery. Electrical equipment of machines. General requirements*;[56]
- Appendix 2 of *The Electricity at Work Regulations 1989* (HSR25) (gives additional references).

Welfare

313 In the past, not all sawmills have given sufficient thought and resources to the provision and maintenance of suitable welfare facilities. Look at the following list and check that your mill meets these requirements.

Toilet and washing facilities

314 You have to provide adequate toilet and washing facilities for your employees. 'Adequate' means you have to provide the following:

- 'So far as is reasonably practicable' you need to provide flushing toilets and running water:
  - Portable cabins converted into toilet facilities are available from hire companies, if required.
  - Only consider alternatives such as chemical toilets and water containers if it is not possible to provide these.
- The basin should be large enough to wash hands and forearms, if necessary, and there must be hot and cold running water.
- Showers should also be provided where there is dirty work.
- Facilities should be well lit and ventilated.
- There should be enough toilets and washbasins for those expected to use them – people should not have to queue for long periods to go to the toilet.
- Separate facilities for men and women should be provided – if this is not possible make sure that rooms have lockable doors.
- Keep the facilities clean:
  - Walls and floors should preferably be tiled (or covered in suitable waterproof material) to make them easier to clean.
  - Delegate somebody to be in charge of this and make sure that facilities are always kept in good working order.
- There should be enough soap or other washing agents and a supply of toilet paper.
- There should also be a means for female employees to dispose of sanitary dressings.
- There should be something to dry hands on, such as paper towels or a hot air dryer.

Rest areas

315 Designate an area which is capable of being heated and has sufficient seating as a rest and/or eating area. The ideal location is somewhere quiet and clean, where food will not be contaminated. There should be washing facilities nearby, and a means of heating food or water for hot drinks.

316 More information can be found in *Welfare at work: Guidance for employers on welfare provisions* INDG293(rev1).[57]

Temperature

317 HSE have defined thermal comfort in the workplace as:

'An acceptable zone of thermal comfort for most people in the UK lies roughly between 13 °C (56 °F) and 30 °C (86 °F), with acceptable temperatures for more strenuous work activities concentrated towards the bottom end of the range, and more sedentary activities towards the higher end.'

318 In an enclosed workroom such as a sawmill, where severe physical effort is common, the minimum reasonable temperature is considered to be 13 °C. Elsewhere, in enclosed workrooms, it is considered to be a minimum of 16 °C.

319 Where workrooms are not fully enclosed or employees need to work in the open air for some of the working day, suitable warm protective clothing should be provided. When providing such protective wear, you need to take into account the dangers associated with numb fingers and loose clothing, particularly when working at dangerous machinery.

320 Where the temperatures in a workroom would otherwise be uncomfortably high, for example during a hot summer, and temperatures are made higher because of hot processes or the design of the building, then all reasonable steps should be taken to achieve a reasonably comfortable temperature, for example by:

- insulating hot plants or pipes;
- providing air-cooling plant or fans/increased ventilation;
- shading windows;
- placing workstations away from places subject to radiant heat.

321 Where, despite the provision of local cooling, workers are exposed to temperatures which do not give reasonable comfort, suitable protective clothing and rest facilities should be provided. Where practical, there should be systems of work (for example, task rotation) to ensure that the length of time for which individual workers are exposed to uncomfortable temperatures is limited.

322 More information on temperature from:

- Regulation 7 of *Workplace health, safety and welfare. Workplace (Health, Safety and Welfare) Regulations 1992. Approved Code of Practice*[58] deals specifically with the temperature in indoor workplaces). See also HSE webpages www.hse.gov.uk/temperature/index.htm.

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15 *Safe use of power-operated cross-cut saws* Woodworking Information Sheet WIS35(rev1) HSE Books 2011 www.hse.gov.uk/pubns/woodindx.htm

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17 BS EN 1870–9:2000 *Safety of woodworking machines – Circular sawing machines – Part 9: Double blade circular sawing machines for cross-cutting with integrated feed and with manual loading and/or unloading* British Standards Institution

18 BS EN 1870–10:2003 *Safety of woodworking machines – Circular sawing machines – Part 10: Single blade automatic and semi-automatic up-cutting cross-cut sawing machines* British Standards Institution

19 BS EN 1870–11:2003 *Safety of woodworking machines – Circular sawing machines – Part 11: Semi-automatic and automatic horizontal cross-cut sawing machines with one saw unit (radial arm saws)* British Standards Institution

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47 *Are you making the best use of lifting and handling aids?* Leaflet INDG398 HSE Books 2004 (priced packs of 15 ISBN 978 0 7176 2900 8) www.hse.gov.uk/pubns/indg398.pdf

48 *Timber treatment installations: Code of Practice for safe design and operation* (Fifth edition) available from the Wood Protection Association www.wood-protection.org/

49 Control of Asbestos Regulations 2006 www.hse.gov.uk/asbestos/regulations.htm

50 Asbestos campaign – Duty to manage www.hse.gov.uk/asbestos/campaign/duty.htm

51 *Managing my asbestos: A step-by-step guide to the duty to manage asbestos* HSE e-tool www.hse.gov.uk/asbestos/managing/index.htm

52 *A short guide to managing asbestos in premises* Leaflet INDG223(rev4) HSE Books 2009 (priced packs ISBN 978 0 7176 6375 0) www.hse.gov.uk/pubns/indg223.pdf

53 *Electricity at work: Safe working practices* HSG85 (Second edition) HSE Books 2003 ISBN 978 0 7176 2164 4 www.hse.gov.uk/pubns/books/hsg85.htm

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55 BS 7671:2008+A1:2011 *Requirements for electrical installations. IEE Wiring Regulations. Seventeenth edition* British Standards Institution

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57 *Welfare at work: Guidance for employers on welfare provisions* Leaflet INDG293(rev1) HSE Books 2007 (priced packs ISBN 978 0 7176 6264 7) www.hse.gov.uk/pubns/indg293.htm

58 *Workplace health, safety and welfare. Workplace (Health, Safety and Welfare) Regulations 1992. Approved Code of Practice* L24 HSE Books 1992 ISBN 978 0 7176 0413 5 www.hse.gov.uk/pubns/books/l24.htm

Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

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

This document is available at: www.hse.gov.uk/pubns/books/hsg172.htm.

British Standards can be obtained in PDF or hard copy formats from BSI: http://shop.bsigroup.com or by contacting BSI Customer Services for hard copies only Tel: 020 8996 9001 email: cservices@bsigroup.com.

UK Timber Grading Committee. More information can be obtained from the Timber Trade Federation, please see below.

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