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Target audience
HSE Inspectors


INFEED CHUTES ON MOBILE WOOD CHIPPERS

This SIM gives information about standards of operator protection at the infeed chutes of mobile wood chippers, and **the deadline for retrofitting** of protective devices on infeed chutes of power-fed machines - set at **5 December 2002**.

BACKGROUND

1 Mobile wood chippers are widely used to process green waste arising from arboricultural and landscaping work. Operators manually load branches and green waste into an infeed chute which funnels the material into a chamber where chipping components (eg knives), mounted on a rotating disc or drum, process the wood into chips which are expelled from the chamber through an outlet chute.

2 Following a number of accidents where the operators were pulled into power-fed machines having become inadvertently entangled in the fed material, HSE undertook a review of the protective measures at the infeed chutes on such machines. The review identified those machines designed to a new CEN draft standard as providing the best protection against accidental entanglement.

3 HSE met with manufacturers and suppliers to persuade them to introduce a new infeed chute guarding standard ahead of the timetable for the CEN standard. It was agreed that from 1 October 2000, new machines would be supplied to the standards set out in Agriculture Information Sheet [AIS 38 Power-fed wood chippers - Operator protection at infeed chutes](#) .

4 Further, suppliers would offer retrofitting on existing machines. HSE then publicised the need for retrofitting with users stating that machines should be upgraded as soon as reasonably practicable. From estimates given by suppliers, around 60% of machines have been retrofitted. To encourage retrofitting on the remaining units, **HSE has set a deadline of 5 December 2002**.

BASIC DESIGN OF WOOD CHIPPERS

5 There are two basic designs: gravity-fed machines and power-fed machines. On gravity-fed machines the infeed chute is usually at an angle of 45° or more and the material slides down the infeed chute directly into the chipping chamber. On power-fed machines the infeed chute is in a horizontal or near horizontal position at the end of which the material is forcibly fed into the chipping chamber by a single or pair of hydraulically powered roller(s).

Alternatively, on some machines the chipping components themselves act to pull the material into the chipping chamber (eg screw type chippers).

6 On machines without powered rollers, the test for whether the chipping components act as infeed components is the ability of the operator to withhold the material from the chipping components during the chipping process. If this cannot be done, the machine is considered to be a power-fed machine.

7 For branches to be fed into a chipper, the size of the infeed chutes allow a significant degree of whole-body access. From this stems a risk of serious injury if the operator comes into contact with either the chipping components or the infeed rollers. On either group of machine (gravity or power-fed) this can happen if the operator reaches into the infeed chute. Thus the infeed chutes of all machines need to be of sufficient length to protect against this risk. On power-fed machines contact may also occur if the operator becomes entangled in the branches or stems as they are being fed into the machine, and as a result, is physically pulled into the infeed rollers/ chipping components.

DESIGN OF INFEED CHUTES ON GRAVITY-FED MACHINES

8 The shape and design of these chutes should be governed by EN 294 'Safety of Machinery - Safety distance to prevent danger zones being reached by the upper limbs' table 2. Notes in the table state that 'protective structures lower than 1400 mm should not be used without additional safety measures'. No measure has been identified that would provide an equivalent level of safety. Therefore the minimum distance between ground and the outermost lower edge of the infeed chute should not be less than 1400 mm. A worked example for a machine with the danger zone at 800 mm is shown in Figure 1 below.

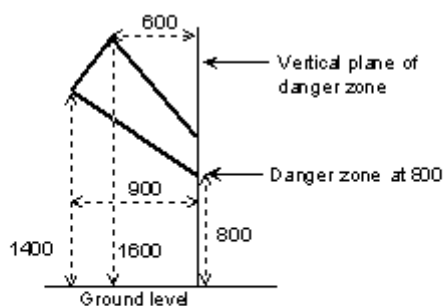


Figure1. Example chute design for a gravity-fed wood chipper according to table 2 of EN 294

DESIGN OF INFEED CHUTES ON POWER-FED MACHINES

9 The design of infeed chutes of power-fed machines is given in AIS 38 *Power-fed mobile wood chippers - Operator protection at infeed chutes*.

10 AIS 38 sets out two basic chute designs for power-fed machines. The first is for machines where the outermost lower edge of the infeed chute is below 600 mm (low chute machines). These machines are high capacity units mostly used for whole-tree chipping. The dimensions of the infeed chute are designed to give protection against both upper and lower limbs from being pulled into the machine. The second is for machines where the outermost lower edge of the infeed chute is 600 mm or higher (high chute machines).

These machines are primarily designed for brush wood and branches. The dimensions of the infeed chute are designed to give protection against the upper limbs being pulled into the machine, taking account of the ability of the operator to bend at the hips.

11 Both of these designs follow the latest draft of proposed CEN standard prEN 13525. The draft standard also provides an alternative design for compact power-fed chippers which are aimed at the semi-professional market. These are narrow machines to allow access through garden gates etc. The design is set out in Figure 2 below.

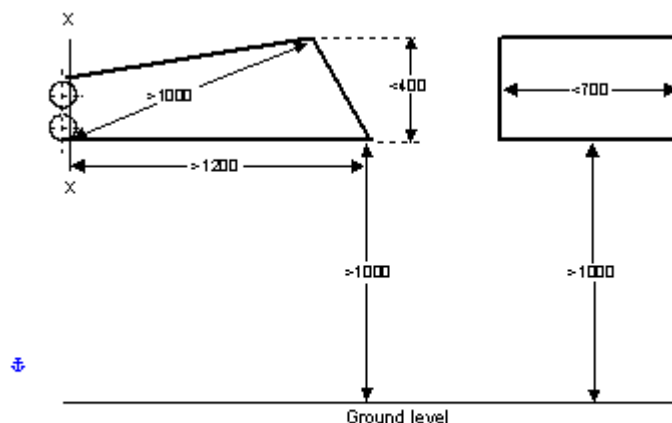


Figure 2: Alternative design for power-fed compact machines

PROTECTION DEVICES AT THE INFEED CHUTES OF POWER-FED MACHINES

12 As already outlined, on power-fed machines operators are at risk from being drawn into the machine if they become entangled in the material being fed. Originally this risk was controlled by locating the protection device on all machines around the sides and top edge of the infeed chute and instructing the operator to feed branches into the machine standing at the side of the infeed chute.

13 This arrangement was satisfactory whilst the width of the infeed chute remained relatively small (eg less than 700 mm). When feeding branches into the machine, the operator would naturally have to stand to one side of the infeed chute. However, as the size and power of the machines increased (with a proportionate increase in the width of the infeed chutes), the ability for the operator to feed from the front of the chute also increased, leaving them unable to contact the protection device if they were drawn in over the front of the infeed chute. It was on such machines that recent entanglement accidents have occurred.

14 The revised arrangements for the position and function of protection devices at the infeed chutes of power-fed machines is given in AIS 38. The protection device should allow the operator, if entangled in the wood being fed into the machine, to stop the infeed action. The operator should be able to engage the protection device, in the direction of infeed, by using parts of the body other than just the hands (eg shoulder, elbow, torso, hip, legs etc). Additionally, on low chute machines, the protection device should stop or reverse the infeed action when pulled against the direction of feed (thought to be the natural reaction if the operator was being drawn in by their feet).

15 To be successfully activated in the direction of infeed, the device must be located sufficiently proud of the chute edge such that it can be moved to the emergency stop

position without interference from the chute edge. Once activated to the emergency stop position, the operator should only be able to select another function (ie infeed or reverse) by a deliberate action. This has different application depending on the configuration of the protection device.

Protection devices with dedicated stopping function

16 Where the protection device is a dedicated stop control, return of the protective device from the emergency stop position to its active position shall not restart infeed or reverse action. The operator will have to either re-actuate the appropriate control (ie infeed or reverse) or actuate another control which reinstates their function (eg closing a dump valve actuated by the stop command or releasing a lock holding the protection device in the emergency stop position).

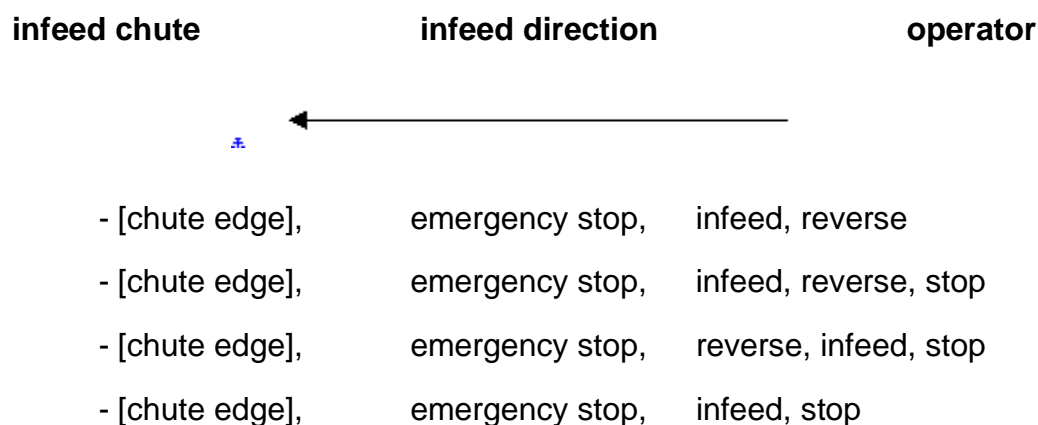
Protection devices combined with infeed and reverse functions

17 Where the protection device is combined with other functions (eg infeed and reverse) the emergency stop position should be nearest to, but still proud of, the chute edge. Once actuated to the emergency stop position, movement of the device to any other position shall not restart infeed or reverse action. A separate control must be provided to reinstate the other functions on the protection device.

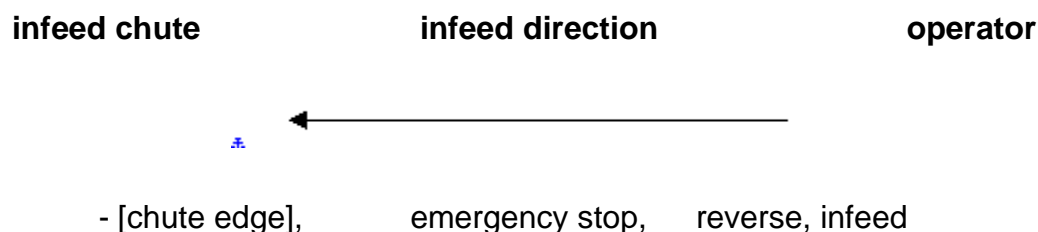
18 On high chute machines, additional stop positions (eg between infeed and reverse functions) can be provided so long as they are not before any position that causes infeed action (as viewed in respect of the infeed direction from the operator to the infeed chute).

19 Taking the above into account permitted control patterns are:

Low chute machine



High chute machines



- [chute edge], emergency stop, infeed, reverse
- [chute edge], emergency stop, reverse, stop, infeed

POWER-FED MACHINES WHERE THE CHIPPING COMPONENTS ACT TO DRAW IN THE MATERIAL

20 At present the only wood chipper on the market where chipping components act to draw in the material is the Laimet screw chipper. The protection device on this machine is an over centre spring-loaded drop-plate, which on activation by the operator, drops down to grip the material to prevent further infeeding. The vertical plane of the drop-plate should be regarded as the hazard point from which the length of the infeed chute should be measured.

21 There are in use a very small number of older machines, known as drum chippers, where the chipping knives rotate in the same direction as the infeed direction (as compared with being at right angles to the infeed direction - the usual configuration on modern machines with infeed rollers). On these machines the chipping drum pulls the material into the machine. HSE is unaware of any machine being fitted with braking on the chipping drum and the run-down time for the chipping drum is in excess of the time that it would take to draw an entangled operator into the danger zone.

22 To bring these machines up to the standards in AIS 38 they will have to be retrofitted with either hydraulic feed rollers or a spring-loaded drop-plate similar to that fitted on the Laimet screw chipper. However, the cost of such modifications are likely be in excess of the value of the machine.

EMM GUIDANCE

23 This guidance is based on the Enforcement Management Model (EMM) Version 3.0 and applies to the risk of contacting or being drawn into the infeed rollers and/or chipping components. Any actions should reflect any subsequent changes to the EMM. The final decision on enforcement should take account of any dutyholder factors.

24 When citing breaches of relevant statutory provisions on prohibition and improvement notices, inspectors will need to check if the machine was supplied prior to 1st January 1995. For machine supplied before this date, inspectors can cite the appropriate parts of regs.11-19 of PUWER 98. Post this date, inspectors should cite PUWER 98 reg.10(1), but use the lack of compliance with the appropriate parts of regs.11-19 as the legal standard.

Immediacy of risk

25 Failure to comply with all aspects of AIS 38 does not necessarily constitute an immediate serious risk of personal injury. However, should inspectors encounter the following deficiencies, then the issue of a prohibition notice should be considered.

On gravity-fed machines:

- (1) Where the positioning and dimensions of the infeed chute are not sufficient to prevent the operator from reaching the danger zone without determined action. *(NB do not use your own arm to check this distance!)*

On power-fed machines (whether or not retrofitted to AIS 38 standards)

(2) Complete absence of a protection device on power-fed machines to prevent operators being drawn into the infeed chute when feeding from the side (old standard) or the front of the chute (AIS 38 standard).

(3) Protection device is jammed or disabled

(4) Protection device ineffective by virtue of:

(a) a lack of maintenance;

(b) 'feed' being at the position closest to the chute edge;

(c) 'stop/emergency stop' not being sufficiently proud of, or behind, the chute edge.

(5) high chute machines where the reach distances are less than those shown in figure 3 of AIS 38.

(6) Low chute machines where the chute dimensions do not conform to those in AIS 38 figure 1. *(NB On machines with very low chutes, the length of the sides and the bottom of the chute may be below 1200 mm and still provide adequate protection).*

(7) After 5 December 2002, high chute machines where the protection device is not located in accordance with AIS 38 and the chute is greater than 700 mm in width.

Benchmark standard

26 The benchmark is compliance with PUWER 98, guidance in AIS 38 and the additional information given in this SIM. The benchmark does not extend to operators climbing into the infeed chute to use their hands or feet in close proximity to the danger zone to force material into the machine. Taking this into account, the benchmark for the risk of contact with the dangerous parts, including contact as a result of entanglement, is considered to be nil/negligible.

Risk gap

27 The risk gap is derived from EMM table 2.1 for the key scenarios summarised below. Inspectors may use these scenarios as a guide to making their assessment of actual risk and the subsequent risk gap. However, inspectors must ensure that they base their assessment of risk on the actual operator protective measures found on the machine.

Scenario	Actual risk	Risk gap
High chute machines where the protective device is not located in accordance with AIS 38 and the chute is less than 700 mm in width	Remote risk of a serious personal injury	Substantial
Any machine where 'reverse' function is in the position closest to the chute	Remote risk of a serious personal injury	Substantial

edge		
Any machine where, following activation of the protective device to the emergency stop position, the operator can directly restart the infeed rollers without having to activate a separate control.	Remote risk of a serious personal injury	Substantial
Low chute machines where the protection device does not engage stop or reverse when pulled against the direction of feed	Remote risk of a serious personal injury	Substantial

Initial Enforcement Expectation

28 In general, defined standards are explicit in what must be achieved. Which standard(s) is/are relevant when applying the EMM depends on the change in behaviour or activity which the Inspector is seeking to achieve, ie whether the change the inspector desires is documented in a defined, established or an interpretative standard.

29 The following are relevant when deriving the authority of standards for use in EMM table 5.1 and in deciding the initial enforcement expectation.

Title	Authority
Provision and use of work equipment Regulations 1998	Defined
AIS 38 Power-fed mobile wood chippers - Operator protection at infeed chutes	Established
EN 294 Safety of Machinery - Safety distance to prevent danger zones being reached by the upper limbs (for gravity-fed machines)	Established

Strategic factors

30 Inspectors are asked to bear in mind seriousness of the injuries that can occur from being drawn into a wood chipper. The Sector contends that the contribution from correctly fitting a properly engineered protection device to reducing the risk of an operator having their hand or arm amputated in a wood chipper **is not** grossly disproportionate to the sacrifice (money, time and effort) needing to be made by the employer and thus is 'reasonably practicable'.

SUPPLY ISSUES

31 Inspectors encountering new machines supplied after 31 October 2000, not meeting the standards in AIS 38 should raise a SAPID and contact the Sector.

CANCELLATION OF INSTRUCTIONS

32 SIM 1/1999/06 Lindanna wood chippers - **cancel** and **destroy**.

Date first issued: 23 August 2002

