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Powered shredders and chippers — Definitions, safety requirements and test procedures

Broyeurs et déchiqueteurs à moteur — Définitions, exigences de sécurité et modes opératoires

Reference number
ISO 11448:1997(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11448 was prepared by Technical Committee 23, *Tractors and machinery for agriculture and forestry*, Subcommittee 13, *Powered lawn and garden equipment*.

Annexes A, B and C form an integral part of this International Standard. Annexes D and E are for information only.

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Powered shredders and chippers – Definitions, safety requirements and test procedures

1 Scope

This International Standard presents definitions of terms and specifies safety requirements and test procedures applicable to hand-fed powered shredders and chippers, including those which have vacuum assisted collection and are used in a stationary position and are designed primarily for use with organic material at and around the home. This International Standard does not apply to shredders and chippers with feed openings greater than 400 mm × 400 mm measured at the relevant safety distance to the cutting means.

This International Standard does not specify requirements for units powered by an external power source or for powered discharge units intended to broadcast material or load vehicles. Mechanically powered feed intake machines or attachments are excluded from this International Standard, as are machines for which the cutting means is either one or more non-metallic filaments, or one or more non-metallic cutting elements pivotally mounted on a generally circular central drive unit, where these cutting elements rely on centrifugal force to achieve cutting, and have a kinetic energy for each single cutting means of less than 10 J.

The electrical aspects of electrically powered shredder/grinders and shredder/baggers having a voltage exceeding 42 V d.c. or mains connected are not covered by this International Standard.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of the IEC and ISO maintain registers of currently valid International Standards.

ISO 3767-1:—[1], *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 1: Common symbols.*

ISO 3767-3:1995, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 3: Symbols for powered lawn and garden equipment.*

ISO 3767-5:1992, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 5: Symbols for manual portable forestry machinery.*

ISO 11684:1995, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety signs and hazard pictorials — General principles.*

ISO 13852:1996, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs.*

IEC 335-1:1991, *Safety of household and similar electrical appliances — Part 1: General requirements.*

1) To be published. (Revision of ISO 3767:1991)

IEC 335-2-93:—[2] , *Safety of household and similar electrical appliances — Part 2: Particular requirements for powered shredders.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 chipper
Machine for the purpose of cutting branches and wood into chips, having one or more cutting means and designed to operate in a stationary position (see figures 1 and 2).

3.2 discharge chute
Extension of the opening through which shredded or chipped material is discharged.

3.3 discharge zone
Space into which shredded or chipped material is ejected from the machine.

3.4 exhaust system
Means of conveying exhaust gases from the engine exhaust port to the atmosphere.

3.5 feed intake opening
Opening through which material is inserted to be fed to the cutting mechanism.

3.6 guard
Component intended to provide protection for the operator or bystander from injury.

3.7 material discharge deflector
Fixed or movable component used to direct the flow of processed material being discharged from the machine.

3.8 maximum operating engine speed
Highest engine speed obtainable when adjusted in accordance with manufacturer's specifications and/or instructions with the cutting means engaged.

3.9 normal operation
Any use of the machine which is reasonably foreseeable, and which is consistent with such activities as reducing organic material, starting, stopping, fuelling, or connecting to (or disconnecting from) a power source.

3.10 normal use
Normal operation, plus routine maintenance, servicing, cleaning, transporting, attaching or removing accessories, and making ordinary adjustments as determined by the manufacturer's instructions.

3.11 power source
Engine or motor which provides mechanical energy for linear or rotational movement.

3.12 screen; grid
Perforated metal piece or bar(s) located between the cutting means and discharge chute or opening of the machine to assist in reducing bulk organic materials to smaller pieces.

3.13 shredder
Machine for the purpose of reducing bulk organic materials to smaller pieces, having one or more cutting means and designed to operate in a stationary position (see figures 1 and 2).

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2) To be published.

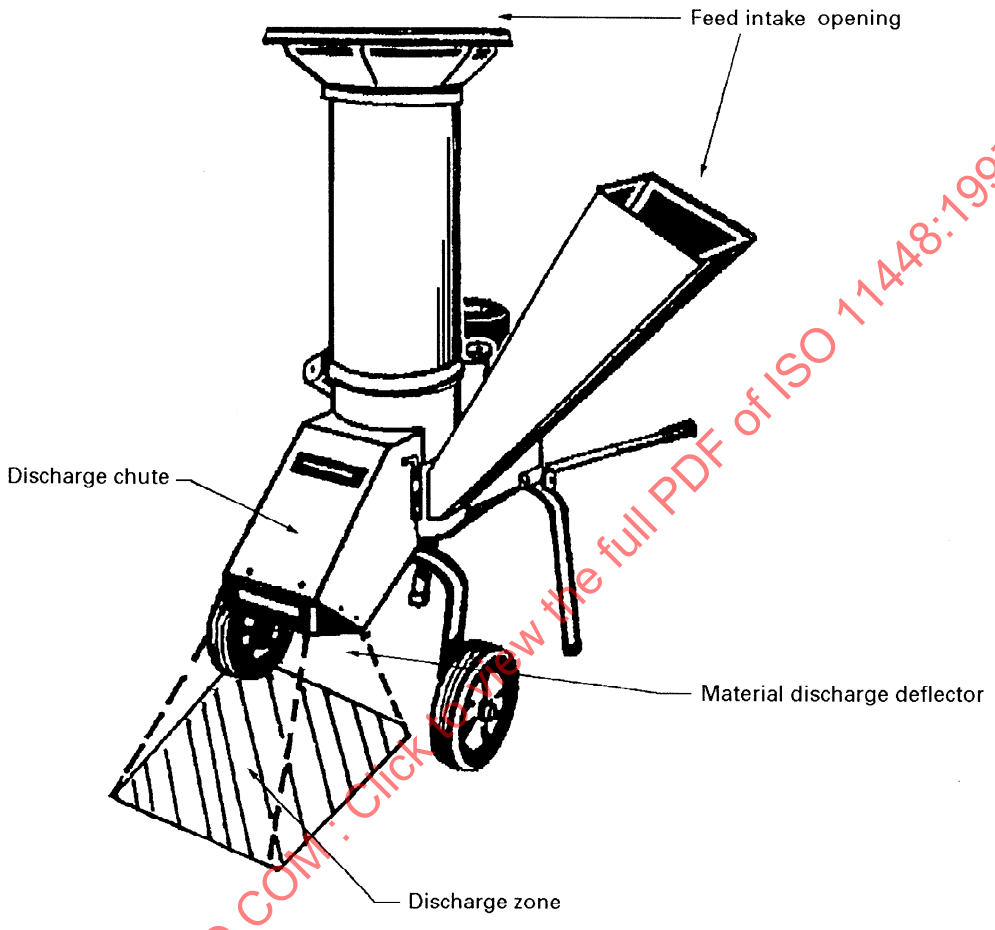

Figure 1 — Example of typical chipper/shredder

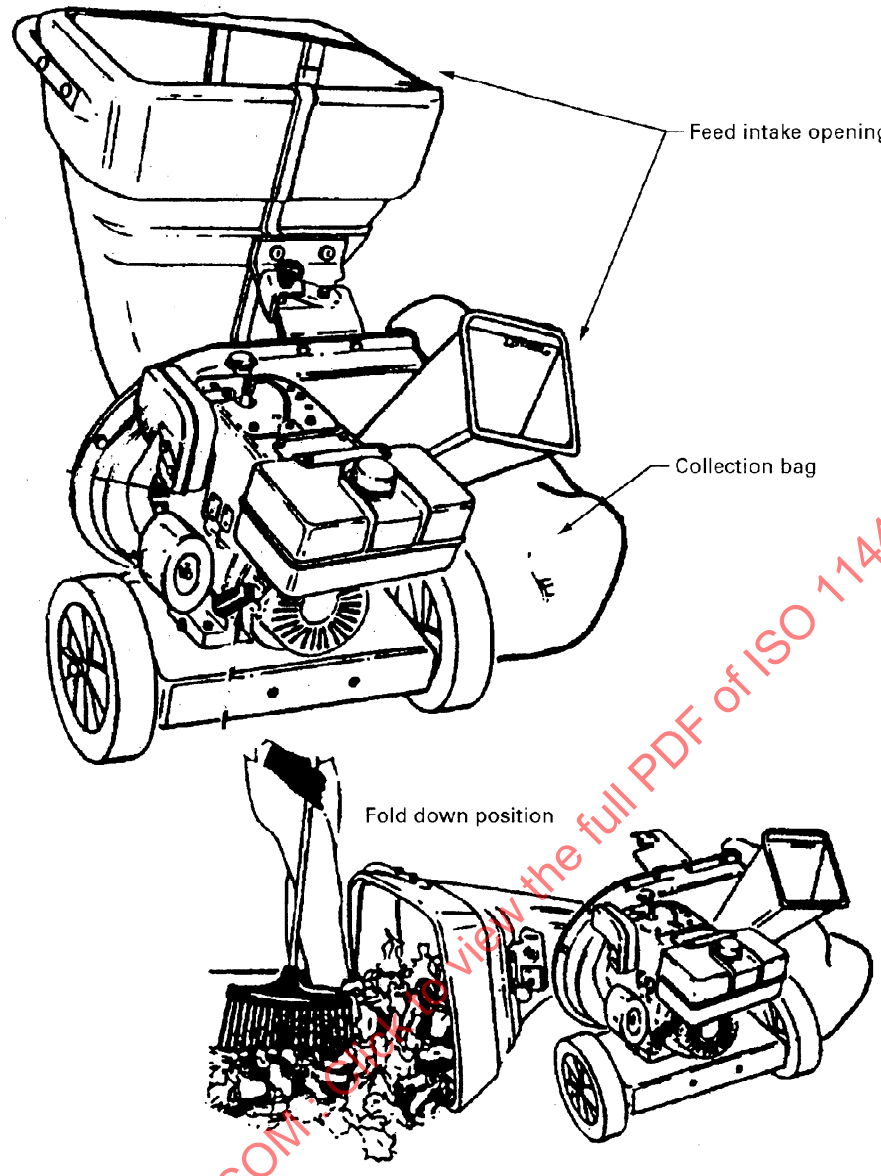

Figure 2 — Example of typical chipper/shredder

4 General construction

4.1 Power-driven components

All power-driven components (except the cutting means) shall be guarded to prevent contact with these parts during normal operation. The principles set out in ISO 13852 shall be followed when developing the guard system.

Rotating covers or discs shall have a continuous unbroken or smooth surface.

4.2 Feed openings and safety distances

To safeguard against contact with the cutting means the machines shall be constructed to meet the requirements given in tables 1 and 2.

Table 1 — Safety distances from feed openings less than 250 mm

Dimensions in millimetres

Feed opening size[1]	Distance from opening to cutting means		
	Feed opening shape		
	slot	square	round
⩽ 40	⩾ 200	⩾ 200	⩾ 120
> 40 ⩽ 50	⩾ 850[2)3)]	⩾ 200	⩾ 200
> 50 ⩽ 250	⩾ 850[3)]	⩾ 850[3)]	⩾ 850[3)]

1) Measured across the narrowest point.

2) If the length of the slot opening measured along the longest side of the slot is ⩽ 65 mm, the safety distance can be reduced to 200 mm.

3) Where the height of the lowest outer edge of any barrier or the feed opening itself is ⩾ 1 200 mm above the ground, the safety distance is measured as a chain measurement from the outer edge (see figure 3). Openings < 1 200 mm above the ground are measured as the shortest distance from the plane of the opening. If the opening is more than 1 200 mm above the ground, this safety distance to the cutting means can be reduced by $L/2$ where $L = h - 1\,200$ and h is the height above the ground of the lowest point of the feed opening.

Where a feed opening is not a slot, square or round, the overall size of the opening is considered to be a slot, square, or round envelope that contains the opening. The shortest safety distance of this envelope may then be used. Where a combination of slots, squares, and/or rounds are used and they create a pinch point of less than or equal to 30 mm, each shape can be considered separately for opening size and safety distance.

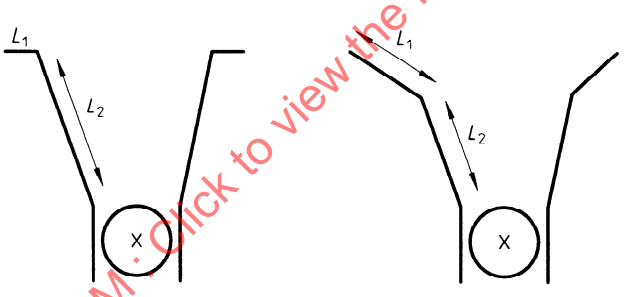

Figure 3 — Chain measurement

Table 2 — Safety distances from feed openings greater than 250 mm

Dimensions in millimetres

Height above the ground at the lowest edge of the feed opening	Distance to the cutting means from the edge of the feed opening
⩽ 1200	⩾ 1200[1)]
⩾ 1200	⩾ 850[2)]

1) Where the height of the lowest edge of the opening is below 1 200 mm, the chute shall be restricted to not more than 400 mm × 400 mm at the distance of at least 850 mm from the cutting means and the actual opening shall measure no more than 1 000 mm in any direction (see figure 4).

2) Where the height of the lowest outer edge of any barrier or the feed opening itself is ⩾ 1 200 mm above the ground, the safety distance is measured as a chain measurement from the outer edge (see figure 3). Openings < 1 200 mm above the ground are measured as the shortest distance from the plane of the opening. If the opening is more than 1 200 mm above the ground, this safety distance to the cutting means can be reduced by $L/2$ where $L = h - 1\,200$ and h is the height above the ground of the lowest point of the feed opening.

Dimensions in millimetres

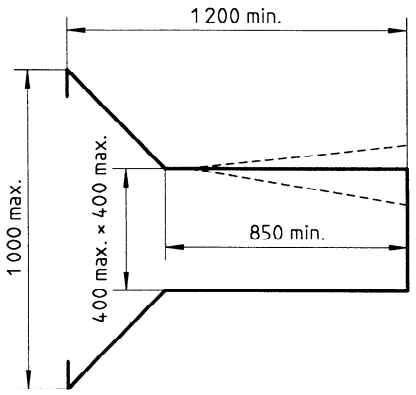

Figure 4 — Example of compliance with table 2 for height opening below 1200 mm

4.3 Discharge openings

The discharge chute shall be designed so as to prevent direct access to and accidental contact with the cutting means, where no part of the outer edge of the discharge chute is more than 350 mm from the ground. The cutting means shall be at least 3 mm above the highest part of the outer edge of the discharge chute and the minimum distance from the chute edge to the hazard point shall be 230 mm (see figure 5).

Dimensions in millimetres

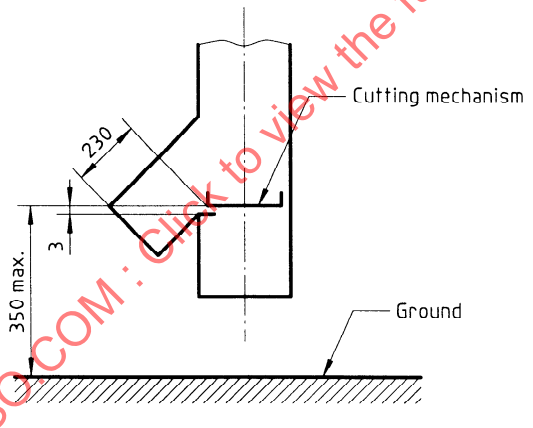

Figure 5 — Discharge opening distance requirements

If the highest edge of the discharge opening is greater than 350 mm from the ground and smaller than 120 mm × 120 mm, the safety distance shall conform to the principles set out in ISO 13852.

If the highest edge of the discharge opening is greater than 350 mm from the ground and larger than 120 mm × 120 mm, the safety distance shall be at least 850 mm and the maximum discharge opening shall be 250 mm × 250 mm.

Discharge openings enclosed with a bag or container which when removed does not meet the above requirements shall be fitted with an interlock which cause the moving parts to come to rest. While the cutting means is exposed it shall not be possible to start the engine.

4.4 Guard attachment

Guards allowing access to the cutting means shall be interlocked to cause the moving parts to come to rest before access can be gained. It shall not be possible to start the engine while the cutting means is exposed. Other guards shall be permanently attached to the machine and shall not be detachable without the use of tools, or the construction of the machine shall be such that it cannot be used without the guard in its guarding position.

Guards shall be provided to prevent accidental contact with hazardous points when servicing the machine as recommended by the manufacturer. Guards may require repositioning for servicing requirements as directed by manufacturer's instructions.

Where a guard is designed to be opened or removed and thus exposes a hazard, a safety sign warning of the hazard shall be located on the guard or adjacent to the hazard.

Where a guard is positioned so that it may be used as a step, it shall withstand a force of 1 200 N.

4.5 Heat protection

4.5.1 Temperature limits of exposed parts

A guard shall be provided to prevent accidental contact with any exposed engine exhaust components which are larger than 10 cm^2 and which have a surface temperature greater than 80 °C (at 20 °C ± 3 °C) ambient temperature during normal starting and operation of the machine. For the purposes of this equipment, the guard is considered to be part of the exposed engine exhaust components.

4.5.2 Test equipment and method of test

4.5.2.1 Test equipment

The measuring equipment shall have an accuracy of ± 4 °C.

4.5.2.2 Method of test

The test shall be conducted in the shade. The engine shall be operated at its maximum operating speed until the surface temperatures stabilize. Temperatures shall be determined by correcting the observed temperature by the difference between the specified ambient and test ambient temperature. Identify the hot surface area(s) on the engine exhaust system. When the distance between the identified hot area and the nearest control is greater than 100 mm, cone A shall be used. When the distance between the identified hot area and the nearest control is less than 100 mm, cone B shall be used. See figure 6.

For cone A, move the cone, keeping the axis of the cone anywhere between 0° and 180° to the horizontal and with the nose or point of the cone in a downward to horizontal direction towards the hot surface. The cone shall not be moved in an upward direction. Move cone B in any direction. When moving the cone, determine if the cone tip or conical surface makes contact with the hot surface area(s).

4.5.2.3 Test acceptance

The tip or conical surface of cone A or B shall not be able to make contact with a hot surface area greater than 10 cm^2 of the exhaust system.

4.6 Controls

4.6.1 Location

No control used for stopping, starting, or speed control shall be located in such a manner as to require the operator to be in the discharge zone or in front of the engine exhaust outlet.

Dimensions in millimetres

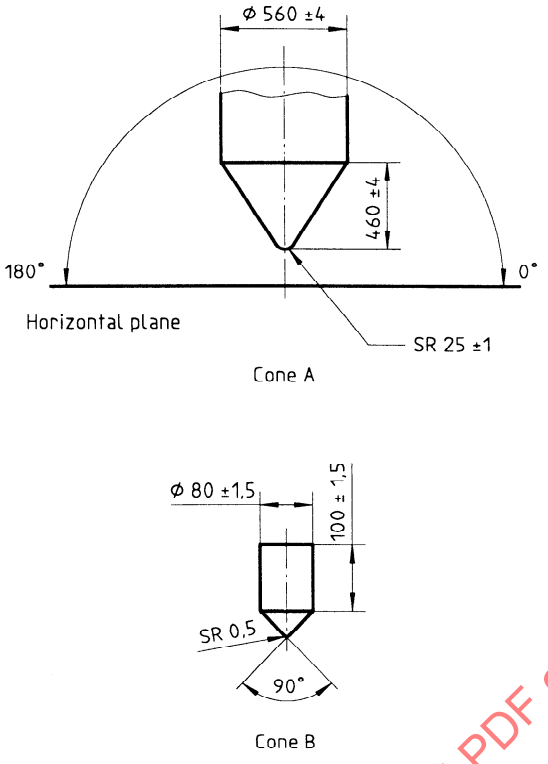

Figure 6 — Test cones

4.6.2 Engine stopping and starting

An engine stopping device shall be provided. The device shall not depend on sustained manual pressure for its continued operation. The device shall require manual and intentional activation in order to restart the engine, and shall be accessible from starting positions.

Machines shall not be equipped with a starter operated by means of a loose rope.

Machines started by means of a crank shall disconnect the crank from the shaft immediately after starting.

4.6.3 Identification of controls

The function, direction and/or method of operation of the controls shall be clearly identified by a durable label or mark.

Easily understandable, detailed instructions on the operation of all controls shall be provided in an operator's manual.

NOTE — International symbols may be used for identification of controls. Reference should be made to ISO 3767-1, ISO 3767-3 and ISO 3767-5.

5 Marking

5.1 Machine identification

All machines shall be marked legibly and permanently with the following information:

— name of the manufacturer or supplier;

— model number or type;

— serial number.

5.2 Warnings and symbols

All machines shall be prominently marked with the following warnings (hazard pictorials) or appropriate symbols:

— **"DANGER: Rotating cutting blades. Keep hands and feet out of openings while machine is running."** (wording should be adjusted to suit specific machine under consideration);

— "Read operator's manual";

— "Wear eye protection";

— "Wear ear protection" (when appropriate);

— "Wear ear and eye protection" (when appropriate);

— direction of rotation of cutting means.

The symbols or hazard pictorials shall follow the conventions laid down in ISO 3767-1, 3767-3 and 3767-5 for symbols, and in ISO 11684 for hazard pictorials. This International Standard does not require specific symbols or hazard pictorials to be used on the machine, but stresses that accepted conventions shall be used when developing the appropriate symbol or hazard pictorial. Annex D presents examples of symbols and hazard pictorials which may be used on shredders and chippers.

All symbols and hazard pictorials shall be explained in the operator's manual.

5.3 Labels

5.3.1 Requirements

Labels provided for identification and directional or cautionary information shall have a reasonable life for the anticipated machine operating environment and shall satisfy the following requirements:

— the label shall have a durable bond with the base surface material;

— the label shall be weather resistant and under normal cleaning procedures shall not fade, discolour, crack or blister and shall remain legible;

— marks or labels giving cautionary information shall be located close to the relevant hazard. Such labels shall be in the official language(s) of the country in which the product is sold.

5.3.2 Durability test

To test the durability of the marking and/or labels, rub them by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with hexane.

After the test the marking shall be easily legible, it shall not be easily possible to remove any labels and they shall shown no curling.

6 Maintenance and operation requirements

Each machine shall be provided with a manual giving operating, servicing and maintenance instructions. The instructions shall include those operations which can normally be performed by the operator.

NOTE — For advice on formatting of instructions, see ISO 3600.

The instructions shall include, where appropriate, the following:

— instructions for proper assembly of the machine for use, if the machine is not supplied in a completely assembled form;

— instructions for proper adjustment of the machine, including a warning of the danger of rotating blade(s), for example, "Caution — do not touch rotating blades";

— instructions for safe and correct machine operation and, where appropriate, such items as:

  • instructions for de-energizing stored energy devices, such as spring-loaded mechanisms;

  • if necessary, a warning of noise level and of the need to wear ear protection;

  • an explanation of any symbols or pictorials used on the equipment;

— safety instructions in accordance with annex C.

7 Electrical requirements

7.1 General

These electrical requirements apply only to battery circuits of less than 42 V. For the electrical requirements for electrically driven machines, see IEC 335-1 and IEC 335-2.

7.2 Low-voltage battery-powered circuits (not including magneto grounding circuits)

7.2.1 Battery installation

The compartment for a vented storage battery shall have openings to provide ventilation and drainage. Drainage of acid from the battery in its operating position shall not come in contact with parts that will be critically affected in such a manner as to create a hazard.

7.2.2 Overload protection

All circuits, except starting motor and ignition circuits, shall have overload protection devices on the battery feed side of switches, except for two-wire, nongrounded systems, for which the overload protection may be located in either line.

7.2.3 Terminals and uninsulated electrical parts

Terminals and uninsulated electrical parts shall be protected against short-circuiting, for example by a fuel can or tools during normal servicing, refuelling, and lubrication.

7.2.4 Electrical cables

Electrical cables shall be protected if located in potentially abrasive contact with metal surfaces.

Where possible, the wiring assembly shall be grouped together, properly supported, and located so that no portion is in contact with the carburettor, metallic fuel lines, the exhaust system, moving parts or sharp edges. Any edges of metal members likely to be in contact with the cables shall be rounded or protected to prevent possible damage to cables by cutting or abrasion.

8 Test procedures

8.1 General test conditions

The machine shall be completely assembled and shall rest on a horizontal surface. A new machine may be used for each test if necessary.

The tests shall be carried out in the order presented.

Where it is specified that the cutting means shall run during the tests, it shall be operated at the maximum operating motor speed. Sealed adjustments shall not be moved when checking the maximum operating speed.

It shall not be possible to sustain an engine speed greater than the manufacturer's maximum specified speed through use of the speed control provided or altered by the use of common tools.

Any feed or outlet opening guard that can be removed without the use of tools shall be removed when conducting these tests unless the guard is interlocked.

Screens or grids that may be removed without the use of tools shall be positioned (or removed) to achieve the minimum (or worst) test conditions.

Machine shall be tested under the most unfavourable conditions allowed by the manufacturer's instructions.

8.2 Thrown object test

The purpose of the thrown object test is to detect unacceptable objects being ejected from the feed and discharge openings. The following does not apply to machines with cutting means speeds ⩽ 50 r/min.

CAUTION — This test has some element of risk. Test personnel shall either be kept out of the test area or otherwise protected from the hazard.

8.2.1 Test enclosure and target arrangements

The test enclosure required for thrown object test shall be constructed generally as shown in figures 7 and 8. The enclosure is similar to the one described in ISO 5395:1990, 3.3.1.4.

The walls shall consist of eight panel areas, each 900 mm high, perpendicular to the base of the test fixture so as to form an octagon as in figure 7. An additional area consisting of a single thickness of kraft paper of nominal 80 g/m^2 shall extend 360° above the 900 mm target panels to a height of 2 000 mm. A line parallel to the base and 450 mm high shall be marked on each panel.

The test fixture base and the target panels composition shall meet the material specifications given in annexes A and B.

NOTE — In order to facilitate the counting of penetrations, the panel supports should be designed to allow sliding in and out of at least one target panel.

Replace the targets if hits from previous tests leave holes that cannot be covered by a 40 mm square gummed label. Not more than one thickness of gummed labels, used as patches, shall be placed over any one area.

The targets shall generally be located perpendicular to a radial line extending (750^{+50}_{0}) mm from the discharge opening(s) of the machine (see figure 7). If a target interferes with any part of the machine, handle, or wheel, the target shall be moved just sufficiently to avoid interference.

A panel of kraft paper having a mass per unit area of 80 g/m^2, fitted to a frame, shall be suspended 200 mm above and project at least 200 mm beyond all sides of the feeding device entrance. If the design of the machine prevents these distances from being maintained, the paper wall shall be arranged so as to achieve the closest possible dimensional compliance. See figure 8.

Dimensions in millimetres

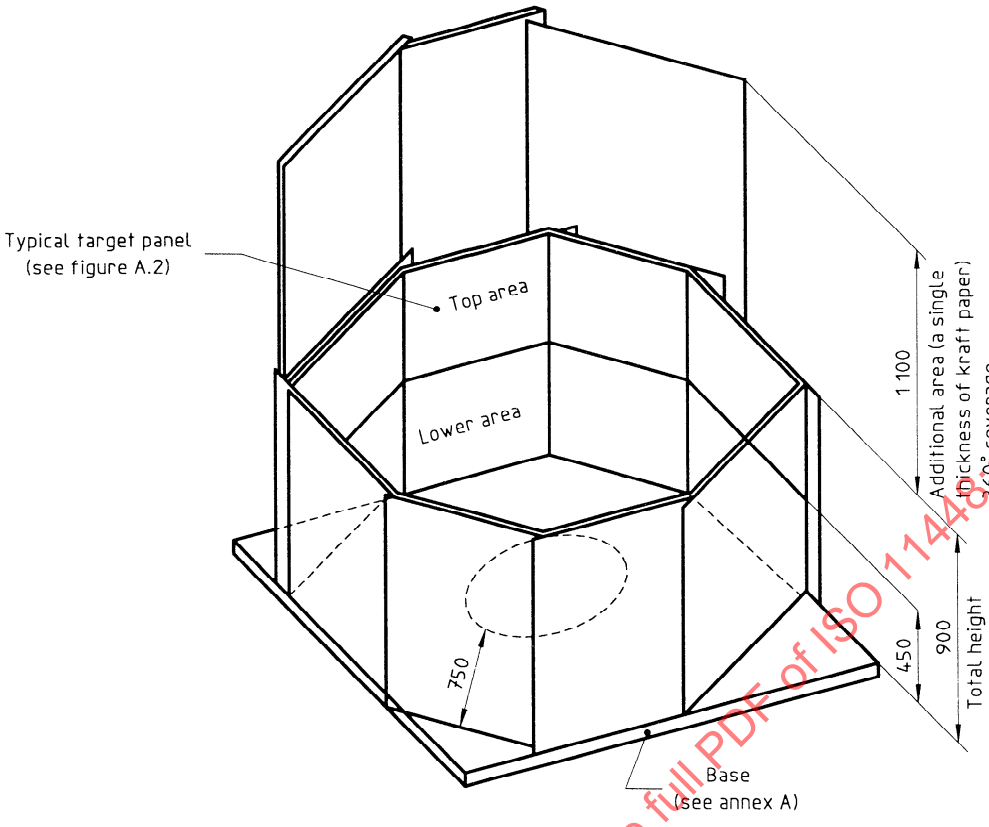

Figure 7 — Thrown object test figure — General layout

Dimensions in millimetres

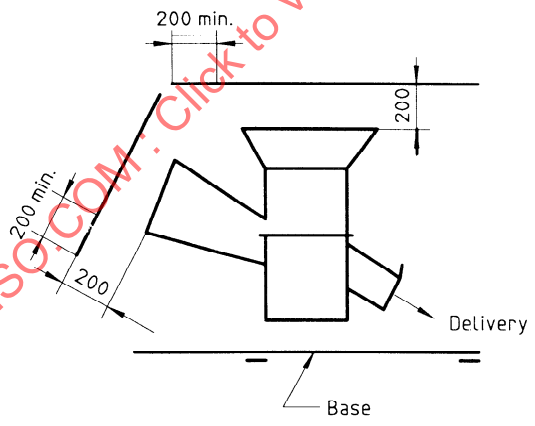

Figure 8 — Kraft paper panel placement

8.2.2 Test equipment

The machine shall be tested in the test enclosure described in 8.2.1 and shall be placed on the test enclosure base as specified in annex A.

Projectiles consisting of cylindrical hardwood dowels 20 mm ± 2 mm in diameter and 50 mm in length shall be used.

8.2.3 Test method

The test shall be conducted for each feed opening of the machine.

All moveable guards or shields shall be adjusted to the position of greatest opening or discharge (worst condition).

Feed 50 projectiles into each feed opening one at a time. Where multiple feed openings exist, 50 projectiles shall be fed into each opening.

Stop the machine 10 min after all projectiles have been fed into the feed opening(s) or when all projectiles have been fully processed and discharged by the machine.

8.2.4 Test results

Determine if any hits occurred on the kraft paper panel above the feed opening(s) and the target panels with its kraft paper. Hits are recorded if the projectile or any part of it has passed completely through the target. Begin by examining the backside of the panel.

8.2.5 Test acceptance

No hits for the kraft paper panel above the feed openings shall occur.

Not more than five hits shall occur between the base and the 450 mm line. There shall be no hits above the 450 mm line.

In the event of a test failure, two additional machines shall be tested. If either of the additional machines fails the test, the model is considered not to be in compliance with the thrown objects requirement of this International Standard.

8.3 Stability test

The purpose of the stability test is to determine the static stability of the machine.

8.3.1 Test method

Place the machine free standing on a tilt table inclined 10° to a horizontal and rotated 360°. If the wheels are not equipped with locks, they shall be chocked as necessary in their most unfavourable position.

8.3.2 Test acceptance

The machine shall not tip over in any direction.

8.4 Impact and dynamic stability test

The purpose of the impact and dynamic stability test is to determine the structural integrity of the cutting mechanism and dynamic stability of the machine.

8.4.1 Test method

Insert a welded or seamless mild steel tube 30 mm in diameter and 400 mm long with a wall thickness of at least 3 mm into the feed opening of the machine in an unsupported manner, causing a sudden stop of the rotor. Machines having more than one feed opening shall be tested with a new tube at each opening. The tube may be bent as required to make contact with the cutting means.

8.4.2 Test acceptance

If the machine does not stop in 15 s, the test shall be concluded.

The machine shall not tip over in any direction and shall remain in its operating position.

No portion of the test steel tube or machine part shall be ejected except through the discharge opening. No part of the machine necessary for compliance with this International Standard shall become detached or deformed so that it is no longer in compliance.

It is not required that the machine be suitable for use after the test.

Annex A
(normative)
Test enclosure

A.1 Base

The test enclosure specified in 8.2.1 shall consist of a test fixture base of 19 mm plywood covered with 500 mm squares of coconut matting nailed to the plywood with nails spaced as shown in figures A.1 and A.2.

NOTE 1 Squares are used so that, should wear develop, the worn area can be replaced without replacing the entire test surface.

The minimum base size shall be sufficient to support the whole of the enclosure area as shown in figure 7.

The coconut matting shall have approximately 20 mm high fibres embedded in a PVC base weighing approximately 700 g/m^2

NOTE 2 The coconut matting surface may be covered with a light flexible plastic sheet to assist in clean up of discharged wood chips on the condition that it does not affect the test results.

A.2 Target composition

For the penetration tests specified in annex B a single 900 mm target panel (see figure A.2) shall be made of one of the following:

— a single sheet of corrugated fibreboard;

— a single sheet of corrugated fibreboard with extra sheets of kraft paper added in front of the target face; or

— two sheets of corrugated fibreboard stacked together. The fibreboard construction may have two or three liners and have one or two flutes.

Dimensions in millimetres

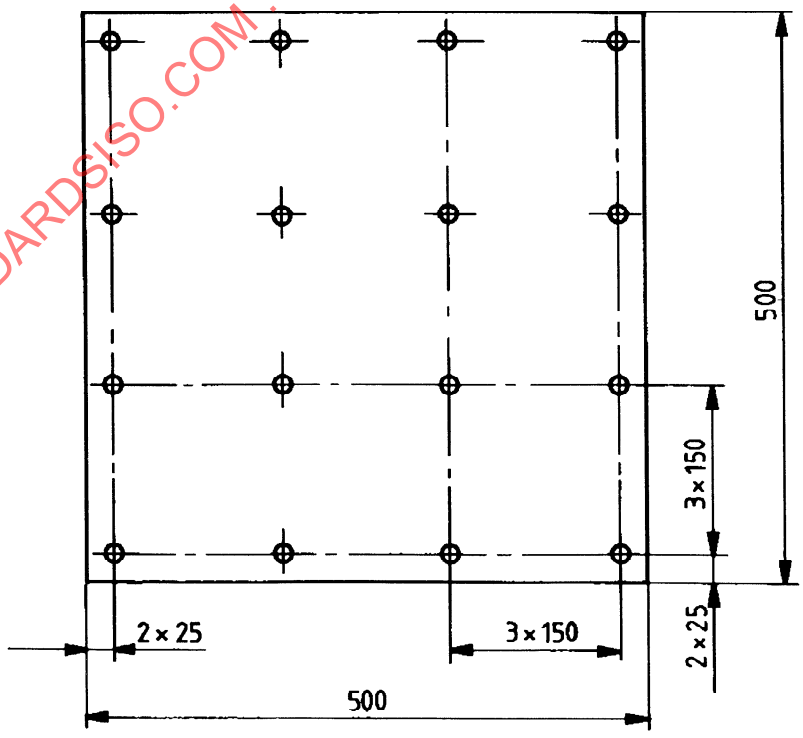

Figure A.1 — Nail plan of test fixture base

Dimensions in millimetres

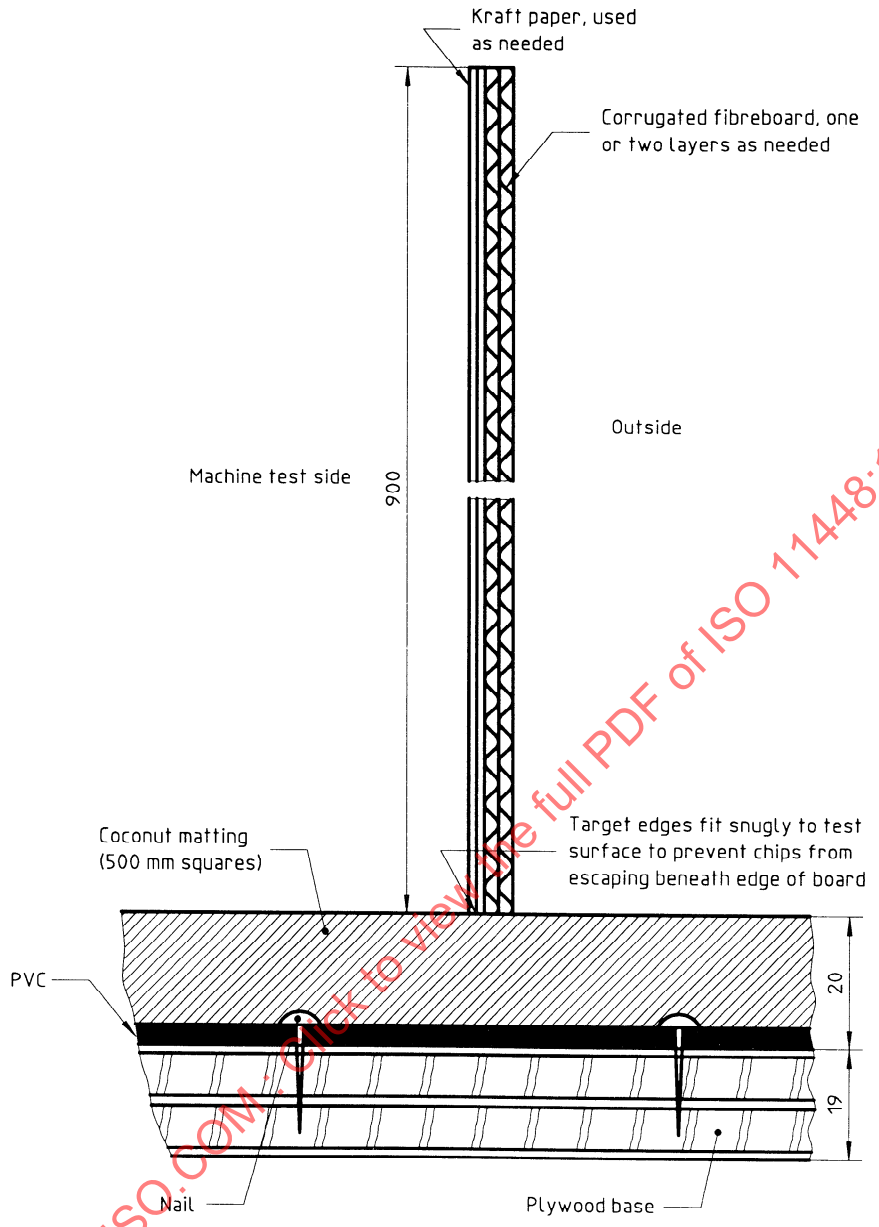

Figure A.2 — Test enclosure walls and base

Annex B
(normative)
Corrugated fibreboard penetration tests for test enclosure wall panels

B.1 Purpose

The purpose of these tests is to provide a means of selecting a uniform target material for throwing object tests on shredders and chippers.

B.2 Test fixture

The test fixture shall be in accordance with figure B.1.

B.3 Fibreboard samples

The fibreboard shall be cut into squares measuring 150 mm per side.

B.4 Procedure

Immediately before and after the machine tests, five samples of the fibreboard shall be tested and the requirements of clause B.5 shall be met.

Place a fibreboard square centrally on the bottom plate. The square may be secured at the edges by tape or adhesive. Cover with the top plate and make sure that the centre holes of the top and bottom plates are aligned and that the fibreboard is flattened by the steel top plate.

Raise the penetrator to the recommended height as shown in figure B.1, and allow to fall onto the fibreboard samples.

B.5 Acceptance criteria

The spherical end of the penetrator shall not penetrate completely through the test sample more than two out of five drops when dropped 300 mm.

The spherical end of the penetrator shall penetrate completely through the test sample in at least four out of five drops when dropped 400 mm.

If the penetrator penetrates the fibreboard more than the permitted number of times when dropped 300 mm, sufficient sheets of kraft paper shall be added to the target face of the fibreboard in order to meet penetration requirements.

Dimensions in millimetres

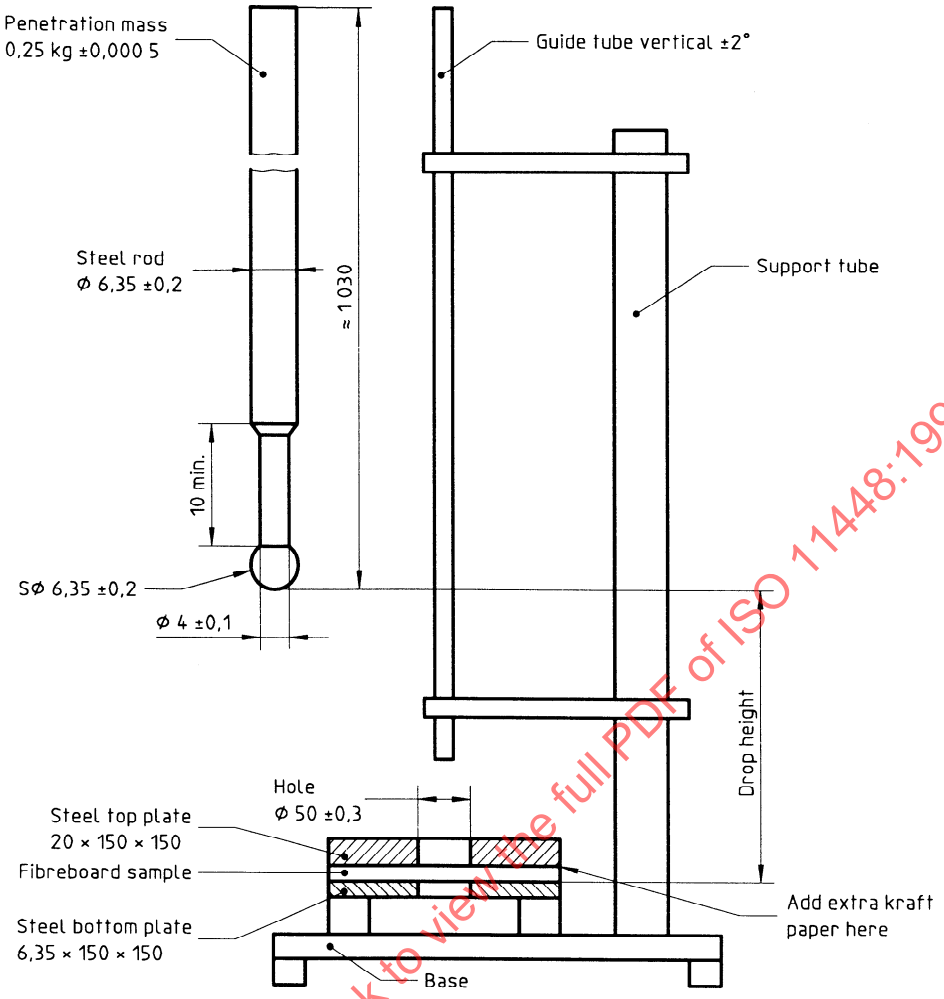

Figure B.1 — Test fixture for corrugated fibreboard penetration test

Annex C
(normative)
Safety instructions for shredders and chippers

These instructions are not all-inclusive. The substance of these requirements shall be provided with each machine as appropriate and tailored to the specific type of machine.

C.1 Training

a) Become familiar with the owner's manual before attempting to operate this equipment.

b) Do not allow children to operate this equipment.

c) Do not operate this equipment in the vicinity of bystanders.

d) Carbon monoxide can be extremely dangerous in enclosed areas; do not run the machine in an enclosed area since the exhaust from the engine contains carbon monoxide, which is colourless, odourless, and tasteless.

e) Do not allow hands or any other part of the body or clothing inside the feeding chamber, discharge chute, or near any moving part.

f) Before inspecting or servicing any part of the machine, shut off the power source, disconnect the spark plug wire from the spark plug, and make sure that all moving parts have come to a complete stop.

C.2 Preparation

a) Wear safety glasses at all times while operating the machine.

b) Avoid wearing loose-fitting clothing.

c) Operate the machine in a recommended position and only on a firm, level surface.

d) Do not operate the machine on a paved or gravel surface where ejected material could cause injury.

e) Before starting the machine, check that all screws, nuts, bolts, and other fasteners are properly secured and guards and screens in place. Replace damaged or unreadable warning and operating labels.

f) Use extra care in handling fuels. They are flammable and vapours are explosive.

   1) Use only an approved container.

   2) Never remove fuel cap or add fuel with the engine running. Allow engine to cool before refuelling.

   3) Do not smoke.

   4) Never refuel the machine indoors.

   5) Never store the machine or fuel container inside where there is an open flame, such as a water heater.

   6) If fuel is spilled, do not attempt to start the engine, but move the machine away from the area of spillage before starting.

   7) Always replace and securely tighten fuel cap after refuelling.

C.3 Operation

a) Before starting the machine, make certain that the feeding chamber is empty.

b) Keep your face and body away from the feed opening.

c) Keep proper balance and footing at all times. Do not overreach. Never stand at a higher level than the base of the machine when feeding material into it.

d) Always stand clear of the discharge area when operating this machine.

e) When feeding material into the equipment be extremely careful that pieces of metal, rocks, bottles, cans or other foreign objects are not included.

f) If the cutting mechanism strikes any foreign objects or if the machine should start making any unusual noise or vibration, immediately shut off the engine and allow the machine to stop. Disconnect the spark plug wire from the spark plug and proceed as follows:

   1) Inspect for damage.

   2) Replace or repair any damaged parts.

   3) Check for and tighten any loose parts.

   4) Do not attempt to repair the machine unless you are competent to do so.

g) Do not allow processed material to build up in the discharge area; this may prevent proper discharge and can result in kickback of material through the feed opening.

h) If the machine becomes clogged, shut off the engine (or motor) and disconnect the spark plug wire (electric unit unplug) before cleaning debris.

i) Keep all guards and deflectors in place and in good working condition.

j) Do not tamper with the engine governor settings on the machine; the governor controls the maximum safe operating speed and protects the engine and all moving parts from damage caused by overspeed. Seek authorized service if a problem exists.

k) Keep the engine clean of debris and other accumulations to prevent damage to the engine or possible fire.

l) Do not transport this machine while the engine is running.

m) Shut off the engine whenever you leave the work area.

C.4 Maintenance and storage

a) When this equipment is stopped for servicing, inspection, or storage, or to change an accessory, make sure the spark plug wire is disconnected from the spark plug. Allow the machine to cool before making any inspections, adjustments, etc. Maintain the machine with care and keep it clean.

b) Store the machine out of the each of children and where fuel vapour will not reach an open flame or spark. For extended storage periods, run the unit dry of fuel. Always allow the machine to cool before storing.

C.5 Additional safety instructions for units with bagging attachments

a) The manufacturer shall provide instructions for when and how to attach and detach the bag from the unit.

b) Shut off the unit before attaching or removing the bag.