

for Outdoor Power Equipment – Walk-Behind Powered Rotary Tillers and Hand Supported Cultivators – Safety Specifications

ANSI/OPEI B71.8-1996

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ANSI/OPEI B71.8-1996
Revision of
ANSI/OPEI B71.8-1986

American National Standard
for Outdoor Power Equipment –

Walk-Behind Powered Rotary Tillers and Hand Supported Cultivators – Safety Specifications

Sponsor

Outdoor Power Equipment Institute, Inc.

Approved March 22, 1996

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Foreword (This foreword is not part of American National Standard ANSI/OPEI B71.8-1996.)

This edition of *American National Standard for Outdoor Power Equipment – Walk-Behind Powered Rotary Tillers and Hand Supported Cultivators – Safety Specifications*, ANSI/OPEI B71.8-1996, was prepared by the Outdoor Power Equipment Institute's (OPEI) Subcommittee for Tillers as part of OPEI's continuing work on standards and was approved on March 22, 1996 by the American National Standards Institute, Inc.

The safety specifications given in this standard are for (a) walk-behind powered rotary tillers, and (b) hand supported cultivators. They are intended to provide safety requirements and to help ensure uniform operator environments. These specifications are intended to apply to products specifically intended as consumer products for personal use. These specifications are not intended to apply to commercial products customarily used by hired operators or to products designed primarily for agricultural purposes such as defined in ANSI/SAE J1116 or SAE J1150. They are not intended to cover tractor mounted or drawn tillers, electrically operated hand supported cultivators, and are not intended to completely cover electrical requirements.

Consensus for this standard was achieved by the use of the Canvass Method.

Suggestions for improvement of the standard will be welcomed. They should be sent to the Outdoor Power Equipment Institute, 341 S. Patrick Street, Alexandria, VA 22314.

The following organizations recognized as having an interest in the standardization of safety requirements for walk-behind powered rotary tillers and hand supported cultivators were contacted prior to the approval of this revision of the standard. Inclusion in the list does not necessarily imply that the organization concurred with the submittal of the proposal to ANSI.

Acoustical Society of America
American Insurance Services Group, Inc.
American Society of Agricultural Engineers
Consumer Product Safety Commission
Consumers Union
Engine Manufacturers Association
Equipment Manufacturers Institute
McCanse Engineering Services
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American National Standard for Outdoor Power Equipment – Walk-Behind Powered Rotary Tillers and Hand Supported Cultivators – Safety Specifications

1 Scope

The safety specifications given in this standard are for (a) walk-behind powered rotary tillers, and (b) hand supported cultivators. They are intended to provide safety requirements and to help ensure uniform operator environments. These specifications are intended to apply to products specifically intended as consumer products for personal use. These specifications are not intended to apply to commercial products customarily used by hired operators or to products designed primarily for agricultural purposes such as defined in ANSI/SAE J1116 or SAE J1150. They are not intended to cover tractor mounted or drawn tillers, electrically operated hand supported cultivators, and are not intended to completely cover electrical requirements.

2 Normative references

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

ANSI Z535.4-1991, *Product safety signs and labels*

ANSI/ASAE S304.5 (R1993), *Symbols for operator controls on agricultural equipment*

ANSI/ASAE S350 (R1992), *Safety-alert symbol for agricultural equipment*

ANSI/SAE J156-APR86, *Fusible links*

ANSI/SAE J553-JUN92, *Circuit breakers*

ANSI/SAE J554-AUG87, *Electric fuses (cartridge type)*

ANSI/SAE J833-MAY89, *USA human physical dimensions*

ANSI/SAE J1128-JUN88, *Low tension primary cable*

ANSI/SAE J1362-FEB94, *Graphical symbols for operator controls and displays on off-road self-propelled work machines*

ANSI/SAE J1500-JUN80, *Universal symbols for operator controls*

ANSI/SAE J2031-JAN90, *High tension ignition cable*

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ANSI/UL 82-1995, *Standard for safety for electrical gardening appliances*

ISO 3767-1:1991, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays – Part 1: Common Symbols* [1)]

ISO 3767-3:1988, *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*[1)]

3 Definitions

3.1 clutch: A device used for engaging or disengaging the load from the power source.

3.2 durable label: A label that shall meet the requirements of clause 9.

3.3 engine (motor) start: The change of engine state from not producing power to producing power.

3.4 guard or shield: A barrier that minimizes inadvertent personal contact with hazards created by moving machinery parts or hot surfaces.

3.5 hand supported cultivator: An operator-controlled (walk-behind) powered rotary cultivator (generally less than 2 HP), comprised of two handles intended to be easily hand supported by the operator. The rotating tines/tool(s) ensure propulsion away from the operator.

3.6 manual start: Utilization of operator force to cycle the engine for starting purposes.

3.7 operator hand control position: The area within which all hand controls requiring operation from the operator position shall be located.

3.8 operator position: The area occupied by the operator during normal operation of the machine as illustrated in figure 1.

3.9 operator presence control (normally off control): A control requiring continuous operation by the operator and designed so that it will automatically stop power to a drive when the operator's actuating force is removed.

3.10 right, left:* The designation that refers to the orientation of the machine or tiller when the operator is at the operator's position, facing in the forward direction of machine travel.

3.11 shall: The word "shall" is to be understood as a requirement.

3.12 should: The word "should" is to be understood as a recommendation.

3.13 starting device: A handle, lever, switch, or similar control required to actuate a starting mechanism.

3.14 tine barrier: Structural members, such as transport wheels, portions of the tiller frame, ground stake, or any combination of these members, that restrict entry of the operator into the rotating tines.

3.15 tines: That portion of the rotating member that engages and penetrates the soil.

3.15.1 counter rotating tines (CRT): Tine rotation in a direction toward normal operator position.

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* The asterisk denotes general definitions that are also applicable to other American National Standards in the B71 series.

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3.15.2 standard rotating tines (SRT): The rotation in a direction away from the normal operator position.

3.16 walk-behind powered rotary tiller: A tilling machine with a powered rotary member, with or without traction drive, that is intended to break up soil and is normally controlled by the operator walking behind or alongside the unit.

3.16.1 front tine: A walk-behind powered rotary tiller designed to be operator controlled, with support wheels whose ground traction is provided by its rotating tines.

3.16.2 rear tine: A walk-behind powered rotary tiller whose ground traction is provided by the drive wheels and whose rotating member is substantially behind the drive wheels.

4 Controls

4.1 Control identification

4.1.1 The following controls, if provided, for tine speed, tine direction, engine (motor) speed, engine (motor) shutoff, traction speed, tine engagement, and traction engagement shall be identified by a durable label as to direction of operation and function. Universal symbols, as illustrated in ANSI/SAE J1362, ANSI/ASAE S304.5, ISO 3767-1, and ISO 3767-3, may be used.

4.1.2 Labels shall be located near the control positions and be legible to the operator when the operator is in the normal position to use the controls.

4.1.3 Identification in accordance with 4.1.1 shall use legible lettering. Minimum letter height should not be less than 3 mm (0.115 inch).

4.2 Shutoff control device

A shutoff control device shall be provided to stop operation of the engine (motor). This device shall require manual and intentional activation in order to start the engine (motor). A key switch, or similar device, shall be provided to prevent unauthorized starting of the engine (motor), unless manual start is the only means of starting the engine. The shutoff control device and the key switch, or similar device, may be combined in one control.

4.3 Engine speed control

4.3.1 An engine speed control lever, if in the operator hand control position, shall move generally forward or upward, or both, to increase speed and generally rearward or downward, or both, to decrease speed.

4.3.2 An engine speed push/pull control, if in the operator hand control position, shall be pulled to increase speed and pushed to decrease speed.

4.3.3 An operator presence type speed control shall increase speed when activated and automatically decrease speed when released.

4.4 Tine/traction control

4.4.1 Operation of the tiller in any direction of travel shall require an operator presence (normally off) control(s) for traction and tines engagement located in the operator hand control position (see figure 1). In a reverse direction of travel the maximum speed shall not exceed 1 meter per second (2.2 mph).

4.4.2 A means shall be provided to disengage the tines from the power supply. It shall require intentional activation in order to start operation.

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4.5 Controls

4.5.1 Control location

Controls and starting devices should be so designed and located as to prevent hazardous conditions, such as pinching or cutting the operator during their normal operation.

4.5.2 Resistance to movement

During the normal operation of the machine, all controls specified in 4.1.1, except the operator presence (normally off) control, should remain in the position set by the operator. The motion or vibration of the tiller should not cause these controls to move from their selected position.

5 General requirements

5.1 Starting stabilization

5.1.1 Tillers

A tiller with a rope or recoil starter shall have a labeled designated area to indicate where the operator's foot or free hand shall be placed when manually starting the engine.

5.1.2 Hand supported cultivators

If equipped with a centrifugal clutch, a means shall be provided to start and operate the engine from the normal operating position.

5.2 Handle structure (fastening)

The handle shall be fastened to the walk-behind powered rotary tiller to prevent unintentional uncoupling while in operation.

5.3 Power disengagement (clutch action)

5.3.1 Tine drive

5.3.1.1 Test procedure

5.3.1.1.1 General

Except for walk-behind powered rotary tillers and hand supported cultivators with centrifugal clutches and electrically driven tillers, the walk-behind powered rotary tillers shall be tested twice; first with the engine running at the idle speed recommended by the tiller manufacturer and then with the engine running at the maximum governed speed recommended by the tiller manufacturer. The tines shall be engaged while raised off the ground. The tines shall cease to rotate when disengaged and lowered to a hard, flat, level surface.

5.3.1.1.2 Walk-behind powered rotary tillers and hand supported cultivators with centrifugal clutches

If the means to disengage the tines from the power supply, as required in 4.4.2, is a combination throttle/disengagement control (i.e., centrifugal clutch), the tines shall be raised from the ground and the control actuated to engage the tines. Upon release of the control, the tines shall cease to rotate when lowered to a hard, flat, level surface.

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5.3.1.1.3 Electrically driven tillers

These tillers shall be tested only once; with the motor running at the idle speed recommended by the tiller manufacturer. The tines shall be engaged while raised off the ground. The tines shall cease to rotate when disengaged and lowered to a hard, flat, level surface.

5.3.1.2 Test acceptance

The tines shall not rotate when disengaged.

5.3.2 Traction drive

5.3.2.1 Test procedure

With the tines and wheels disengaged, all wheels of the tillers shall be placed before a 25.4-mm (1-inch) vertical step. These tillers shall be tested twice; first with the engine running at the idle speed recommended by the tiller manufacturer and then with the engine running at the maximum governed speed recommended by the tiller manufacturer. (However, electrically driven tillers shall only be tested with the motor running at the idle speed recommended by the tiller manufacturer.) The tillers shall not traverse the 25.4-mm (1-inch) vertical step.

5.3.2.2 Test acceptance

The wheels shall not rotate when disengaged.

6 Shields or guards

6.1 Power drives

Nip and pinch points (related to exposed gears, friction drive components, belts, chains, and idlers) and outside faces of pulleys, sheaves, sprockets, and gears shall be guarded by location or otherwise guarded to prevent inadvertent contact by the operator during normal starting and operation of the machine.

A component is sufficiently guarded if it cannot be contacted with the probe shown in figure 3 when tested in accordance with 6.1.1.

These guarding requirements do not pertain to contact during maintenance activities and to the following components:

a) Tines, belts, chains, and smooth components that do not have an exposed pinch point;

b) Rotating shafts protruding less than one-half their outside diameters.

6.1.1 Test procedure

CAUTION: The following procedures should be conducted with the engine not running.

Insert the probe (figure 3) into all openings to its maximum depth, 102 mm (4.0 inches), or until a force of 4.4 N (1 lb) is attained. As the probe is inserted, rotate and position it in all possible angles within the opening, attempting to contact the part or parts under test. The finger probe shall not be inserted beyond the length of the probe, 105.2 mm (4.14 inches).

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6.1.2 Guarded by location

A hazard caused by a walk-behind powered rotary tiller shall be considered "guarded by location" if one of the following apply:

a) The hazard is covered by other parts of the machine or, because of the remote location, cannot be contacted with the finger probe shown in figure 3 when held by a 95th percentile (large) man (as described in ANSI/SAE J833) maneuvering the probe in any manner;

b) The hazard is under and within the perimeter of the chassis elements and cannot be reached with the finger probe shown in figure 3 held by a 95th percentile (large) man (as described in ANSI/SAE J833) maneuvering the probe as follows:

1) From the chassis elements, downward through openings in or between the elements;

2) Underneath the chassis elements allowing only horizontal or downward probe movement, or both. Upward probe movement is not permitted;

c) The hazard is controlled by the operator-presence (normally off) control(s) such that the inspector, when functioning in accordance with (a) and (b) above, cannot reach the hazard while simultaneously actuating the operator-presence (normally off) control(s) in its normal manner.

6.1.3 Shielding

6.1.3.1 Rear tine shielding

A protective shield shall be provided at the rear of the tiller that, when the tines are placed on a level supporting surface, will extend to a maximum of 25.4 mm (1 inch) above the level supporting surface and shall have a width of at least the overall width of the tines. Any moveable shield, when released, shall automatically return to meet the requirements shown in figure 2.

6.1.3.2 Front tine shielding

A front tine tiller shall be considered guarded by location provided that the operator position as defined in figure 1 does not contact the rotating tines. If such contact can be made, the tiller shall be shielded in accordance with 6.1.3.1, or a tine barrier shall be provided.

6.1.3.3 Hand supported shielding

Tine shielding shall be required on a hand supported cultivator as described in figure 7. The rotating tines shall be protected by a solidly fixed shield covering them rearward from the 12 o'clock position (vertical) rotated 60° about the tine shaft axis, see figure 7(a). The minimum width of the shield shall be the overall width of the tines. A crossbeam shall be placed between the handlebars, located at more than 550 mm (21.6 inch) from the tool periphery to prevent operator contact, see figure 7(b). This crossbeam is not necessary if at 550 mm (21.6 inch) from the tool the distance between the handlebars is less than 320 mm (12.6 inch), see figure 7(c).

6.2 Attachment of shields or guards

All shields and guards shall be designed to prevent their removal from the machine without the use of tools. The opening of the guards shall require the use of a tool. Exceptions to this are the opening of or removing interlocked shields and guards which disable the protected moving parts and the opening of hinged shields and guards for soil discharge.

6.3 Hot surfaces

Hot surfaces such as a muffler shall be guarded or located so that the operator will not inadvertently contact them when starting or operating the unit according to the manufacturer's recommendations.

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6.4 Engine exhaust

Exhaust gases shall not be directed toward the operator position.

7 Servicing requirements

7.1 Specific written or illustrative instructions with appropriate safety warnings shall be provided with the equipment for those servicing operations recommended by the manufacturer that must be performed with the engine running.

7.2 A manufacturer shall supply, with the equipment, instructions for safe servicing and maintenance, such as shown in figure 6. Instructions may be tailored to the specific machine design.

8 Electrical requirements

8.1 General

The specifications given in this standard are not intended to completely cover electrical requirements. Therefore, all such requirements shall be carefully chosen for each application, giving maximum consideration to safety, efficiency, and accessibility.

8.2 Line voltage circuits

All line-operated electrical components shall comply with the applicable electrical requirements contained in ANSI/UL 82.

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

8.3.1 Insulated cable

Insulated cable shall meet the requirements of ANSI/SAE J1128. The wiring shall be properly supported and located to prevent possible damage by cutting, abrasion, or heat.

8.3.2 Battery installation

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

8.3.3 Overload protection

All circuits, except starting motor and ignition circuits, shall have overload protective devices on the battery-feed side of switches, except that for two-wire, non-grounded systems the overload protection may be located in either line. (See ANSI/SAE J554, ANSI/SAE J156, and ANSI/SAE J553.)

8.3.4 Terminals and non-insulated electrical parts

Terminals and non-insulated electrical parts shall be protected against shorting during normal servicing, refueling, and lubrication.

8.4 High-tension cable

High-tension cable shall meet the requirements of ANSI/SAE J2031.

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9 Label durability requirements

9.1 General

Required labels shall be certified by the machine manufacturer to meet the following label durability requirements.

Permanent safety signs are considered to have a reasonable life if the sign has good color and legibility for a period of at least five years. Exterior durability is based on vertical exposure tests for weatherability in the extreme climate of the United States, or a 2000 h carbon-arc test in accordance with ASTM G 23, or a 2000 h xenon-arc test in accordance with ASTM G 26. Other test methods may be used providing the method ensures equal or superior sign durability.

9.2 Additional requirements

Labels shall form a durable bond with the base material surface and shall show no appreciable loss of adhesion or legibility during weathering exposure or exposure to spilled fuel or oil. When processed and applied in accordance with the label manufacturer's recommendations, labels shall be weather resistant in accordance with 9.1 and, following normal cleaning procedures, shall show no appreciable fading, discoloration, cracking, crazing, blistering, or dimensional change. Labels shall not curl at the edges.

9.3 Types considered durable

9.3.1 Embossed, indented, cast, or molded labels shall be considered sufficient to meet the requirements of 9.1.

9.3.2 Metal plates more than 0.48 mm (0.019 in) thick with embossed or etched lettering, and fastened with rivets or equivalent fastening means, shall be considered sufficient to meet the requirements of 9.1.

9.4 Silk screening

Silk screening or other types of marking, when used, shall meet the applicable requirements of 9.1 and 9.2.

10 Tests for fuel lines and fuel tanks

10.1 Fuel tank overfill test

10.1.1 Test procedure for front and rear tine tillers

With the machine at ambient temperature and parked on a level surface and resting on tip of tines or between tines, the fuel tank inlet shall be overfilled with 118 cm^3 (4 ounces) of liquid in less than 5 seconds. Do not use the depth stake, if provided to simulate other positions of the machine. The tank area shall be inspected for collection of liquids (surface wetting is acceptable).

10.1.2 Test procedure for hand supported cultivators

When filling fuel tank according to manufacturer’s recommendations at ambient temperature the fuel inlet shall be overfilled with 118 cm^3 (4 ounces) of liquid in less than 5 seconds. The tank shall be inspected for the collection of liquids (surface wetting is acceptable).

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10.1.3 Test acceptance

The machine shall have failed this test if the test liquid:

a) passes through the projected exhaust outlet area;

b) collects on the machine;

c) comes in contact with high-tension ignition cables or any noninsulated electrical connection.

10.2 Fuel line axial pull test

Fuel lines shall not pull off fittings or fail when subjected to an axial pull of 44 N (10 lb). The test shall be performed with the test liquid in the line. Short lines held in position by compression shall be excluded from this test.

11 Safety instructions for tillers and hand supported cultivators

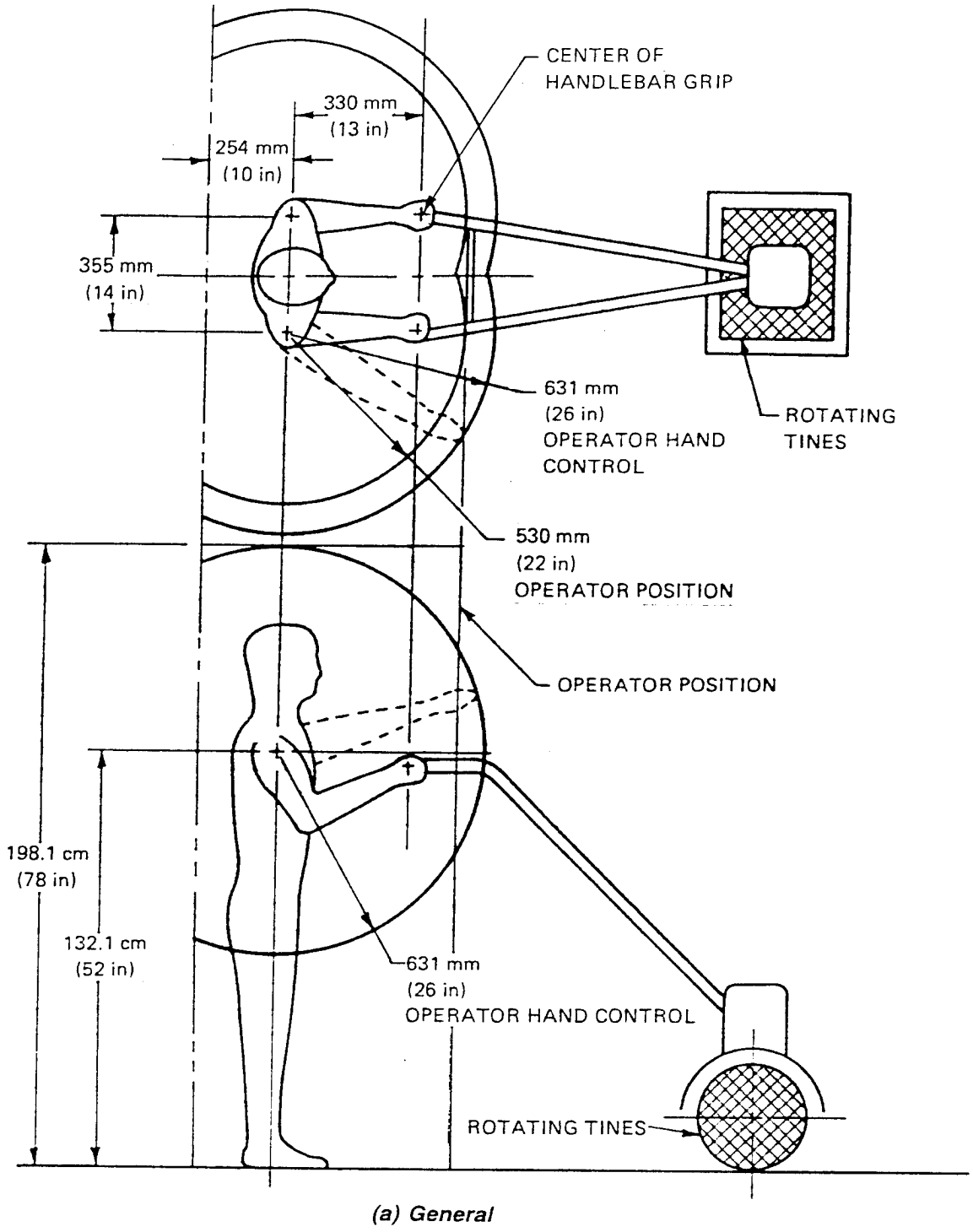
11.1 On-product labeling

A label(s), as shown in figure 4 (or similar statement of these safety practices) and figure 5, shall be provided. The durable safety sign shown in figure 5 shall be located near the tines. The safety label(s) shall conform to the format and color requirements of ANSI Z535.4. Additional statements of safety practices are allowed and the signal word shall conform to 5.3.2 of ANSI Z535.4.

11.2 Safety instructions

A manufacturer shall supply, with the equipment, instructions for operation such as those shown in figure 6. Instructions may be tailored to the specific tiller design.

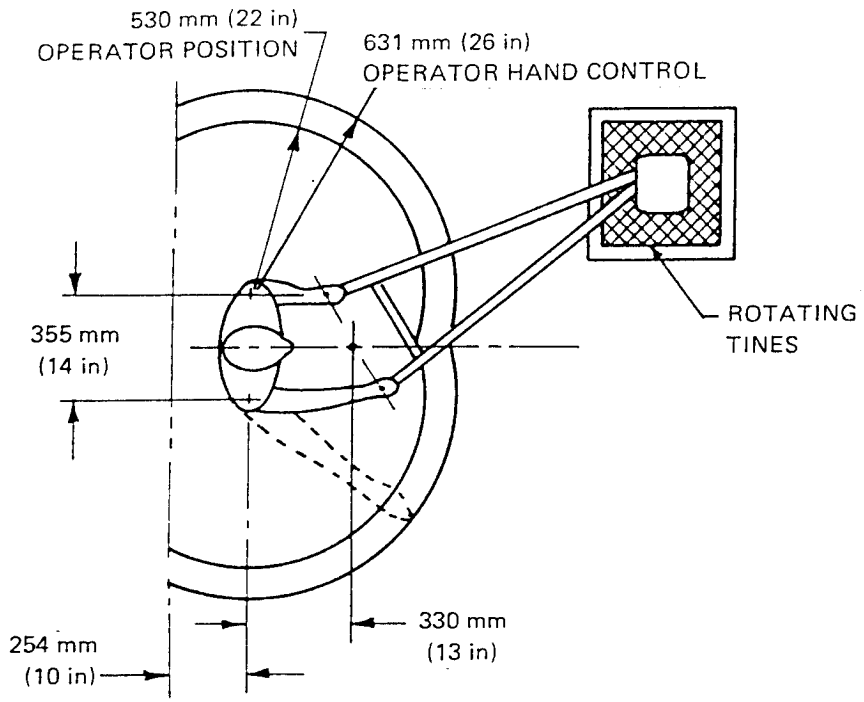
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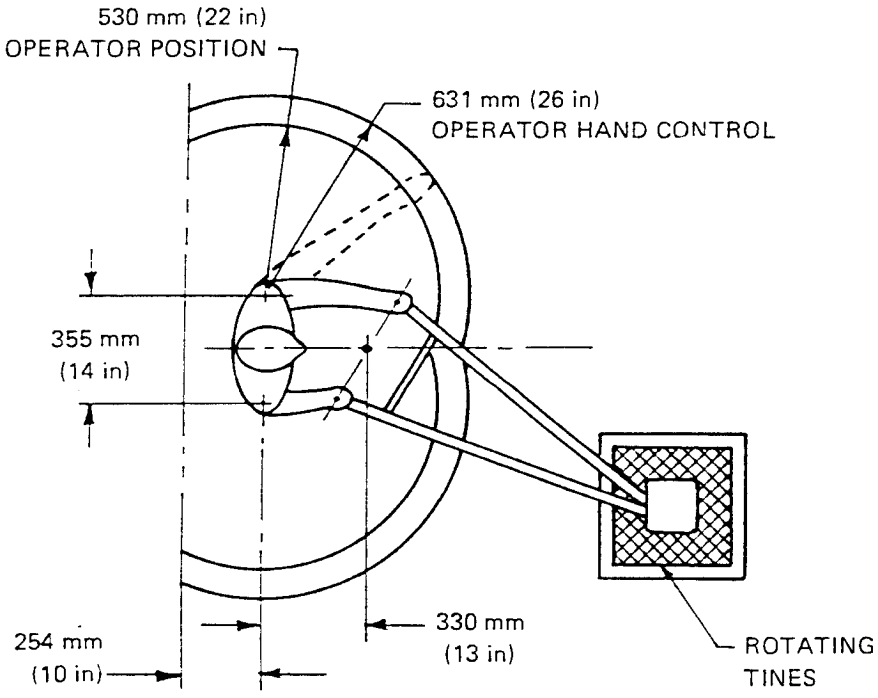
(a) General

Figure 1 – Operator position and operator hand control position *(continued)*

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(b) Right



(c) Left

Figure 1 *(coninued)*

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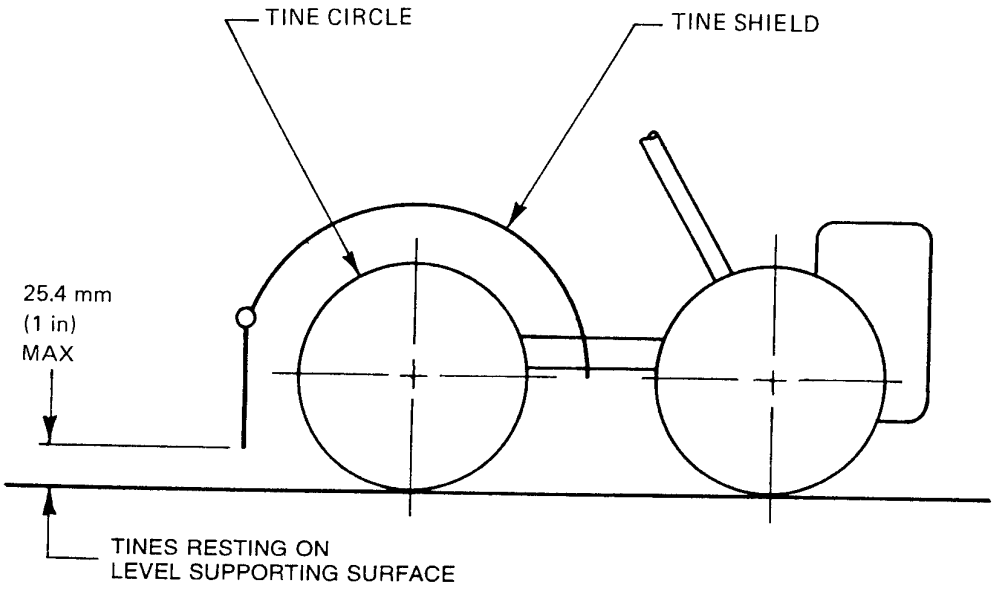


Figure 2 – Tine shielding for rear tine tillers

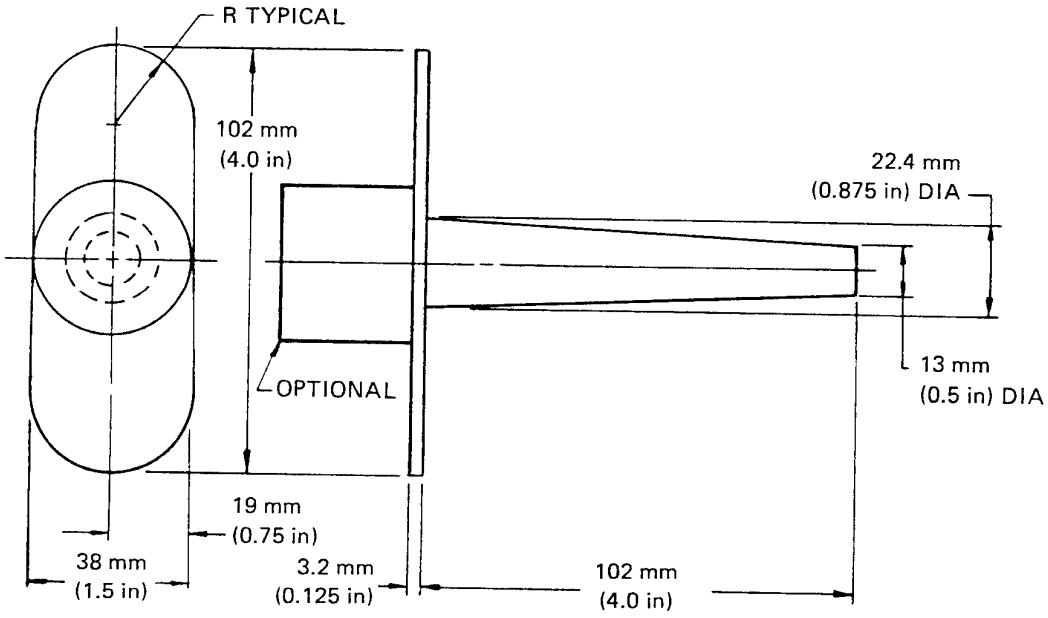
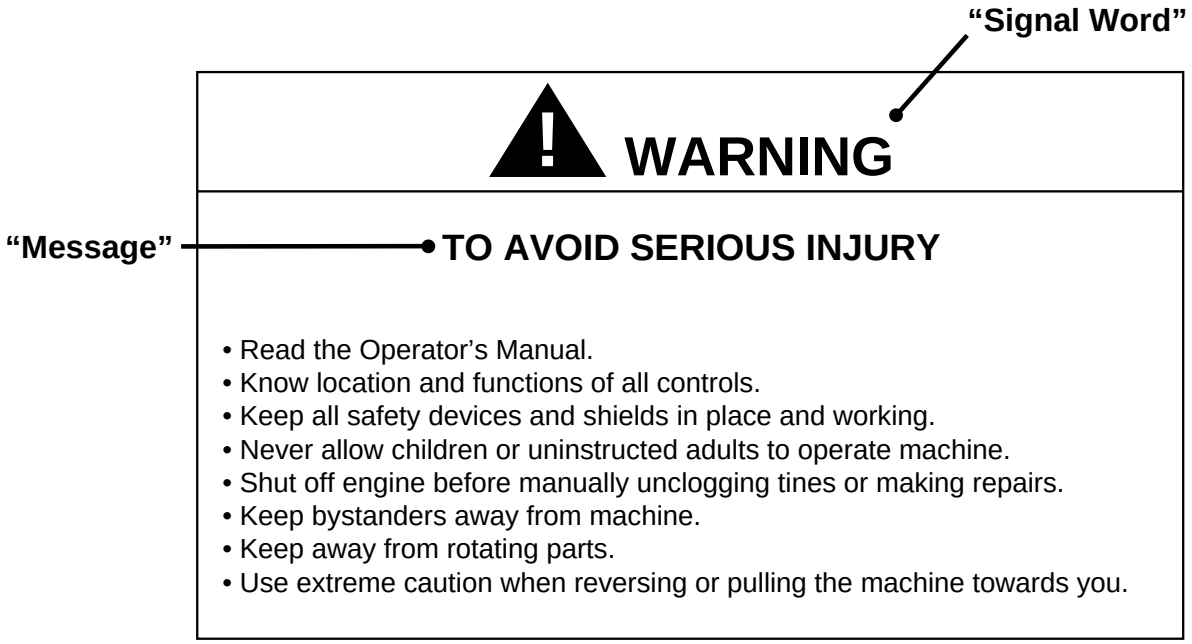


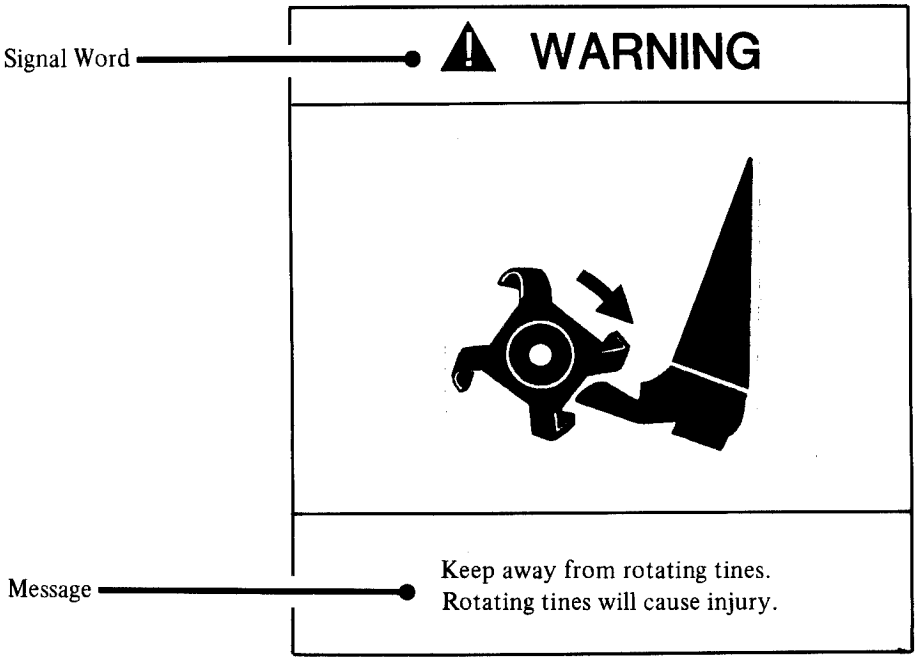
Figure 3 – Finger probe

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• All signal words are 6 mm minimum letter height.
• All message panel words are 3 mm minimum letter height.

Figure 4 – Safety message for walk-behind powered rotary tillers and hand supported cultivators



• All signal words are 6 mm minimum letter height.
• All message panel words are 3 mm minimum letter height.

Figure 5 – Safety sign

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IMPORTANT
Safe Operation Practices for Walk-Behind
Powered Rotary Tillers and Hand Supported Cultivators

Training

1. Read the operating and service instruction manual carefully. Be thoroughly familiar with the controls and the proper use of the equipment. Know how to stop the unit and disengage the controls quickly.
2. Never allow children to operate the equipment. Never allow adults to operate the equipment without proper instruction.
3. Keep the area of operation clear of all persons, particularly small children, and pets.
4. Keep in mind that the operator or user is responsible for accidents or hazards occurring to other people, their property, and themselves.

Preparation

1. Thoroughly inspect the area where the equipment is to be used and remove all foreign objects.
2. Disengage all clutches and shift into neutral before starting the engine (motor).
3. Do not operate the equipment without wearing adequate outer garments. Wear protective footwear that will improve footing on slippery surfaces.
4. Warning: Fuel is highly flammable. Take the following precautions:
   (a) Store fuel in containers specifically designed for this purpose.
   (b) Refuel outdoors only and do not smoke while refueling.
   (c) Add fuel before starting the engine. Never remove the cap of the fuel tank or add fuel while the engine is running or when the engine is hot.
   (d) If fuel is spilled, do not attempt to start the engine but move the machine away from the area of spillage and avoid creating any source of ignition until fuel vapors have dissipated.
   (e) Replace all fuel tank and container caps securely.
5. Use extension cords and receptacles as specified by the manufacturer for all units with electric drive motors or electric starting motors.
6. Never attempt to make any adjustments while the engine (motor) is running (except where specifically recommended by the manufacturer).

Operation

1. Do not put hands or feet near or under rotating parts.
2. Exercise extreme caution when operating on or crossing gravel drives, walks, or roads. Stay alert for hidden hazards or traffic. Do not carry passengers.
3. After striking a foreign object, stop the engine (motor), remove the wire from the spark plug, thoroughly inspect the machine for any damage, and repair the damage before restarting and operating the machine. Disconnect the cord on electric motors.
4. Exercise caution to avoid slipping or falling.
5. If the unit should start to vibrate abnormally, stop the engine (motor) and check immediately for the cause. Vibration is generally a warning sign of trouble.
6. Stop the engine (motor) when leaving the operating position, before unclogging the tines, and when making any repairs, adjustments, and inspections.
7. Take all possible precautions when leaving the machine unattended. Disengage the power take-off, lower the attachment, shift into neutral, stop the engine, and remove the key.
8. Before cleaning, repairing, or inspecting, shut off the engine and make certain all moving parts have stopped. Disconnect the spark plug wire, and keep the wire away from the plug to prevent accidental starting. Disconnect the cord on electric motors.
9. Do not operate the engine in a confined space where dangerous carbon monoxide fumes can collect.
10. Never operate the machine without proper guards, plates, or other safety protective devices in place.
11. Keep children and pets away.

Figure 6 – Safety instructions for walk-behind powered rotary tillers and hand supported cultivators *(continued)*

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12. Do not overload the machine capacity by attempting to till too deep at too fast a rate.
13. Never operate the machine at high transport speeds on hard or slippery surfaces.
14. Never allow bystanders near the unit.
15. Use only attachments and accessories approved by the manufacturer of the machine (such as wheel weights, counterweights, and the like.)
16. Never operate the tiller without good visibility or light.
17. Be careful when tilling in hard ground. The tines may catch in the ground and propel the tiller forward. If this occurs, let go of the handlebars and do not restrain the machine.
18. Use extreme caution when reversing or pulling the machine towards you.
19. Do not change the engine governor settings or overspeed the engine.
20. Start the engine or switch on the motor carefully according to instructions and with feet well away from the tines
21. Never pick up or carry a machine while the engine is running.
22. Do not operate the tiller while under the influence of alcohol or drugs.

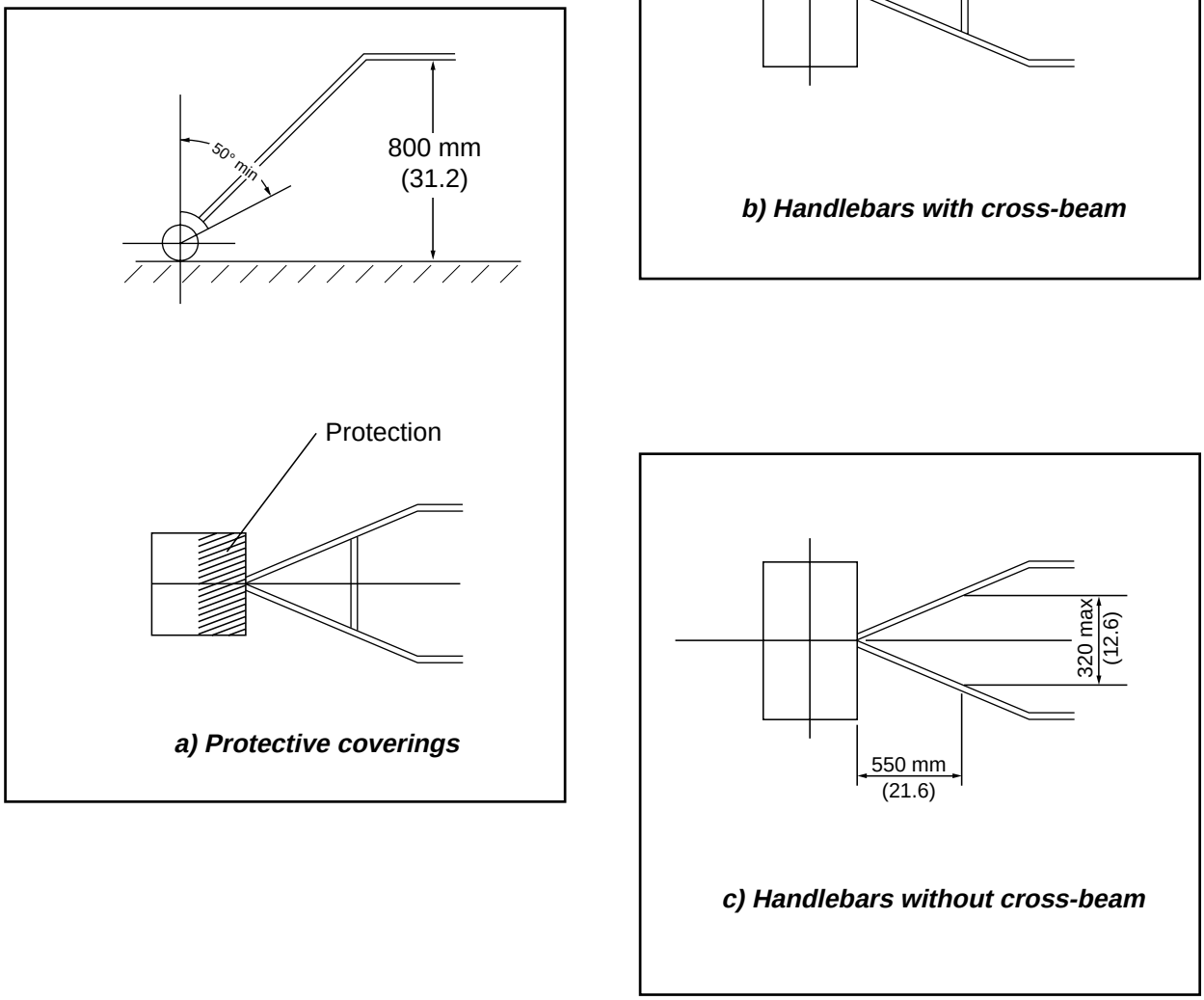
Maintenance and Storage

1. Keep machine, attachments, and accessories in safe working condition.
2. Check shear bolts, engine mounting bolts, and other bolts at frequent intervals for proper tightness to be sure the equipment is in safe working condition.
3. Never store the machine with fuel in the fuel tank inside a building where ignition sources are present, such as hot water and space heaters, clothes dryers, and the like. Allow the engine to cool before storing in any enclosure.
4. Always refer to the operator's manual for important details if the tiller is to be stored for an extended period.
5. If the fuel tank has to be drained, do this outdoors.
6. Follow manufacturer's recommendations for safe loading, unloading, transport, and storage of machine.

Figure 6 *(concluded)*

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Dimensions in millimeters
(Dimensions in inches)



b) Handlebars with cross-beam

a) Protective coverings

c) Handlebars without cross-beam

Figure 7 – Guarding of tilling means – Hand supported cultivators

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Annex A
(informative)

Rationale

This annex gives the rationale behind the various requirements of this voluntary safety standard. The numbers used in this annex correspond to those used in the body of the standard.

A.1 Scope

The purpose of the scope is to establish coverages and limitations of the standard. Hand supported cultivators have been added to the standard due to the increased consumer acceptance of this product category since 1986.

A.3 Definitions

The purpose of each definition is to establish the meaning of words or phrases to express the intent of the text.

A.3.16 (3.16.1 – 3.16.2) Walk-behind powered rotary tiller, front tine, and rear tine

The term "drive wheels" used in these definitions denotes those wheels, located at or near the balance point of the walk-behind powered rotary tillers, that are used to transport, balance, maneuver, or propel the tiller. These wheels may or may not be powered by the power source of the tiller.

A.4 Controls

A.4.1 Control identification

A.4.1.1 Those controls relating to the safe operation of the unit are required to be identified by a durable label to provide for rapid control location by the user and to maximize the probability of proper control usage.

A.4.2 Shutoff control device

This subclause provides for a user-controlled engine stop/start device, requiring manual, intentional activation to reduce the probability of inadvertent starting. The requirements of the key switch or similar device is to prevent unauthorized starting by young children.

A.4.3 Engine speed control

A.4.3.1 This subclause is intended to promote safety by setting forth a uniform operator environment and control movements with which users are generally familiar because of other commonly used consumer products. It specifies the direction of operation of the engine speed control to help provide the expected response. Forward, rearward, upward, and downward are determined with respect to the operator in the forward tilling direction.

A.4.3.2 The engine speed push/pull control is used widely in the outdoor powered equipment industry and is recognized as an acceptable means of controlling engine speed.

A.4.3.3 This subclause is intended to provide requirements for common speed control devices for hand supported cultivators with centrifugal clutches

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A.4.4 Tine/traction control

A.4.4.1 The control helps prevent operator contact with rotating tines whenever the operator leaves the operating position without having first disengaged the traction and tine drives. Additionally, should the operator lose control of the tiller while in the forward or reverse direction of travel and release the operator presence control, the tine/traction control helps prevent the tiller from running over the operator or bystander(s). Limitation of the reverse speed allows for operator reaction time.

A.4.4.2 This requirement is intended to minimize operator contact with moving tines during transport. Independent tine disengagement is preferred for heavy tillers that must be transported under power. However, any device that stops power from being transmitted to the tine is acceptable.

A.4.5 Controls

A.4.5.2 Resistance to movement

This subclause was added to ensure that controls do not randomly change position, thereby causing injury to the operator during normal starting, stopping, operating, and servicing of the unit.

A.5 General requirements

A.5.1 Starting stabilization

These requirements help to prevent inadvertent operator contact with hot surfaces and to stabilize the operator and machine during starting. Stabilization is required to prevent inadvertent contact with hot surfaces and to minimize tip-over when manually starting an engine.

A.5.2 Handle structure (fastening)

Unintentional uncoupling of the handle would prevent the operator from controlling the machine.

A.5.3 Power disengagement (clutch action)

A.5.3.1 Tine drive

A.5.3.1.1 Test procedure

A.5.3.1.1.1 General

Stopping the tines on a hard surface provides a consistent test to ensure that power is not transmitted to the tines. Centrifugal clutches are a widely recognized means of disengaging the power supply from the drive. Disengagement may require slowing the engine to idle speed to be effective. By their design, the clutches require a speed lower than the maximum governed speed at which the clutch will disengage; therefore, it becomes necessary to add an alternate test procedure (5.3.1.1.2) for this design.

A.5.3.2 Traction drive

A.5.3.2.1 Test procedure

Stopping the wheels from traversing a 25.4-mm (1-inch) vertical step provides a consistent test to ensure that power is not transmitted to the wheels.

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A.6 Shields or guards

A.6.1 Power drives

This subclause establishes the minimum requirements for sufficient guarding from hazards caused by rotating components and pinch points. The test probe is used as consistent simulation of an operator's finger or hand. The test for compliance recognizes that an operator-presence (normally off) control may control a hazard. A 95th percentile (large) man is used to ensure compliance at the extremes of human dimensions. Short smooth shafts and smooth moving surfaces are not considered hazards.

A.6.1.3.1 Rear tine shielding

The rear tine shielding is necessary to protect the operator since the tines are in close proximity to the operator position. The barrier (shield) minimizes personal contact with rotating tines.

A.6.1.3.2 Front tine shielding

If the operator position does not intersect the hazard zone, the operator is guarded by the location of the tines. If the operator can contact the hazard area from the operator position, the operator must be guarded from contacting the tines when they are rotating.

A.6.1.3.3 Hand supported shielding

Hand supported shielding and barrier is necessary to protect the operator since tines are in close proximity to the operator's position. The barrier and shield minimize personal contact with rotating tines when operating according to the manufacturer's instructions.

A.6.2 Attachment of shields or guards

This subclause is provided to minimize the possibility of operating the tiller with the guards or shields removed.

A.6.3 Hot surfaces

This subclause is provided to minimize the possibility of thermal burns when the operator is in the position indicated.

A.7 Servicing requirements

These requirements are provided to ensure that the operator can be made aware of specific servicing procedures that may be unique to the design of the machine. This subclause instructs the manufacturer to provide information in the owner's manual for safely carrying out those procedures.

A.8 Electrical requirements

A.8.2 Line voltage circuits

This subclause describes requirements to minimize the possibility of electrical shock.

A.8.3 Low-voltage battery-powered circuits (not including magneto grounding circuits)

These subclauses describe use of state-of-the-art wiring materials and procedures to minimize short circuits, which would cause arcing and subsequent ignition of combustible material. Battery compartment venting is important to minimize the chance for accumulation of hydrogen, a highly explosive gas.

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A.8.4 High-tension cable

The requirements in this subclause are needed to minimize short circuits, which could cause arcing and subsequent ignition of combustible material.

A.9 Label durability requirements

This clause describes the requirements that labeling must meet in order to provide the permanency of safety information to the operator.

A.10 Tests for fuel lines and fuel tanks

A.10.1 Fuel tank overfill test

This test is required because, while refueling a machine, the operator may inadvertently overfill the fuel tank. If this occurs, the overflow fuel should be drained away in a manner and place that will minimize overflowed fuel ignition.

A.10.2 Fuel line axial pull test

This test is intended to ensure that fuel lines are adequately retained to minimize inadvertent separation of the fuel line during normal use.

A.11 Safety instructions for tillers

Both on-product and safety messages within the owner's manual, are required. Expanded safety instructions in the owner's manual are supplied because all safety messages/instructions cannot be located on the equipment. It is not intended that the examples given be all-inclusive. The instructions provided should be tailored to the specific tiller design.

A.11.1 On-product labeling

This subclause requires the durable labeling of the tiller to provide the operator with a constant reminder of safety precautions to avoid frequently encountered hazards. Furthermore, these safety precautions are identified with an appropriate signal word (as identified by ANSI Z535.4) to ensure a consistent and appropriate hazard level designation for safety messages. The signal word WARNING was added to conform with requirements described in ANSI Z535.4. The purpose of the arrow in figure 5 is to indicate tine motion and not specific direction.

A.11.2 Safety instructions

Instructions for the safe operation of the tiller shall be supplied with the equipment to maximize the possibility that these instructions will reach the purchaser. It is not intended to be all-inclusive. The instructions provided should be tailored to the specific tiller design and the manufacturer's recommendations for its use. These instructions may vary from manufacturer to manufacturer as long as the basic hazards identified in the instructions are addressed.

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