



Underwriters Laboratories Inc.®

A not-for-profit organization dedicated to public safety
and committed to quality service

April 11, 1996

Revision pages for

Standard for

Electric Chain Saws

UL 1662, Second Edition

Attached to this transmittal notice is a revision of the Second edition of UL 1662.

A CHANGE ON A PAGE DATED APRIL 11, 1996 IS INDICATED BY A SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM, PRECEDED AND FOLLOWED BY AN ASTERISK.

THE REVISED REQUIREMENTS ARE NOW IN EFFECT.

THE FOLLOWING REVISIONS WERE ISSUED TO REPLACE TYPE W-A CORDS WITH TYPE W CORDS FOR OUTSIDE USE.

THIS REVISION ALSO CONTAINS A RE-ORGANIZATION OF PAGES 59 – 66.

Attention is directed to the note on the title page of this standard outlining the procedure to be followed to retain the approved text of ANSI/UL 1662-1995.

Revised and/or additional pages may be issued from time to time.

With the inclusion of the accompanying material, the standard consists of pages dated as shown in the following checklist:

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79 – 101, A1	October 14, 1994

7.6 User-maintenance shall consist of inspection of or replacement of motor brushes or fuses and other service that is recommended in the instruction manual to be performed by the user. It does not include maintenance that the instruction manual recommends to be done by authorized service personnel.

7.7 Compliance with the requirement in 7.5 may be accomplished by routing of wires, provision of wire channels, provision of locating wells for components, use of barriers, use of restraints, securing of components, and other means.

7.8 Routing, as mentioned in 7.7 is acceptable if the construction is such that after the wire has been put into the intended position preparatory to the reassembling of the chain saw, that the reassembly procedure will not result in the wire contacting a moving part or being pinched. This does not mean that the wire must be of such length or so clamped that it cannot reach the pinch point or the moving part.

7.9 A chain saw employing a soft rubber, neoprene, or polyvinyl chloride pressure pad to hold down or maintain permanent position of an electrical part, such as a motor, to provide proper functioning of the chain saw shall be tested in accordance with 42.1. If the pressure pad is exposed to grease, it shall also be tested in accordance with 42.2.

Exception: The test is not required if a risk of fire or electric shock does not result from deterioration of the pad as determined by an abnormal operation test in which the chain saw is operated without the pressure pad.

8 Protection Against Corrosion

8.1 Except as noted in 8.2, iron and steel parts shall be protected against corrosion by enameling, galvanizing, plating, or other equivalent means if deterioration or breakage of such parts would be likely to result in a risk of fire, electric shock, or injury to persons.

8.2 If the oxidation of iron or steel due to the exposure of the metal to air and moisture is not likely to be appreciable — thickness of metal and temperature also being factors — the surfaces of sheet steel and cast-iron parts in an enclosure may not be required to be protected against corrosion. The requirement in 8.1 does not apply to bearings, laminations, and minor parts of iron or steel, such as washers, screws, and the like.

9 Power-Supply Cords

9.1 Cords and plugs

9.1.1 A chain saw shall be provided with a motor-attachment plug or a permanently attached flexible cord not more than 18 inches (457 mm) in length and shall comply with one of the following:

- a) The manufacturer shall make an acceptable outdoor-use extension cord available and shall include a statement, marked on the tool, indicating the availability of such an extension cord, or include a statement indicating the availability of such an extension cord in the instruction manual or the like regularly furnished with the tool; or
- b) The manufacturer shall furnish an acceptable detachable cord set, 6 ft (1.8 m) or more in length, with the tool.

9.1.2 The permanently attached flexible cord mentioned in 9.1.1 shall be of such a length that it cannot be damaged or impaired by any cutting edges or rotating parts.

9.1.3 A three-to-two-wire grounding-type adapter shall not be provided with a chain saw unless an acceptable 3-wire grounding-type extension cord set is also provided.

9.1.4 A permanently attached flexible power-supply cord or a detached cord set provided with a chain saw shall be the outdoor use type, either hard-service (such as Type SJ) or extra-hard-service cord (such as Type S), identified by W-A suffix type designation on the cord.

Exception: The suffix type W is an acceptable alternative designation for W-A.

9.1.4 revised April 11, 1996

9.1.5 The flexible cord shall be rated for use at a voltage not less than the rated voltage of the tool, and shall have an ampacity, as given in the National Electrical Code, ANSI/NFPA 70-1993, not less than the current rating of the chain saw.

9.1.5 revised October 14, 1994

9.1.6 The attachment plug shall be acceptable for use with a current not less than the rated current, and at the rated voltage of the chain saw.

9.1.7 A chain saw intended for use with a detachable power-supply cord shall not be provided with terminal pins that will accommodate a standard flatiron or appliance plug.

9.1.8 If a chain saw incorporates a disconnecting means, such as a cord connector in the power-supply cord, the arrangement shall be such that no live parts will be exposed under any normal conditions.

9.1.9 An attachment plug on the supply cord of an appliance shall be constructed so that, when inserted in the connector of an extension cord, the blades will not be energized until they are inaccessible to contact by persons. See Attachment Plug Test, Section 49A.

Added 9.1.9 effective April 1, 1997

9.2 Strain relief

9.2.1 Strain relief shall be provided to prevent a mechanical stress on a flexible cord from being transmitted to terminals, splices, or internal wiring. See Section 40, Strain Relief Test.

9.2.2 Means shall be provided to prevent the flexible cord from being pushed into the chain saw through the cord-entry hole if such displacement may expose the cord to mechanical damage or to a temperature higher than that for which the cord is rated, or is likely to reduce spacings, such as to a metal strain-relief clamp, below the minimum acceptable values.

9.2.3 If a knot in a flexible cord serves as strain relief, the surface against which the knot may bear or with which it may come in contact shall be free from projections, sharp edges, burrs, fins, and the like, that may cause abrasion of the cord jacket or the insulation on the conductors.

9.2.4 The strain relief provided on the power-supply cord shall be independent of any rubber cord guard unless the guard is molded on the cord or has been determined to be acceptable for the particular application.

9.3 Bushings

9.3.1 At a point at which a flexible cord passes through an opening in a wall, barrier, or enclosing case, there shall be a bushing or the equivalent that shall be acceptably constructed and secured in place, and shall have a smooth, round surface on which the cord may bear.

9.3.2 If the cord-entry hole is in porcelain, phenolic composition, or other equivalent insulating material, a smooth, round surface is considered to be equivalent to a bushing.

58.10 The instruction manual for a chain saw shall include the following:

- a) Basic instructions for starting and stopping the chain saw safely;
- b) Instructions for properly installing and adjusting the guide bar and saw chain;
- c) Instructions for use of hearing protection;

Exception: Instructions regarding hearing protection are not required if the sound levels have been investigated and found to be below 90 dBA at the operator's ear.

d) Instructions for use of an extension cord, including:

- 1) A statement indicating that the extension cord is to be a type acceptable for outdoor use, marked with the suffix W-A following the cord type designation, for example – SJTW-A;

Exception: The suffix type W is an acceptable alternative designation for W-A.

- 2) The proper size extension cord to be used with the tool – that is wire size for various lengths of cord;
- 3) A statement that instructs the user to use an extension cord heavy enough to carry the current the tool will draw, and that an undersized cord will cause a drop in line voltage resulting in loss of power and overheating;
- 4) A statement that the user should make sure the extension cord is in good condition before using; and
- 5) A statement to keep the cord away from the cutting area and to position cord so that it will not be caught on branches, and the like, during cutting.

e) The instruction manual shall also include basic chain saw nomenclature as explained in (1) – (26) and illustrated in Figures 58.1 and 58.2. Equivalent wordings may be used whenever appropriate, and terms may be omitted when not applicable to the involved chain saw.

- 1) Bar Tip Guard – An attachment that may be provided on the end of the guide bar to prevent the chain at the end of the guide bar from contacting the wood.
- 2) Bucking – The process of cross cutting a felled tree or log into lengths.
- 3) Chain Brake – A device used to stop the chain saw.
- 4) Chain Saw Powerhead – A chain saw without the saw chain and guide bar.
- 5) Clutch – A mechanism for connecting and disconnecting a driven member to and from a rotating source of power.
- 6) Drive Sprocket or Sprocket – The toothed part that drives the saw chain.
- 7) Felling – The process of cutting down a tree.
- 8) Felling Back Cut – The final cut in a tree felling operation made on the opposite side of the tree from the notching undercut.

- 9) **Front Handle** – The support handle located at or toward the front of the chain saw.
- 10) **Front Handle Guard** – A structural barrier between the front handle of a chain saw and the guide bar, typically located close to the hand position on the front handle and sometimes employed as an activating lever for a chain brake.
- 11) **Guide Bar** – A solid railed structure that supports and guides the saw chain.
- 12) **Kickback** – The backward or upward motion, or both of the guide bar occurring when the saw chain near the nose of the top area of the guide bar contacts any object such as a log or branch, or when the wood closes in and pinches the saw chain in the cut.
- 13) **Kickback, Pinch** – The rapid pushback of the saw which can occur when the wood closes in and pinches the moving saw chain in the cut along the top of the guide bar.
- 14) **Kickback, Rotational** – The rapid upward and backward motion of the saw which can occur when the moving saw chain near the upper portion of the tip of the guide bar contacts an object, such as a log or branch.
- 15) **Low-Kickback Chain** – A chain that complies with the kickback performance requirements of ANSI B175.1-1991 when tested on a representative sample of chain saws.
- 16) **Normal Cutting Position** – Those positions assumed in performing the bucking and felling cuts.
- 17) **Notching Undercut** – A notch cut in a tree that directs the tree's fall.
- 18) **Oiler Control** – A system for oiling the guide bar and saw chain.
- 19) **Rear Handle** – The support handle located at or toward the rear of the saw.
- 20) **Reduced Kickback Guide Bar** – A guide bar which has been demonstrated to reduce kickback significantly.
- 21) **Replacement Saw Chain** – A chain that complies with the kickback performance requirements of ANSI B175.1-1991 when tested with specific chain saws. It may not meet the ANSI performance requirements when used with other saws.
- 22) **Saw Chain** – A loop of chain having cutting teeth, that cut the wood, and that is driven by the motor and is supported by the guide bar.
- 23) **Spiked Bumper (Spike)** – The pointed tooth or teeth for use when felling or bucking to pivot the saw and maintain position while sawing.
- 24) **Switch** – A device that when operated will complete or interrupt an electrical power circuit to the motor of the chain saw.
- 25) **Switch Linkage** – The mechanism that transmits motion from a trigger to the switch.
- 26) **Switch Lockout** – A movable stop that prevents the unintentional operation of the switch until manually actuated.

f) Instructions to explain the proper techniques for making the basic felling, limbing, and bucking cuts with the chain saw as explained in (1) – (7) and illustrated in Figures 58.3 – 58.9. Equivalent wordings may be used whenever appropriate.

- 1) **Holding the Chain Saw** – Always grip each handle with the thumb and fingers encircling the handle as illustrated in Figure _____ (for example see Figure 58.2). If a manual oiler control is provided additional or modified instructions regarding its use shall be provided.
- 2) **Using the Chain Saw** – Always be sure of your footing and hold the chain saw firmly with both hands while the motor is running.
- 3) **Felling a Tree** – When bucking and felling operations are being performed by two or more persons, at the same time, the felling operation should be separated from the bucking operation by a distance of at least twice the height of the tree being felled. Trees should not be felled in a manner that would endanger any person, strike any utility line or cause any property damage. If the tree does make contact with any utility line, the utility company should be notified immediately.

The chain saw operator should keep on the uphill side of the terrain as the tree is likely to roll or slide downhill after it is felled.

A retreat path should be planned and cleared as necessary before cuts are started. The retreat path should extend back and diagonally to the rear of the expected line of fall as illustrated in Figure _____ (for example see Figure 58.3).

Before felling is started, consider the natural lean of the tree, the location of larger branches and the wind direction to judge which way the tree will fall.

Remove dirt, stones, loose bark, nails, staples, and wire from the tree where felling cuts are to be made.

- 4) **Notching Undercut** – Make the notch $\frac{1}{3}$ the diameter of the tree, perpendicular to the direction of fall as illustrated in Figure _____ (for example see Figure 58.4). Make the lower horizontal notching cut first. This will help to avoid pinching of either the saw chain or the guide bar when the second notch is being made.

- 5) **Felling Back Cut** – Make the felling back cut at least 2 inches (50.8 mm) higher than the horizontal notching cut as illustrated in Figure _____ (for example see Figure 58.4). Keep the felling back cut parallel to the horizontal notching cut. Make the felling back cut so enough wood is left to act as a hinge. The hinge wood keeps the tree from twisting and falling in the wrong direction. Do not cut through the hinge.

As the felling cut gets close to the hinge the tree should begin to fall. If there is any chance that the tree may not fall in the desired direction or it may rock back and bind the saw chain, stop cutting before the felling back cut is complete and use wedges of wood, plastic or aluminum to open the cut and drop the tree along the desired line of fall.

When the tree begins to fall remove the chain saw from the cut, stop the motor, put the chain saw down, then use the retreat path planned. Be alert for overhead limbs falling and watch your footing.

6) Limbing a Tree – Limbing is removing the branches from a fallen tree. When limbing, leave larger lower limbs to support the log off the ground. Remove the small limbs in one cut as illustrated in Figure _____ (for example see Figure 58.5). Branches under tension should be cut from the bottom up to avoid binding the chain saw.

7) Bucking a Log – Bucking is cutting a log into lengths. It is important to make sure your footing is firm and your weight is evenly distributed on both feet. When possible, the log should be raised and supported by the use of limbs, logs or chocks. Follow the simple directions for easy cutting.

When the log is supported along its entire length as illustrated in Figure _____ (for example see Figure 58.6), it is cut from the top (overbuck).

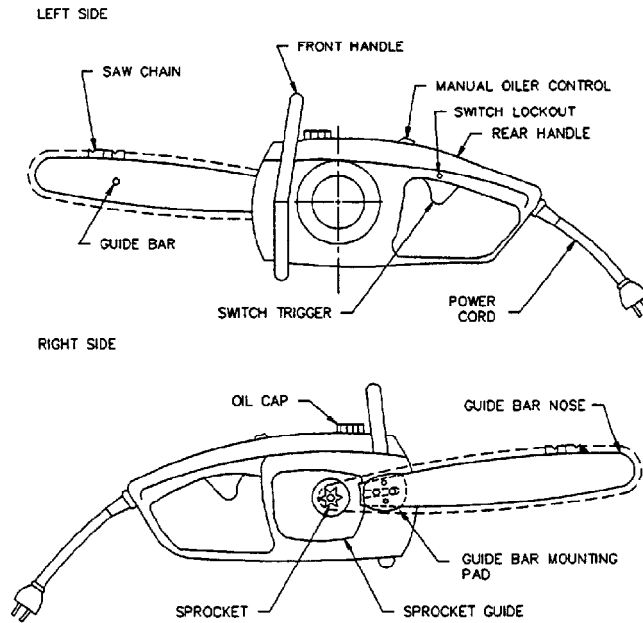
When the log is supported on one end, as illustrated in Figure _____ (for example see Figure 58.7), cut 1/3 the diameter from the underside (underbuck). Then make the finished cut by overbucking to meet the first cut.

When the log is supported on both ends, as illustrated in Figure _____ (for example see Figure 58.8), cut 1/3 of that diameter from the top overbuck. Then make the finished cut by underbucking the lower 2/3 to meet the first cut.

When bucking on a slope always stand on the uphill side of the log, as illustrated in Figure _____ (for example see Figure 58.9). When "cutting through", to maintain complete control release the cutting pressure near the end of the cut without relaxing your grip on the chain saw handles. Don't let the chain contact the ground. After completing the cut, wait for the saw chain to stop before you move the chain saw. Always stop the motor before moving from tree to tree.

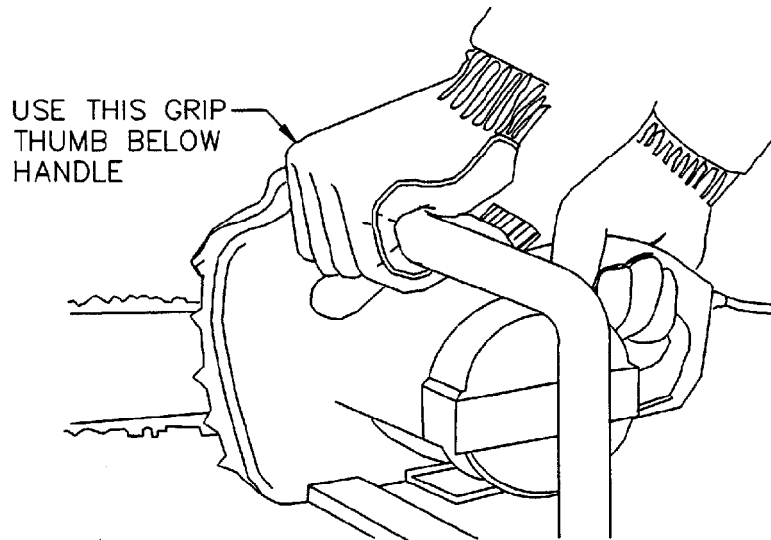
58.10(d)(1) revised April 11, 1996

Figure 58.1
Chain saw nomenclature



SB1920

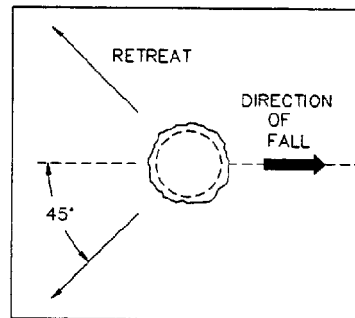
Figure 58.2
Holding the chain saw



SA1921

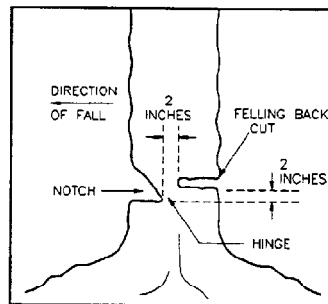
Figure 58.2 revised April 1, 1996

Figure 58.3
Retreat path



SA1930

Figure 58.4
Notching undercut



SA1929

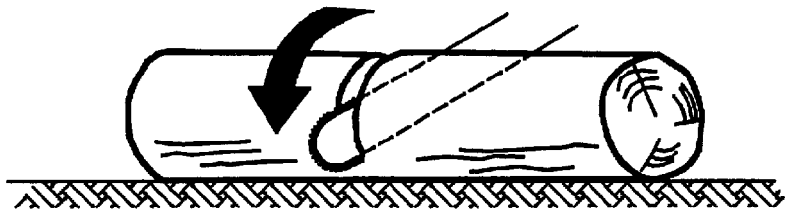
Figure 58.5
Tree limbing



SA1931

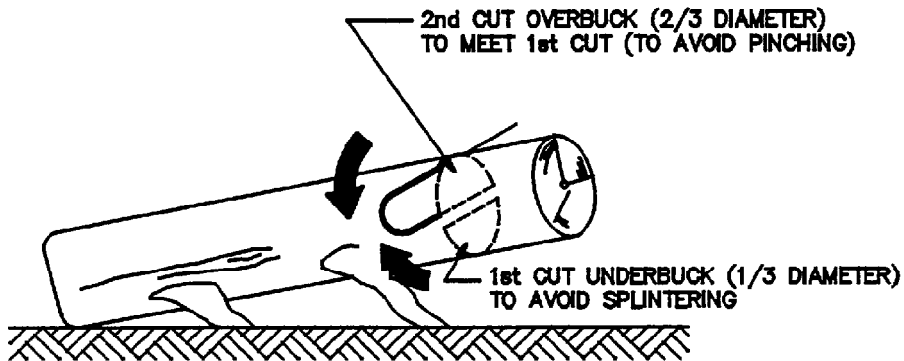
Figure 58.6
Log supported along the entire length

CUT FROM TOP (OVERBUCK)
AVOID CUTTING EARTH



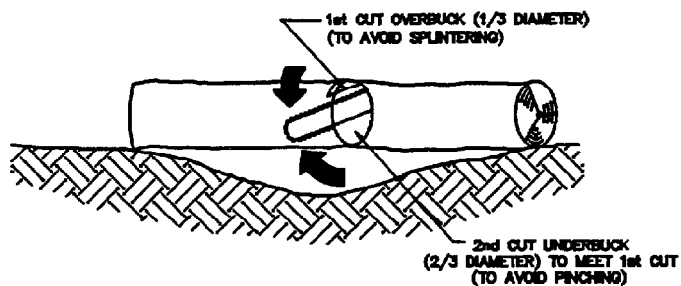
SA1932

Figure 58.7
Log supported one end



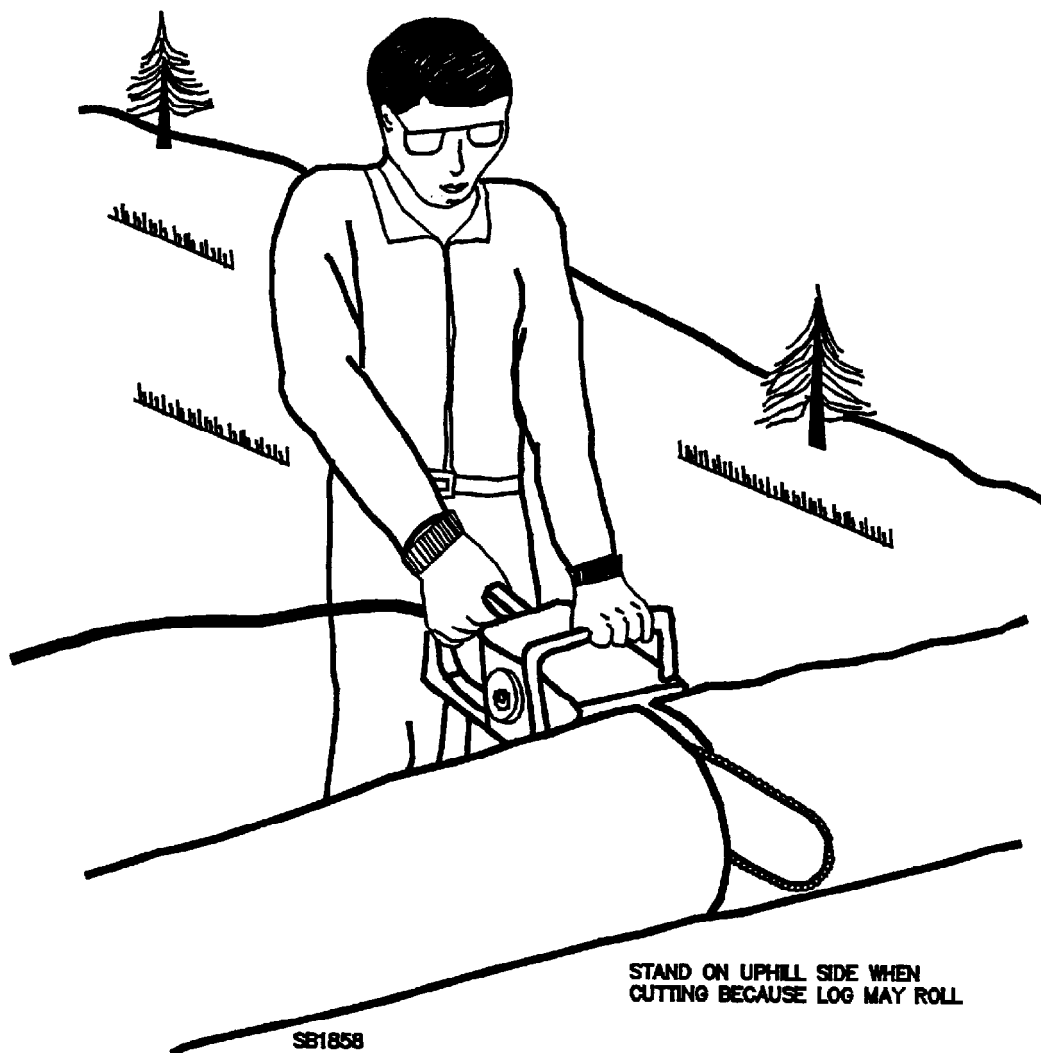
SA1933

Figure 58.8
Bucking a log



SA1934

Figure 58.9
Bucking a log



59 Important Safety Instructions

59.1 The important safety instructions shall include the following phrases. The phrases "Read All Instructions" and "SAVE THESE INSTRUCTIONS" shall appear and shall be the first and last item respectively. The phrase "Read All Instructions" shall be preceded by the statement: "WARNING: When using an electric chain saw, basic safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to persons, including the following:". Equivalent wordings in equally definitive terminology may be used, except for the signal word which is to remain "WARNING."



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April 1, 1996

Revision pages for

Standard for

Electric Chain Saws

UL 1662, Second Edition

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A CHANGE ON A PAGE DATED APRIL 1, 1996 IS INDICATED BY A SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM, PRECEDED AND FOLLOWED BY AN ASTERISK.

THESE NEW AND REVISED REQUIREMENTS ARE NOW IN EFFECT EXCEPT FOR PARAGRAPHS 6.5, 6.6, 6.7, 9.1.9, 11.2, 19.6, 23.5, 32.3, 46.2.1, 64.5.1, 59.2, SECTIONS 6A AND 49A, AND FIGURE 6.1, WHICH BECOME EFFECTIVE APRIL 1, 1997 AS INDICATED IN THE SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM. TO RETAIN THE REQUIREMENTS IN EFFECT UNTIL APRIL 1, 1997, DO NOT DISCARD THE PREVIOUS PAGES CONTAINING THE REQUIREMENTS SPECIFIED ABOVE UNTIL THIS FUTURE EFFECTIVE DATE.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this standard unless the applicant specifically requests that the product be judged under the current requirements. However, should the applicant elect this option, it should be noted that compliance with all the requirements in this standard will be required as a condition of continued Listing and Follow-Up Services after the effective date and understanding of this should be signified in writing.

The new and revised requirements are substantially in accordance with UL's bulletin on this subject dated October 30, 1995. The bulletin is now obsolete and may be discarded.

Attention is directed to the note on the title page of this standard outlining the procedure to be followed to retain the approved text of ANSI/UL 1662-1995.

Revised and/or additional pages may be issued from time to time.

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UL 1662
Standard for
Electric Chain Saws

First Edition – August, 1986

Second Edition

October 14, 1994

Approval as an American National Standard (ANSI) covers the numbered paragraphs on pages dated October 14, 1994. These pages should not be discarded when revised or additional pages are issued if it is desired to retain the ANSI approved text.

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc.

Approved as ANSI/UL 1662-1989, October 5, 1989
Approved as ANSI/UL 1662-1995, November 15, 1995

Revisions of this standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest published set of revision pages.

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FOREWORD

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

PART 1 – ALL CHAIN SAWS

INTRODUCTION

1 Scope

1.1 These requirements cover electric chain saws rated not more than 250 V, for use in accordance with the National Electrical Code, NFPA 70.

1.2 In addition these requirements cover accessories and attachments for use with electric chain saws. Specific requirements are outlined in Sections 82 – 90.

1.3 These requirements cover double-insulated chain saws. Specific requirements are given in Sections 60 – 81.

1.4 These requirements cover accessories and attachments that are:

- a) Recommended by the manufacturer;
- b) Identified by catalog number (or equivalent product designation) in the instruction manual for a chain saw; or
- c) Packed with a chain saw.

1.4 revised April 1, 1996

1.5 These requirements do not cover accessories or attachments that:

- a) Are not provided with the chain saw; and
- b) Are not identified in the required instruction manual by catalog numbers or equivalent product designation – such as those mentioned in mini-catalogs or fliers that may or may not be provided with the chain saw.

1.6 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this Standard, and that involve a risk of fire, electric shock, or injury to persons shall be evaluated using the appropriate additional component and end-product requirements as determined necessary to maintain the acceptable level of safety as originally anticipated by the intent of this Standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this Standard cannot be judged to comply with this Standard. Where considered appropriate, revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this Standard.

2 Glossary

2.1 For the purpose of these requirements, the following definitions apply.

2.2 **ACCESSORY** – A device such as a sprocket that is attached only to the spindle of the unit.

2.3 **ATTACHMENT** – A device attached to the housing or other component of the chain saw and may or may not be attached to the spindle. Attachments include replacement guards, guide bars, and saw chains.

2.4 LOW-KICKBACK SAW CHAIN – A chain intended for use on any saw for which it is sized to fit and that complies with the computed kickback angle requirements in Section 30, Kickback, when tested on representative samples, as described in the Safety Requirements for Gasoline Powered Chain Saws, ANSI B175.1 – 1991.

2.5 REPLACEMENT SAW CHAIN – A chain that, when used for field replacement on those specific listed chain saws identified on the chain reel or package marking, will provide protection against rotary kickback for the saw and chain combination conforming to the requirements for kickback in 30.3.

3 Components

3.1 Except as indicated in 3.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

3.2 A component need not comply with a specific requirement that:

- a) Involves a feature or characteristic not needed in the application of the component in the product covered by this standard; or
- a) Is superseded by a requirement in this standard.

3.3 A component shall be used in accordance with its recognized rating established for the intended conditions of use.

3.4 Specific components are recognized as being incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be restricted to use only under those specific conditions for which they have been recognized.

4 Units of Measurement

4.1 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

CONSTRUCTION

5 General

5.1 A chain saw shall employ materials throughout that are acceptable for the particular use.

6 Frame and Enclosure

6.1 A chain saw shall be so formed and assembled that it will have the strength and rigidity necessary to resist the abuses to which it is likely to be subjected, without increasing the risk of fire, electric shock, or injury to persons due to total or partial collapse with resulting reduction of spacings, loosening or displacement of parts, or other serious defects.

6.2 The minimum thickness of cast metal shall be in accordance with Table 6.1.

Table 6.1
Minimum thickness of cast metal

Metal	At surfaces that are reinforced by curving, ribbing, or the like (or are otherwise of a shape and/or size) to provide acceptable physical strength, Inch (mm)	At unreinforced flat surfaces, Inch (mm)
Die-cast metal	3/64 (1.2)	5/64 (2.0)
Cast malleable iron	1/16 (1.6)	3/32 (2.4)
Other cast metal	3/32 (2.4)	1/8 (3.2)

6.3 An enclosure of sheet metal shall be considered with respect to its size, shape, thickness of metal, and its acceptability for the particular application, including the intended use of the complete chain saw.

6.4 Among the factors taken into consideration when determining the acceptability of a nonmetallic enclosure or an enclosure of magnesium are each of the following:

- a) Mechanical strength;
- b) Resistance to impact;
- c) Moisture-absorptive properties;
- d) Combustibility;
- e) Resistance to distortion at temperatures to which the material may be subjected under conditions of intended use and reasonably foreseeable abuse; and
- f) Resistance to arcing.

6.5 **Deleted effective April 1, 1997**

6.6 **Deleted effective April 1, 1997**

6.7 During examination of a chain saw a part of the outer enclosure that is intended to be removed without the use of tools by the user of the chain saw (for the attachment of accessories, access to means for making operating adjustments, or other reasons) is to be disregarded – that is, such a part is not considered to reduce the risk of electric shock.

Revised 6.7 effective April 1, 1997

6.8 The enclosure of a chain saw shall exclude foreign matter (abrasive or electrically conductive particles and the like) likely to be present during operation that might adversely affect electrical insulation or otherwise result in a risk of electric shock, fire, or injury to persons.

Figure 6.1
Probe

Figure 6.1 deleted effective April 1, 1997

6A Accessibility Of Live Parts

6A.1 Electrical parts of a chain saw shall be located or enclosed to reduce the likelihood of unintentional contact with uninsulated live parts. Insulated brush caps do not require additional enclosure.

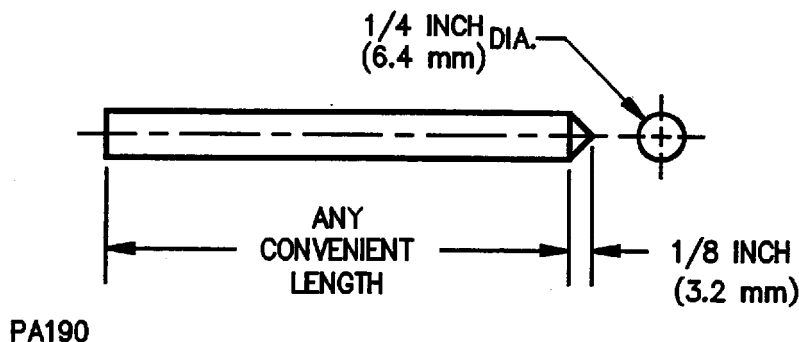
Added 6A.1 effective April 1, 1997

6A.2 An opening anywhere in the enclosure of a hand-supported appliance, or in the handle portion, (the area likely to be handled in guiding during normal operation) of an appliance that normally rests on the ground and is guided by the handle, is acceptable if the probe of Figure 6A.1, when inserted as far as possible into the opening:

- a) Does not enter the opening for a distance of more than 1/8 inch (3.2 mm); and
- b) Does not touch any uninsulated live part or film-coated wire.

Added 6A.2 effective April 1, 1997

Figure 6A.1
Probe for hand-supported enclosure



PA190

Added Figure 6A.1 effective April 1, 1997

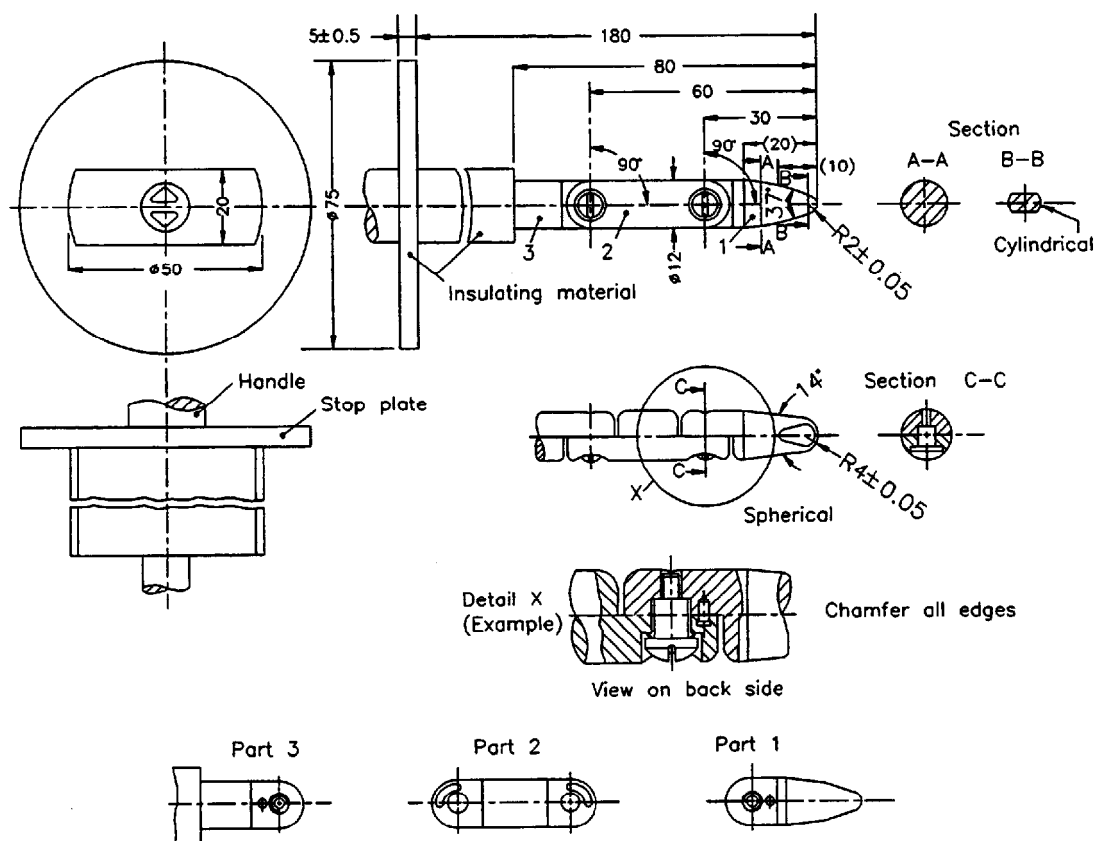
6A.3 With reference to the requirement in 6A.1 and except as indicated in 6A.2:

- a) An opening that will not permit entrance of a 3/4 inch (19.1 mm) diameter rod is capable of being used when:
 - 1) A probe as illustrated in Figure 6A.2 cannot be made to touch any uninsulated live part or any film-coated wire when inserted through the opening in any possible direction using no appreciable force; and

- 2) A probe as illustrated in Figure 6A.3 cannot be made to touch any uninsulated live part when inserted through the opening in any possible direction using no appreciable force.
- b) An opening that will permit entrance of a 3/4 inch diameter rod is capable of being used under the conditions described in 6A.4 and illustrated in Figure 6A.4.

Added 6A.3 effective April 1, 1997

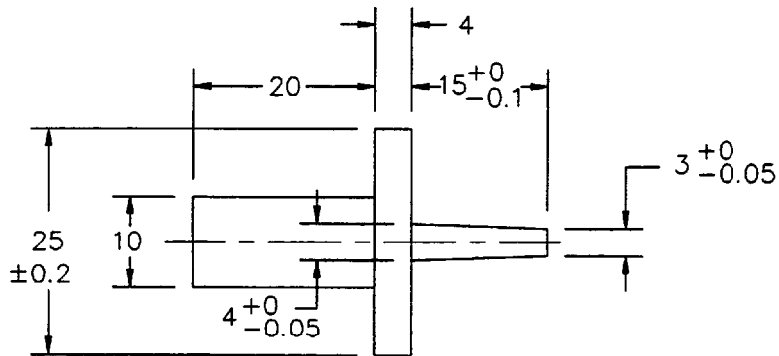
Figure 6A.2
IEC articulate probe



S3404

Added Figure 6A.2 effective April 1, 1997

Figure 6A.3
IEC test pin



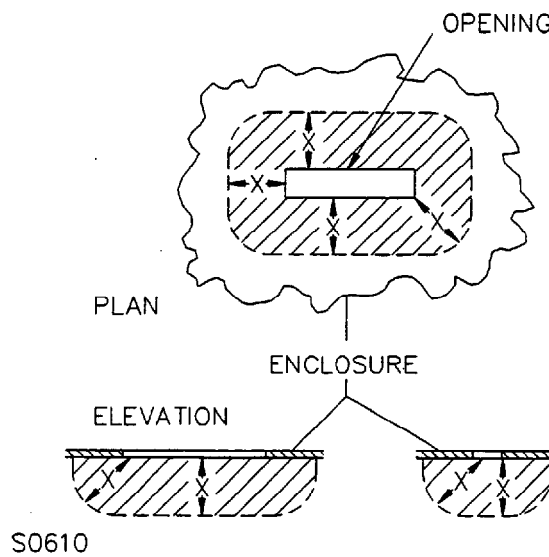
S2962

Dimensions in millimeters

Added Figure 6A.3 effective April 1, 1997

Figure 6A.4
Opening in enclosure

Proportions exaggerated for clarity



Added Figure 6A.4 effective April 1, 1997

6A.4 The opening illustrated in Figure 6A.4 is capable of being used when, within the enclosure, there is no uninsulated live part or film-coated wire:

- a) Less than X distance from the perimeter of the opening; and
- b) Within the volume generated by projecting the perimeter distance X normal to its plane.

X equals five times the diameter of the largest round rod that can be inserted through the opening, and not less than 4 inches (102 mm). In evaluating an opening, any barrier located within the volume is to be ignored unless it intersects the boundaries of the volume in a continuous, closed line.

Added 6A.4 effective April 1, 1997

6A.5 During the examination of an appliance to determine compliance with the requirements in 6A.1, a part of the outer enclosure that is capable of being removed without the use of a tool by the user of the appliance, to permit the attachment of accessories, to allow access to means for making operating adjustments, or for another reason, is to be disregarded – that is, it will not be assumed that the part in question reduces the risk of electric shock.

Added 6A.5 effective April 1, 1997

6A.6 A latch or fastener that is intended to be opened by use of a coin or the like is determined to be capable of being opened without the use of a tool.

Added 6A.6 effective April 1, 1997

7 Mechanical Assembly

7.1 A chain saw shall be so assembled that it will not be adversely affected by the vibration of intended operation.

7.2 A brush cap shall be tightly threaded or otherwise so constructed such that it does not loosen.

7.3 A switch, a motor attachment plug, and a plug connector shall be mounted securely and shall be prevented, by means other than friction between surfaces, from turning or shifting to the extent of:

- a) Reducing spacings below the minimum acceptable values;
- b) Applying stress to connections; or
- c) Flexing leads.

7.4 A lock washer, properly applied, is acceptable as a means to prevent turning of a switch or other device having single-hole mounting means.

7.5 A chain saw shall be so constructed that user-maintenance can be accomplished without the likelihood of:

- a) Pinching leads;
- b) Reducing spacings to values less than those indicated in Table 17.1;
- c) Mislocating or damaging the means for accomplishing strain relief; and
- d) Mislocating or damaging a guard or other similar device.

7.6 User-maintenance shall consist of inspection of or replacement of motor brushes or fuses and other service that is recommended in the instruction manual to be performed by the user. It does not include maintenance that the instruction manual recommends to be done by authorized service personnel.

7.7 Compliance with the requirement in 7.5 may be accomplished by routing of wires, provision of wire channels, provision of locating wells for components, use of barriers, use of restraints, securing of components, and other means.

7.8 Routing, as mentioned in 7.7 is acceptable if the construction is such that after the wire has been put into the intended position preparatory to the reassembling of the chain saw, that the reassembly procedure will not result in the wire contacting a moving part or being pinched. This does not mean that the wire must be of such length or so clamped that it cannot reach the pinch point or the moving part.

7.9 A chain saw employing a soft rubber, neoprene, or polyvinyl chloride pressure pad to hold down or maintain permanent position of an electrical part, such as a motor, to provide proper functioning of the chain saw shall be tested in accordance with 42.1. If the pressure pad is exposed to grease, it shall also be tested in accordance with 42.2.

Exception: The test is not required if a risk of fire or electric shock does not result from deterioration of the pad as determined by an abnormal operation test in which the chain saw is operated without the pressure pad.

8 Protection Against Corrosion

8.1 Except as noted in 8.2, iron and steel parts shall be protected against corrosion by enameling, galvanizing, plating, or other equivalent means if deterioration or breakage of such parts would be likely to result in a risk of fire, electric shock, or injury to persons.

8.2 If the oxidation of iron or steel due to the exposure of the metal to air and moisture is not likely to be appreciable – thickness of metal and temperature also being factors – the surfaces of sheet steel and cast-iron parts in an enclosure may not be required to be protected against corrosion. The requirement in 8.1 does not apply to bearings, laminations, and minor parts of iron or steel, such as washers, screws, and the like.

9 Power-Supply Cords

9.1 Cords and plugs

9.1.1 A chain saw shall be provided with a motor-attachment plug or a permanently attached flexible cord not more than 18 inches (457 mm) in length and shall comply with one of the following:

a) The manufacturer shall make an acceptable outdoor-use extension cord available and shall include a statement, marked on the tool, indicating the availability of such an extension cord, or include a statement indicating the availability of such an extension cord in the instruction manual or the like regularly furnished with the tool; or

b) The manufacturer shall furnish an acceptable detachable cord set, 6 ft (1.8 m) or more in length, with the tool.

9.1.2 The permanently attached flexible cord mentioned in 9.1.1 shall be of such a length that it cannot be damaged or impaired by any cutting edges or rotating parts.

9.1.3 A three-to-two-wire grounding-type adapter shall not be provided with a chain saw unless an acceptable 3-wire grounding-type extension cord set is also provided.

9.1.4 A permanently attached flexible power-supply cord or a detached cord set provided with a chain saw shall be the outdoor use type, either hard-service (such as Type SJ) or extra-hard-service cord (such as Type S), identified by W-A suffix type designation on the cord.

9.1.5 The flexible cord shall be rated for use at a voltage not less than the rated voltage of the tool, and shall have an ampacity, as given in the National Electrical Code, ANSI/NFPA 70-1993, not less than the current rating of the chain saw.

9.1.5 revised October 14, 1994

9.1.6 The attachment plug shall be acceptable for use with a current not less than the rated current, and at the rated voltage of the chain saw.

9.1.7 A chain saw intended for use with a detachable power-supply cord shall not be provided with terminal pins that will accommodate a standard flatiron or appliance plug.

9.1.8 If a chain saw incorporates a disconnecting means, such as a cord connector in the power-supply cord, the arrangement shall be such that no live parts will be exposed under any normal conditions.

9.1.9 An attachment plug on the supply cord of an appliance shall be constructed so that, when inserted in the connector of an extension cord, the blades will not be energized until they are inaccessible to contact by persons. See Attachment Plug Test, Section 49A.

Added 9.1.9 effective April 1, 1997

9.2 Strain relief

9.2.1 Strain relief shall be provided to prevent a mechanical stress on a flexible cord from being transmitted to terminals, splices, or internal wiring. See Section 40, Strain Relief Test.

9.2.2 Means shall be provided to prevent the flexible cord from being pushed into the chain saw through the cord-entry hole if such displacement may expose the cord to mechanical damage or to a temperature higher than that for which the cord is rated, or is likely to reduce spacings, such as to a metal strain-relief clamp, below the minimum acceptable values.

9.2.3 If a knot in a flexible cord serves as strain relief, the surface against which the knot may bear or with which it may come in contact shall be free from projections, sharp edges, burrs, fins, and the like, that may cause abrasion of the cord jacket or the insulation on the conductors.

9.2.4 The strain relief provided on the power-supply cord shall be independent of any rubber cord guard unless the guard is molded on the cord or has been determined to be acceptable for the particular application.

9.3 Bushings

9.3.1 At a point at which a flexible cord passes through an opening in a wall, barrier, or enclosing case, there shall be a bushing or the equivalent that shall be acceptably constructed and secured in place, and shall have a smooth, round surface on which the cord may bear.

9.3.2 If the cord-entry hole is in porcelain, phenolic composition, or other equivalent insulating material, a smooth, round surface is considered to be equivalent to a bushing.

9.3.3 Ceramic materials and some molded compositions are acceptable for insulating bushings. Separate bushings of wood or of so-called hot-molded shellac and tar compositions are not acceptable.

9.3.4 Vulcanized fiber may be employed if the bushing is not less than 3/64 inch (1.2 mm) thick, and if it is so formed and secured in place that it will not be affected adversely by conditions of ordinary moisture.

9.3.5 An acceptable separate soft-rubber, neoprene, or polyvinyl chloride bushing may be employed in the frame of a motor or in the enclosure of a capacitor attached to a motor (but not elsewhere in the chain saw) if:

- a) The bushing is not less than 1/16 inch (1.6 mm) thick; and
- b) The bushing is so located that it will not be exposed to oil, grease, oily vapor, or any other substance that may deteriorate the compound employed.

9.3.6 If a bushing of one of the materials mentioned in 9.3.5 is used, the edges of the hole in which the bushing is mounted shall be smooth and free from fins, burrs, and the like.

9.3.7 At any point in a chain saw, a bushing of the same material as, and molded integrally with, the supply cord is acceptable if the built-up section is not less than 1/16 inch (1.6 mm) thick at the point where the cord passes through the enclosure. An insulating metal grommet may be accepted in place of an insulated bushing if the insulating material used is not less than 1/32 inch (0.8 mm) thick and completely fills the space between the grommet and the metal in which it is mounted.

10 Live Parts

10.1 Metal employed for a current-carrying part shall be silver, copper, a copper alloy, or other metal that is acceptable for the particular application.

10.2 Iron or steel with a corrosion-resistant coating may be used for a current-carrying part:

- a) If permitted in accordance with 3.1; or
- b) Within a motor or associated governor. The use of unprotected iron or steel for current-carrying parts elsewhere in a chain saw is not acceptable.

10.3 An uninsulated live part shall be so secured to the surface on which it is mounted, and supporting insulating materials shall be so secured in place, that it will be prevented from turning or shifting in position, if such motion may result in a reduction of spacing below the minimum acceptable values. A brush-holder connector shall be acceptably captivated independently of the brush.

10.4 Friction between surfaces is not acceptable as a means to prevent turning or shifting of uninsulated live parts. A lock washer is acceptable for this purpose.

11 Internal Wiring

11.1 The wiring and the connections between parts of a chain saw shall be protected or enclosed.

11.2 With reference to exposure to internal wiring through an opening in the enclosure of a chain saw, the protection of the wiring required by 11.1 is considered to exist if, when considered as though it were film-coated wire, the wiring would be acceptable according to Section 6A, Accessibility of Live Parts. Internal wiring not so protected may be acceptable if it is so secured within the enclosure that it is unlikely to be subject to stress or mechanical damage.

Revised 11.2 effective April 1, 1997

11.3 Internal wiring of a chain saw shall consist of wires that are acceptable for the particular application when considered with respect to:

- a) The temperature and voltage to which the wire is likely to be subjected;
- b) Exposure to oil, grease, or other substances likely to deteriorate the insulation; and
- c) Other conditions of service to which it is likely to be subjected.

11.4 Thermoplastic-insulated, neoprene-insulated, or rubber-insulated wire used for internal wiring shall be standard building wire or appliance wiring material and shall comply with Table 11.1.

Table 11.1
Characteristics of internal wiring

Insulation	Nominal wall thickness of insulation, inch (mm)	Braid or jacket required	Nominal thickness of braid or jacket, inch (mm)
Thermoplastic or neoprene	0.030 ^a (0.76)	No ^a	—
Rubber	0.030 ^b (0.76)	Yes ^b	0.015 (0.038)
Cross-linked synthetic polymer	0.015 (0.38)	No	—
^a The wall thickness may not be less than 0.015 inch (0.38 mm) if the wire is provided with a braid or jacket not less than 0.015 inch. ^b For heat-resistant rubber (other than a silicone type), the wall thickness is to not be less than 3/64 inch (1.2 mm) and no braid is required.			

11.5 Appliance-wiring material having heat-resistant rubber insulation, of other than a silicone type, not less than 3/64 inch (1.2 mm) thick and not provided with a braid is acceptable.

11.6 Insulating tubing employed instead of wire insulation shall be acceptable for the application and shall have a wall thickness of not less than 1/32 inch (0.8 mm).

11.7 Wiring shall be protected from sharp edges (including screw threads), burrs, moving parts, and other agencies that might cause abrasion of the insulation of conductors.

11.8 A hole through which insulated wires pass in a sheet-metal wall within the overall enclosure shall be provided with a smooth, rounded bushing or shall have smooth, well-rounded surfaces upon which the wires may bear to prevent abrasion of the insulation. A flexible cord used for external interconnection shall be provided with a bushing and strain relief in accordance with 9.2.1 – 9.3.7 and Section 40, Strain Relief Test, unless the construction is such that the cord will be protected from stress and motion.

11.9 Insulated wires may be bunched and passed through a single opening in a metal wall within the enclosure.

11.10 Film-coated wire employed as a jumper between a coil and a brush holder or switch shall be secured in place unless there is no likelihood of its contacting other live parts or dead metal parts if breakage occurs.

11.11 All splices and connections shall be mechanically secure and shall provide effective electrical contact. A soldered connection shall be made mechanically secure before being soldered.

11.12 A chain saw shall be so constructed that if a wire breaks, loosens, or otherwise becomes free to move at a switch termination, the enclosure will not be made live and no live part will project from the enclosure.

11.13 Compliance with the requirement in 11.12 may be accomplished by use of barriers, by relative placement of parts, by mechanical restraint of the conductor in addition to that resulting from its electrical connections, or by other equivalent means.

11.14 An open-end spade lug is not acceptable unless additional means (such as upturned ends on the lug, bosses, shoulders, and the like) are provided to hold the lug in place should the wire-binding screw or nut become slightly loosened.

11.15 A wire-binding screw shall thread into metal.

11.16 A splice shall be provided with insulation if permanence of spacings between the splice and other metal parts may not be maintained.

11.17 The thickness of insulation on a splice shall be 1/32 inch (0.8 mm) or more. In determining if splice insulation consisting of coated-fabric, thermoplastic, or other tubing is acceptable, consideration shall be given to such factors as its dielectric properties, heat-resistant and moisture-resistant characteristics, and the like. Thermoplastic tape wrapped over a sharp edge is not acceptable.

11.18 Stranded internal wiring shall be so connected to a wire-binding screw that loose strands of wire will not contact other uninsulated live parts not always of the same polarity as the wire, and from contacting dead metal parts. This may be accomplished by use of pressure terminal connectors, crimped eyelets, soldering all strands of the wire together, or other equivalent means.

12 Insulating Material

12.1 Material for the mounting of uninsulated live parts shall be phenolic composition, cold-molded composition, or other material that is acceptable for the particular application.

12.2 Vulcanized fiber may be used for insulating bushings, washers, separators, brush-holder liners, and barriers, but not as the direct support for uninsulated live parts where shrinkage, current leakage, or warpage may introduce a condition likely to result in a risk of fire or electric shock. Thermoplastic materials may be employed for direct support of uninsulated live parts only if found to have mechanical strength and rigidity, resistance to heat, resistance to flame propagation, dielectric properties, resistance to arc tracking, and other properties that are acceptable for the application.

12.3 A molded part shall be so constructed that it will have mechanical strength and rigidity to withstand stresses likely to occur in service. A brush cap shall be protected from mechanical damage, by recessing or other means, that might occur unless the part has the strength necessary to withstand the abuses to which it is likely to be subjected as demonstrated by an impact test described in 46.1.1.

13 Motors

13.1 The motor of a chain saw shall drive its maximum intended load without introducing a risk of fire, electric shock, or injury to persons.

13.2 A motor winding shall resist the absorption of moisture and shall be formed and assembled in a workmanlike manner.

13.3 A brush-holder assembly shall be constructed so that when a brush is worn out — no longer capable of performing its function — the brush, spring, and other parts of the assembly shall be retained to the degree necessary to prevent:

- a) An accessible dead metal part from becoming energized; and
- b) A live part from becoming accessible.

14 Switches and Controls

14.1 A switch or other control device shall be acceptable for the application, with a voltage rating and current rating not less than the corresponding values of the load that it controls.

14.1 revised April 1, 1996

14.2 A chain saw shall not employ a through-cord switch.

14.3 A single-pole switch employed in a chain saw having a nominal rating of 120 V shall be connected in the ungrounded circuit conductor.

15 Thermal Cutoffs

15.1 If a thermal cutoff is used as noted in 76.1.2, it shall comply with the applicable requirements in this standard and those in the Standard for Thermal Cutoffs for Use in Electrical Appliances and Components, UL 1020

16 Capacitors

16.1 A capacitor provided as a part of a capacitor motor, and a capacitor connected across the line, such as a capacitor for radio-interference elimination or power-factor correction, shall be housed within an enclosure or a container that will protect the plates against mechanical damage and will prevent the emission of flame or molten material resulting from malfunction of the capacitor. The container shall be of metal providing strength and protection not less than that of uncoated steel having a thickness of 0.020 inch (0.51 mm).

16.2 The individual container of a capacitor may be of sheet metal thinner than that mentioned in 16.1 or may be of material other than metal if the capacitor is mounted in an enclosure that houses other parts of the chain saw and if such a box, case, or the like, is acceptable for the enclosure of live parts.

16.3 The total capacitance of capacitors connected from one side of the line to the frame or enclosure of a chain saw shall not be such as to permit the flow of more than 0.5 mA in the grounding conductor when the frame or enclosure is connected to ground. See also 32.1.

- 19.2 A stick type auxiliary handle that is provided as an insulated gripping surface shall be:
- a) Provided with a flange of insulating material located on the chain saw side of the grasping surface, unless the chain saw housing serves as an insulating flange;
 - b) Provided with a flange height not less than 3/4 inch (19 mm) above any point around the circumference of the handle at the flange base; and
 - c) Insulated along the full length of the grasping surface to the flanges, or housing.
- 19.3 A bolt, screw, or other handle mounting hardware in the area of the handle likely to be grasped during operation and that threads into, or clamps onto, an accessible metal enclosure shall be:
- a) Of insulating material;
 - b) Provided with a layer of insulation between the hardware and metal enclosure equivalent to supplementary insulation; or
 - c) In compliance with 19.6.
- 19.4 The insulating material mentioned in 19.1 – 19.3 shall be acceptable for the intended application.
- 19.5 If the insulating material mentioned in 19.1 – 19.3 overlies dead metal, the material shall be tested as described in 46.3.1.
- 19.6 An assembly screw in an area likely to be grasped that secures a covering of insulating material to a metal enclosure and threads into a metal enclosure containing an electrical component or into a metal enclosure that contacts another metal enclosure containing electrical components:
- a) Shall not be accessible to a probe having a diameter of 3/4 inch (19.1 mm), when inserted to a depth of 1 inch (25.4 mm); or
 - b) If the opening will not admit a 3/8-inch (9.5 mm) diameter cylindrical rod, shall be recessed not less than 1/8 inch (3.2 mm) below the outer surface of the insulating material.

Revised 19.6 effective April 1, 1997

PROTECTION AGAINST INJURY TO PERSONS

20 General

20.1 During examination of a chain saw with respect to risk of injury to persons, the general requirements for such features as materials, enclosures, guards, and the like will be applied, along with appropriate requirements for tests, construction, markings, guards, and the like, that apply to the chain saw. Features of chain saws that are not contemplated herein will be given consideration.

21 Accessories and Attachments

21.1 Operation of the chain saw with an accessory or an attachment (see 1.4, 1.5, 2.2, and 2.3) shall not increase the risk of injury to persons to an unacceptable degree. See Sections 82 – 89 for specific requirements regarding accessories and attachments.

22 Materials

22.1 The material of a part such as an enclosure, a frame, or a guard, the breakdown of which might result in a risk of injury to persons, shall have such properties as to meet the demand of expected loading conditions.

23 Enclosures and Guards

23.1 A moving part shall be so enclosed or guarded as to acceptably reduce the likelihood of injury to persons, except only as such part is necessarily exposed during intended operation of the chain saw.

23.2 Among the factors to be considered in determining the acceptability of an exposed moving part are:

- a) The degree of exposure;
- b) The sharpness of the moving part;
- c) The likelihood of unintentional contact therewith;
- d) The speed of the moving part; and
- e) The likelihood that fingers, arms, feet, or clothing would be endangered by the moving part.

These factors are to be considered with respect to the intended operation of the chain saw and also during setting of any adjustment.

23.3 Features of guards that will be considered include each of the following:

- a) Removability of the guard without the use of tools;
- b) Removability for servicing and the need for replacement;
- c) Strength and rigidity;
- d) Completeness; and
- e) Creation of additional risks, such as pinch points, and the necessity for additional handling because of increased need for servicing, such as cleaning and unjamming.

23.4 Except for an opening for the cutting edge of the chain saw, an opening in a guard or enclosure around a moving part capable of causing injury, such as a fan pulley, gear, or saw chain, shall have a baffle to prevent contact with that part or the opening shall have a minor dimension less than 1 inch (25.4 mm).

23.5 The unobstructed distance from the opening to the moving part mentioned in 23.4 shall not be less than $8D - 1.5$ inches ($8D - 38.1$ mm), in which D is the minor dimension of the opening in inches (mm), except that a fan is considered to be acceptably guarded if it cannot be contacted with a probe having a diameter of $1/2$ inch (12.7 mm).

Revised 23.5 effective April 1, 1997

23.6 The enclosure or guard around a moving part shall be complete from the standpoint of number and size of openings provided, and shall have such strength as to contain a member or part of a member, such as a saw chain, that, because of breakage or other reason, might become loose or separate from the rotating member and strike the guard.

31.2 A fuse or other protective device shall not operate during the intended operation of the chain saw, see 34.2. For all tests, unless otherwise indicated, a fuse or other protective device is to be shorted.

31.3 An alternate magnet wire coating used in a chain saw motor subjected to tests in Section 45, Burnout Test, or Section 76, Overload Test, and Section 77, Armature Investigation Test shall:

- a) Be an investigated magnet wire of the same ANSI grade designation, or generic material type and construction, with the same temperature rating as the original magnet wire tested; or
- b) Be tested as indicated in Section 45, Burnout Test, or Section 76, Overload Test, and Section 77, Armature Investigation Test, as appropriate.

32 Leakage Current Test

32.1 The leakage current of a chain saw rated for a nominal 240-V or 120-V supply when tested in accordance with 32.3 – 32.6, shall not be more than 0.5 mA.

32.2 Leakage current refers to all currents, including capacitively coupled currents that may be conveyed between exposed conductive surfaces of a chain saw and ground or other exposed conductive surfaces of the chain saw.

32.3 All exposed conductive surfaces are to be tested for leakage currents. The leakage currents from these surfaces are to be measured to the grounded supply conductor individually as well as collectively if simultaneously accessible and from one surface to another if simultaneously accessible. Parts are considered to be exposed surfaces unless guarded by an enclosure considered acceptable for protection against risk of electric shock as defined in Section 6A, Accessibility of Live Parts, 6.7, and 6.8. Surfaces are considered to be simultaneously accessible if they can be readily contacted by one or both hands of a person at the same time.

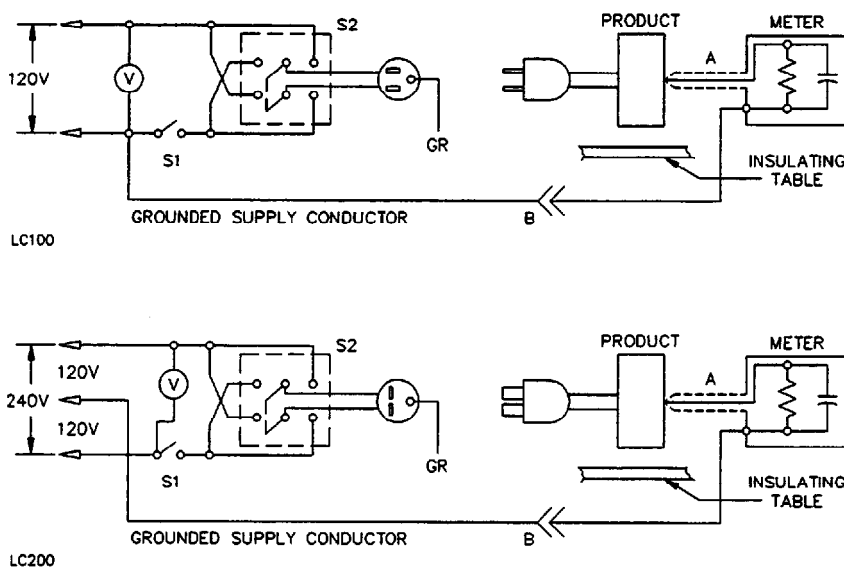
Revised 32.3 effective April 1, 1997

32.4 If a conductive surface other than metal is used for the enclosure or part of the enclosure, the leakage current is to be measured using a metal foil with an area of 3.9 by 7.9 inches (100 by 200 mm) in contact with the surface. When the surface is less than 3.9 by 7.9 inches (100 by 200 mm), the metal foil is to be the same size as the surface. The metal foil is not to remain in place long enough to affect the temperature of the chain saw.

32.5 The measurement circuit for leakage current is to be as shown in Figure 32.1. The measurement instrument is defined in (a) – (d). The meter that is actually used for a measurement need only indicate the same numerical value for a particular measurement as would the defined instrument. The meter used need not have all the attributes of the defined instrument.

- a) The meter is to have an input impedance of 1500 ohms resistive shunted by a capacitance of 0.15 μ F.
- b) The meter is to indicate 1.11 times the average of the full-wave rectified composite wave form of voltage across the resistor or current through the resistor.
- c) Over a frequency range of 0 – 100 kHz, the measurement circuitry is to have a frequency response (ratio of indicated to actual value of current) that is equal to the ratio of the impedance of a 1500-ohm resistor shunted by a 0.15- μ F capacitor to 1500 ohms. At an indication of 0.5 mA, the measurement is to have an error of not more than 5 percent.
- d) Unless the meter is being used to measure leakage from one part of a tool to another, the meter is to be connected between the accessible parts and the grounded supply conductor.

Figure 32.1
Leakage-current measurement circuits



A — Probe with shielded lead.

B — Separated and used as clip when measuring currents from one part of product to another.

32.6 A sample of the chain saw is to be tested for leakage current starting with the as received condition (as received being without prior energization, except as may occur as part of the production line testing), but with its grounding conductor open at the attachment plug. The supply voltage is to be adjusted to 120 V or 240 V, depending upon the rating of the chain saw. The test sequence, with reference to the measuring circuit (Figure 32.1) is to be as follows:

- With switch S1 open the chain saw is to be connected to the measuring circuit. Leakage current is to be measured using both positions of S2, and with the chain saw switching devices in all their normal operating positions.
- Switch S1 is then to be closed, energizing the chain saw, and within a period of 5 seconds, the leakage current is to be measured using both positions of switch S2, and with the chain saw switching devices in all their normal operating positions.
- Leakage current is then to be monitored under the no load condition until thermal stabilization. Both positions of switch S2 are to be used in determining this measurement.

33 Starting Current Test

33.1 A chain saw shall start and operate normally on a circuit protected by an ordinary (not time-delay) fuse having a current rating corresponding to that of the branch circuit of minimum rating to which, in accordance with the National Electrical Code, ANSI/NFPA 70-1993, the chain saw may be connected.

33.1 revised October 14, 1994

36.3 To determine whether a chain saw complies with the requirements in 36.1 – 36.3, the test potential is to be applied as described in 36.5 by means of test equipment having the characteristics outlined in 36.4.

36.4 The test equipment for conducting the dielectric voltage-withstand test is to have the following features and characteristics:

- a) A means for indicating the test voltage that is being applied to the chain saw under test. This may be established by sensing the voltage at the test leads or by an equivalent means.
- b) An output voltage that:
 - 1) Has a sinusoidal wave form;
 - 2) Has a frequency that is within the range of 40 – 70 Hz; and
 - 3) Has a peak value of the wave form that is not less than 1.3 and not more than 1.5 times the root-mean-square value.
- c) A sensitivity of the test equipment that is such that when a resistor of 120,000 ohms is connected across the output, the test equipment does not indicate unacceptable performance for any output voltage less than the specified test voltage, and the test equipment does indicate unacceptable performance for any output voltage equal to or greater than the specified test value. The resistance of the calibrating resistor is to be adjusted as close to 120,000 as instrumentation accuracy can provide, but never more than 120,000 ohms.

Exception: The sensitivity of the test equipment may be increased, a higher value of calibrating resistance may be used, if agreeable to those concerned.

36.5 The method of applying the test voltage to the chain saw is to be such that there are not any transient voltages that result in the instantaneous voltage applied to the product exceeding 105 percent of the peak value of the specified test voltage. The applied potential is to be increased from zero at a substantially uniform rate so as to arrive at the specified test potential in approximately 5 seconds, and then is to be maintained at the test potential for 1 minute. Manual control of the rate of rise may be used.

36.6 The printed foil pattern of a printed-wiring board provided with a conformal coating as mentioned in 17.5(a) shall withstand the potential specified in 36.1 applied between printed-wiring traces of opposite polarity for 1 minute without breakdown. Clean dry samples with and without the conformal coating are to be tested. The samples shall have been subjected to the production-soldering process. The components may be omitted for this test.

37 Leakage Current Following Humidity Test

37.1 A chain saw shall comply with Section 32, Leakage Current Test, following exposure for 48 hours to moist air having a relative humidity of 88 ± 2 percent at a temperature of $32.0 \pm 2.0^{\circ}\text{C}$ ($89.6 \pm 3.6^{\circ}\text{F}$):

- a) The unit is to be at a temperature just above the test chamber temperature when it is placed in a humidity chamber.
- b) The unit is to remain in the humidity chamber for 48 hours.

- c) Following this exposure, while still in the test chamber, the sample is to be tested unenergized as indicated in 32.6(a).
- d) The sample is then to be tested as indicated in 32.6(b) and (c) except that the test may be discontinued when the leakage has stabilized or decreased. This test may be performed in the test chamber or immediately after the sample has been removed from the test chamber.

38 Dew Point Test

38.1 A chain saw shall not have a leakage current exceeding 2.0 mA after being conditioned as described in 38.2. Following conditioning, a chain saw that exceeds 0.5 mA shall be retested after a minimum of 10 hours storage at room temperature and normal humidity, or after 1 hour running at no load, after which the leakage current shall not exceed 0.5 mA.

38.2 The chain saw is to be conditioned in a cold chamber at $5.0 \pm 2.0^{\circ}\text{C}$ ($41.0 \pm 3.6^{\circ}\text{F}$) for at least 4 hours, then transferred from the cold chamber to a humidity chamber at 88 ± 2 percent relative humidity and $32.0 \pm 2.0^{\circ}\text{C}$ ($89.6 \pm 3.6^{\circ}\text{F}$). The transfer time shall not exceed 1 minute.

38.3 The leakage current is to be measured from line to all exposed conductive surfaces and all gripping surfaces at 120 V or 240 V, depending upon the rating of the chain saw, in static mode only (unenergized). The leakage current shall be monitored closely beginning from time of transfer from the cold chamber to humidity chamber until the leakage current stabilizes or drops. See 32.4 and 32.6(a).

39 Continuity of Grounding Connection Test

39.1 The grounding blade of the attachment plug and the dead metal parts of a chain saw as mentioned in 18.2 shall be electrically conductively connected, as determined by testing.

39.2 Any indicating device, such as an ohmmeter or a low-voltage battery and buzzer combination, is to be employed in the test mentioned in 39.1. A resistance greater than 0.1 ohm shall not be reached during the test.

39.2 revised April 1, 1996

39.3 Compliance with 39.1 is to be determined by any convenient method. However, if unacceptable results are obtained, an alternating current of 20 Amps or more from a power supply of 12 volts or less is to be passed from the point of connection of the equipment-grounding means to the metal part in the grounding circuit. The resulting drop in potential is to be measured between the two points. Resistance in ohms is to be determined by dividing the drop in potential in volts by the current in amperes passing between the two points.

39.3 added April 1, 1996

40 Strain Relief Test

40.1 When tested in accordance with 40.2, the strain-relief means provided on a flexible cord shall withstand for 1 minute, without displacement, a direct pull of 35 lbf (156 N) applied to the cord, with the connections within the chain saw disconnected.

40.2 A 35-lb (15.9-kg) weight is to be suspended on the cord and so supported by the chain saw such that the strain-relief means will be stressed from any angle that the construction of the tool permits. The strain relief is not acceptable if at any point of disconnection of the conductors there is such movement of the cord as to indicate that stress would have resulted on the connections.

41 Cord Flexing Test

41.1 A power supply cord shall withstand 20,000 cycles of flexing at the cord entrance to the chain saw. Flexing shall be performed at a rate not exceeding 10 cycles per minute, unless agreeable to those concerned.

44 Electronic Components Test

44.1 If a chain saw employs one or more capacitors, rectifiers, transistors, or similar components, a fire or electric shock condition shall not develop when the circuit between any two terminals of any such component is opened or shorted. Only one of the simulated fault conditions is to be imposed at one time.

44.2 The need for test of a specific component and the type of test needed is to be determined by analysis of the total system. The possible effect of one component fault on another, encapsulation, and the like are factors to be considered.

44.3 Short-circuit tests for determining whether a chain saw complies with the requirements in 44.1 are to take into account the intended usage. For example, if there is indication of malfunction (abnormal operation) of the chain saw (emission of smoke, failure of the chain saw to operate in the intended manner, or other indication), the test is to be discontinued when the malfunction becomes evident. Otherwise, the test is to be continued until ultimate results occur. Exposed dead metal parts of the sample are to be connected to ground through a 3-A fuse. The results are unacceptable if the fuse opens during the test.

45 Burnout Test

45.1 When a chain saw is operated under the conditions described in 45.2:

- a) There shall be no adverse deterioration of the insulation to the extent that live parts are exposed; and
- b) The leakage current measured from accessible dead metal parts shall not be more than 5.0 mA, when monitored continuously as the chain saw reaches the end result using the methods described in 32.3 – 32.6, utilizing both positions of switch S2 and with the chain saw switching devices in all normal operating positions.

45.2 To determine whether a chain saw complies with the requirements in 45.1, each of three previously untested samples of a complete chain saw is to be subjected to operation at 120 percent of rated load for 14-1/2 minutes followed by operation at no load for 1/2 minute. Following the initial 15 minutes of operation, the chain saw is to be subjected to consecutive 15 minute periods of operation – each period consisting of 14-1/2 minutes of operation with the load increased in each successive period by 10 percent of the rated current followed by 1/2 minute of operation at no load. The test is to be continued until the end result occurs (see 45.3) or the load reaches 200 percent of the rated load. If agreeable to those concerned, the overload conditioning may start at a higher load value, in 10 percent increments of rated load, up to 150 percent. If the end result occurs in less than 1/2 hour, the test is to be repeated using a different sample and starting at rated load instead of 120, 130, 140, or 150 percent. The exterior temperatures of the motor housing are to be monitored during the test by means of thermocouples. If the temperature of the motor housing exceeds 90°C (194°F) during operation under load, the chain saw is to be operated at no-load (other than the mechanical load provided by the loading device) until the housing temperature is stabilized; and upon stabilization, the test is to be resumed at the same load increment for the balance of the 14-1/2 minute load cycle. The loading cycle is to be resumed, as indicated above until the end result occurs or the chain saw has been operated for 6 hours.

Exception: Only a single sample of a chain saw employing an alternate magnet wire coating, see 31.3, is to be tested if the test results are equivalent to the test results of the original construction tested. Equivalency is based upon the test duration, the enclosure temperature, and the leakage current being slightly higher, the same or less.

45.3 With reference to 45.2, failure of the sample to operate is considered to have occurred if:

- a) Flame appears;
- b) An open circuit occurs;
- c) The chain saw stalls and will not run at rated load; or
- d) A short circuit develops in the winding that results in a spontaneous increase in current of 50 percent or more of the last adjusted value.

If condition (a) occurs, the flame is to be extinguished immediately. If a condition similar to (c) occurs in which the chain saw stalls except that it will run at rated load then the load, shall be reapplied at the highest level that the chain saw will operate under until a failure of the chain saw to operate occurs. At the moment the end result occurs, switch S1 is to be opened and the leakage current monitored until stabilization.

45.4 If the end results occur as a short circuit in the winding [condition 45.3(d)], operation is to be continued for 30 seconds under load after the short circuit occurs, unless condition 45.3(a) (flame, which is to be extinguished immediately), condition 45.3(b) (open circuit), or condition 45.3(c) (stalling) occurs earlier. If conditions 45.3(a), (b), and (c) occur, operation is to be terminated immediately. If neither condition 45.3(a), (b), or (c) does not occur during the 30-second interval, the tool is then to be given time to cool to room temperature. Without adjustment of the load from the value during the 30-second interval, operation of the chain saw is to be resumed for one period of up to 30 seconds until condition 45.3(a) (flame), condition 45.3(b) (open circuit), or condition 45.3(c) (stalling) occurs, whichever occurs first.

46 Resistance to Impact Test

46.1 Brush cap

46.1.1 A brush cap is considered to have acceptable strength if it will withstand, without cracking or breaking, an impact equal to that which would result from dropping the chain saw through a distance of 3 ft (0.91 m).

46.2 Grounded chain saw

46.2.1 After being subjected to the impact described in 46.4.4 and 46.4.5, a chain saw that is provided with a means for grounding and has other than a thermoplastic enclosure shall:

- a) Comply with the dielectric voltage-withstand requirements in 36.1 – 36.3;
- b) Not be so damaged such that the risk of electric shock would be increased;
- c) Not make uninsulated live parts or internal wiring accessible to contact, as determined by Section 6A, Accessibility of Live Parts; and
- d) Not cause damage to the strain-relief means so that the chain saw will continue to comply with the strain-relief requirements in 9.2.1 – 9.2.4 and Section 40, Strain Relief Test.

Revised 46.2.1 effective April 1, 1997

46.3 Insulated handle

46.3.1 Insulating material that overlies dead metal, as described in 19.5, shall not:

- a) Show holes, cracks, distortion, or other evidence of deterioration after conditioning as described in 46.3.2; or
- b) Break, crack, rupture, or show other adverse effects after being conditioned as described in 46.3.2 and then subjected to the impact test described in 46.3.3.

46.3.2 The conditioning mentioned in 46.3.1 is to consist of placing the chain saw in an air-circulating oven maintained at a temperature at least 10°C (18°F) more than the temperature observed on a handle or other gripping surface under conditions of intended operation, but in no case is the temperature to be less than 70°C (158°F). The chain saw is to remain in the oven for 7 hours.

46.3.3 The impact test mentioned in 46.3.1(b) is to be conducted after the chain saw is given time to cool to room temperature and is to consist of dropping the tool 3 ft (0.91 m) to strike a concrete surface. The chain saw is to be dropped in such a manner that each of the handles or areas likely to be grasped will receive an impact. For the test of a chain saw employing two handles, a single sample may be dropped twice, or two different samples may be used.

46.4 Injury to persons

46.4.1 A component as mentioned in 22.1 shall withstand the impact described in 46.4.4 and 46.4.5 without:

- a) Cracking that might cause subsequent malfunction or breakage of the part, resulting in the intended function of that part being defeated;
- b) Being affected to the extent that moving parts capable, upon contact, of causing injury to persons would be exposed to unintentional contact; and
- c) Affecting the mechanical performance of the chain saw to the extent that the risk of injury to persons has been increased.

46.4.2 Breakage of a working component, such as a saw chain, is acceptable. Deformation of a guard is acceptable if it can be readily restored to its original shape or the deformation does not result in the risk of injury to persons.

46.4.3 A chain saw is to be subjected to the impact described in 46.4.4 and 46.4.5 once for compliance with the requirements in 46.2.1 and 46.4.1, or 46.4.1 and 51.3.1, or 46.4.1 and 52.7.1

46.4.4 Except as noted in 46.4.5, each of three samples of a chain saw is to be dropped three times from a height of 3 ft (0.91 m) onto a concrete surface in such a manner as to test the chain saw most severely. The test is to be conducted with or without any accessories and attachments recommended by the manufacturer so as to result in the most severe test. The test is to be conducted so that, in each drop, the sample strikes the surface in a position different from those of the other drops.

46.4.5 Three individual samples may be employed for the test described in 46.4.4, or if the manufacturer so elects, fewer samples may be used in accordance with Figure 46.1. The overall performance is acceptable upon completion of any one of the procedures represented in the figure. Each series is to consist of three drops, and if any sample does not comply with the test criteria on the first series, the results of the test are unacceptable.

46.4.6 A fixed hand guard or a movable hand guard, in the activated position, shall be struck at the midpoint of the minimum dimension "B" specified in Figure 29.1. A guard shall not break when struck one time by a 2-inch (50.8-mm) diameter steel cylindrical pendulum that will produce an impact of 1 ft-lb (1.4 J). The test shall be conducted at a temperature of $\text{minus } 22.0 \pm 3.6^{\circ}\text{F}$ ($\text{minus } 30.0 \pm 2.0^{\circ}\text{C}$) by exposing the chain saw to a cold chamber for at least four hours before conducting the impact test. During this test the chain saw shall not be operating. The hand guard shall not break or be rendered inoperable as a result of the test.

46.4.6 revised April 1, 1996

Figure 46.1
Procedure for impact test

Series Num- ber	Sample Number								
	1	2	3	1	2	3	1	2	3
1	↓ A	N	N	↓ A	N	N	↓ A	N	N
2	↓ A	N	N	↓ A	N	N	↓ U	↓ A	N
3	↓ A	N	N	↓ U	↓ A	N	↓ A	N	↓ U

Arrows indicate sequence of test procedure

A — Acceptable results from drop

U — Unacceptable results from drop

N — No test necessary

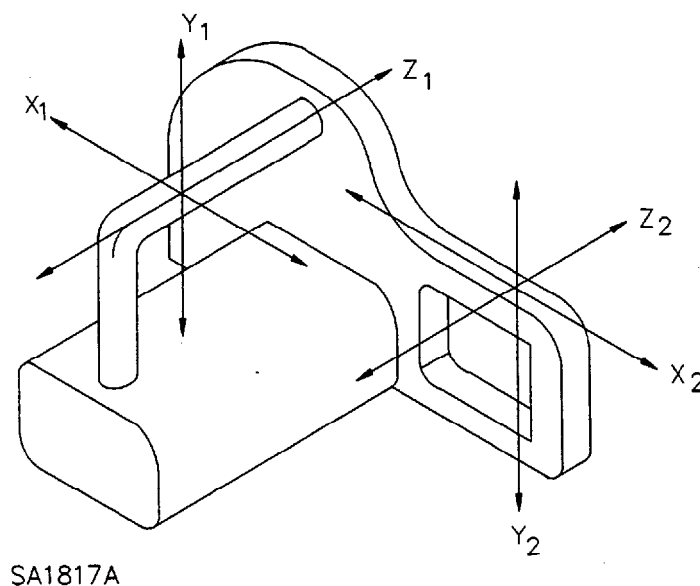
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47 Static Load Test

47.1 The chain saw handles and means for attachment shall not break when subject to the static test loads. The static test loads shall be separately applied in each of the six directions illustrated in Figure 47.1, employing the values specified in Table 47.1. Each test load is to be gradually applied until the specified pounds of force are reached, and then the force is to be immediately released. The chain saw shall be supported at the guide bar mounting pad when the test loads are applied. If during the application of the static test loads the guide bar mounting pad does not support the chain saw, the chain saw shall be remounted as necessary, and the test continued.

47.1 revised April 1, 1996

Figure 47.1
Handle strength tests



SA1817A

Table 47.1
Handle strength test loads

(Applied at Handle Grip Mid-Point)

Front & rear X_1 and X_2	Up & down Y_1 and Y_2	Right & left Z_1 and Z_2
200 Pounds force (890 N) or four times the weight of the saw whichever is greater	200 Pounds force (890 N) or four times the weight of the saw whichever is greater	100 Pounds force (445 N) or four times the weight of the saw whichever is greater

48 Sound Level Test

48.1 The chain saw sound level shall not exceed 100 dBA at the chain saw operator's ear and 84 dBA at a distance of 50 ft (15.2 m) from the chain saw location. The sound level shall be measured in accordance with the chain saw sound level test procedure outlined in 48.2 – 48.16

48.1 revised April 1, 1996

48.2 The following test procedure outlines the instrumentation, test site, saw operation, and measurements necessary for determining the sound level of a chain saw.

48.3 A precision sound level meter that meets the Type 1 requirements of the Specifications for Sound Level Meters, ANSI S1.4 – 1983, is to be used to determine the sound level of a chain saw.

Exception: As an alternative to the above method, a microphone or sound level meter may be used with a magnetic tape recorder and/or a graphic level recorder or indicating meter may be used providing the system meets the requirements in Qualifying A Sound Data Acquisition System ANSI/SAE J184a.

48.4 Each microphone is to be used with a foam wind screen. The windscreen is not to affect the overall reading by more than 0.5 dBA for the sound source that is being measured.

48.5 The test site is to be a flat open area covered with turf not exceeding 3 inches (76.2 mm) in height and free of any large reflecting surfaces, such as sign boards or buildings for a minimum distance of 100 ft (30.5 m) from the chain saw and microphones.

48.6 The ambient sound level at each point of measurement – including wind effects – coming from sources other than the chain saw being tested, is to be at least 10 dBA lower than the sound level of the chain saw. Measurements are to be made only when wind gusts are below 12 miles (19.3 Km) per hour.

48.7 The chain saw is to be adjusted for optimum cutting performance in accordance with the chain saw manufacturer's recommendations.

48.8 The chain saw is to be operated with the chain saw parallel to the ground line and at a height of at least 2 ft (610 mm) above the ground in accordance with Figure 48.1. The chain saw is to be equipped with the shortest guide bar recommended by the manufacturer. The log diameter is to be 2 to 4 inches (50.8 to 102 mm) less than the cutting capacity of the guide bar, distance from the bumper, less spikes, to the end of the chain.

48.9 All readings are to be taken with the chain saw operating at its highest and most efficient cutting speed while cutting the test log. A cutting speed is not to vary more than ± 5 percent during the sound level test cut.

48.10 The log, each microphone, and chain saw are to be so oriented as to produce the maximum sound level at each microphone. The cut is to be made within 2 inches (50.8 mm) of the end of the log.

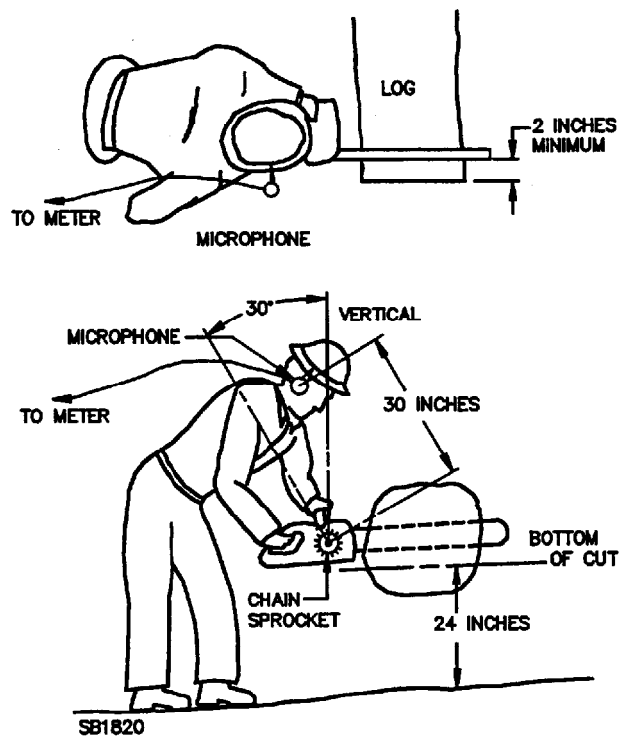
48.11 Each sound level meter and the A-Weighting network is to be set for slow response. Measurements are to be taken with the microphone 50 ft (15.2 m) from the chain saw and 4 ft (1.2 m) above the ground. Measurements are also to be taken at the operator's ear. The ear microphone is to be located in the plane of the guide bar 30 inches (762 mm) from the sprocket center line and within 30 degrees from the vertical toward the operator. See Figure 48.1. The observer reading the microphone is to be at least 8 ft (2.4 m) from the microphone.

48.12 The recorded sound level is to be the average of three recorded sound levels that are within 2 dBA of each other, rounded to the nearest decibel.

48.13 In order to obtain valid measurements, proper use of all test instrumentation is essential. Operating manuals and other literature furnished by the instrument manufacturer are to be referred to for both recommended operation of the instruments and the cautions to be observed. Specific items to be considered are:

- a) The type of microphone and its orientation relative to the source of the noise.
- b) The effects of ambient weather conditions on the performance of all instruments – for example; temperature, humidity, barometric pressure.
- c) Proper signal levels, terminating impedances, and cable lengths in multi-instrument measurement systems.

Figure 48.1
Chain saw operation



48.14 The proper acoustical calibration procedure is to include the influence of extension cables, and the like. Field calibration is to be made immediately before and after each test sequence. Either an external calibration or internal calibration means is acceptable for field use, provided that external calibration is accomplished immediately before and after field use. All test results are to be considered invalid should the recheck by external calibration not be within 0.5 dBA of the initial calibration.

48.15 Because bystanders may have an appreciable influence on meter response when they are in the vicinity of the chain saw or the microphone, not more than one person other than the observer reading the microphone is to be within 50 ft (15.2 m) of the chain saw or microphones, and that person is to be directly behind the observer reading the meter on line to the microphone and the observer.

48.16 The following test data is to be recorded:

- Geographical location;
- Date and time;
- Names of chain saw operator, sound level meterreader, and observers;
- Weather conditions including the ambient temperature, wind velocity, and barometric pressure;
- Make, type, and serial number of sound level meter;

- f) Make, model, and serial number of the chain saw being tested;
- g) Type of guide bar, saw chain, and sprocket being used;
- h) Wood species and size;
- i) All meter readings taken;
- j) Spindle speed (RPM); and
- k) Sketch or photograph of microphone, log, and chain saw orientation.

49 Chain Brake System Test

49.1 A chain brake system, if provided, is to be tested in accordance with 49.2 – 49.4. The saw chain is to stop in 0.15 seconds maximum and 0.10 seconds as an average. The chain brake system is to not be rendered inoperable during the test.

49.2 The following conditions are to prevail during the chain brake test:

- a) The chain saw is to be solidly mounted during the test;
- b) Only new brakes are to be tested;
- c) No adjustment of brakes is to be made during the test;
- d) Initially, the brake is to be in a dry and unlubricated condition, that is in the as-received condition; and
- e) The test temperature is to be $68 \pm 9^{\circ}\text{F}$ ($20 \pm 5^{\circ}\text{C}$).

49.3 The chain brake is to be activated 25 times by a blow from a pendulum that will produce an impact of 1 ft-lb (1.4 J). There is to be a minimum of 1 minute between activations. The chain is to be running during the test. Immediately following each activation of the chain brake, and after the chain stops, the switch shall be returned to the off position.

49.4 A recording device is to be used to measure the time interval from the instant the brake arm starts to move, to the instant the saw chain ceases to move. Five additional operations are to be conducted and the average stopping time computed from those five operations. The maximum stopping time for any of these five operations is not to exceed 0.15 seconds. The rpm of the chain saw drive sprocket, prior to the brake activation, is to be measured and recorded.

49A Attachment Plug Test

49A.1 When tested as described in 49A.2, the test probe shall not contact any blade of the attachment plug while the plug is conductively connected to the connector of the extension cord.

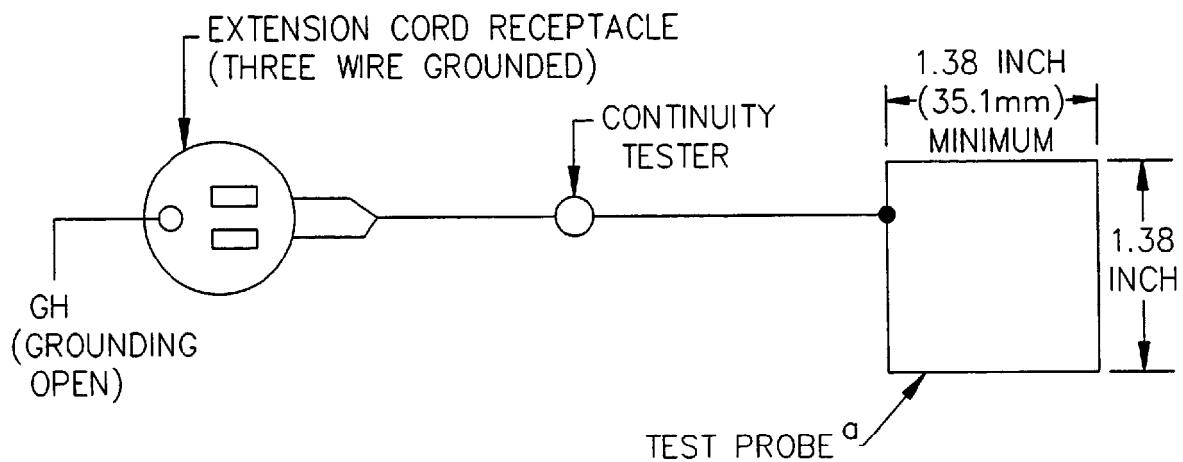
Exception: The probe is not prohibited from contacting the grounding blade of a 3-conductor grounding plug.

Added 49A.1 effective April 1, 1997

49A.2 The receptacle used in the test shall comply with the requirements in the Standard for Attachment Plugs and Receptacles, UL 498. The receptacle is to be connected to the extension cord of the test assembly illustrated in Figure 49A.1. The plug is to be inserted in the receptacle as far as possible. The plug is then to be withdrawn not more than the distance that is necessary to permit the test probe to be inserted between the plug body and the extension cord receptacle. The test probe is to be inserted with a force of 4.1 pounds (18 N) or less, until the probe contacts one blade of the plug. While the probe is in contact with the blade, the electrical continuity is to be determined by an ohmmeter or similar instrument between the contacts of the extension cord receptacle and the test probe. The test is then to be repeated for the other blade of the attachment plug.

Added 49A.2 effective April 1, 1997

Figure 49A.1
Test assembly for accessibility of attachment-plug blades



SA1832A ^a TEST PROBE IS TO BE MADE OF 0.06 INCH (1.5mm) THICK METAL.

Added Figure 49A.1 effective April 1, 1997

49A.3 The test probe mentioned in 49A.2 is to be made of 0.06-inch (1.5-mm) thick metal that is 1.38 inches (35 mm) wide, and not less than 1.38 inches long.

Added 49A.3 effective April 1, 1997

POLYMERIC ENCLOSURES

50 General

50.1 Except as noted in 50.2, a polymeric enclosure shall comply with the requirements in:

- a) 51.1.1 – 51.5.9 except as indicated in 51.5.8; or
- b) Section 52, whichever apply.