# UL 1236

## STANDARD FOR SAFETY

Battery Chargers for Charging Engine-Starter Batteries

UL Standard for Safety for Battery Chargers for Charging Engine-Starter Batteries, UL 1236

Eighth Edition, Dated April 21, 2015

***Summary of Topics***

***This revision of ANSI/UL 1236 dated February 3, 2021 is being issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS). No technical changes have been made.***

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The requirements are substantially in accordance with Proposal(s) on this subject dated October 30, 2020.

No Text on This Page

**APRIL 21, 2015**
(Title Page Reprinted: February 3, 2021)

**ANSI/UL 1236-2016 (R2021)**



# UL 1236

## Standard for Battery Chargers for Charging Engine-Starter Batteries

The first through third editions were titled Standard for Battery Chargers.

First Edition – December, 1972
Second Edition – July, 1978
Third Edition – December, 1986
Fourth Edition – August, 1992
Fifth Edition – June, 1994
Sixth Edition – March, 2002
Seventh Edition – August, 2006

**Eighth Edition**

**April 21, 2015**

This ANSI/UL Standard for Safety consists of the Eighth Edition including revisions through February 3, 2021.

The most recent designation of ANSI/UL 1236 as a Reaffirmed American National Standard (ANS) occurred on January 12, 2021. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

No Text on This Page

## CONTENTS

### INTRODUCTION



### CONSTRUCTION



### PERFORMANCE

**MANUFACTURING AND PRODUCTION TESTS**



**RATING**



**MARKINGS**

## INSTRUCTIONS



## SUPPLEMENT SA – PLUG-IN BATTERY CHARGERS



## SUPPLEMENT SB – MARINE BATTERY CHARGERS



## SUPPLEMENT SC – BATTERY CHARGERS FOR USE WITH INTERNAL COMBUSTION ENGINES DRIVING CENTRIFUGAL FIRE PUMPS

## SUPPLEMENT SD – BATTERY CHARGERS FOR PERMANENT INSTALLATION IN A VEHICLE



## SUPPLEMENT SE – BATTERY CHARGERS FOR ENGINE-DRIVEN EMERGENCY AND STANDBY POWER SYSTEM GENERATORS



## APPENDIX A



## APPENDIX B

## INTRODUCTION

### 1 Scope

1.1 These requirements cover battery chargers rated 600 volts or less and intended for household or commercial use to charge lead-acid engine-starter and other starting, lighting, and ignition (SLI) type batteries, in accordance with the National Electrical Code, NFPA 70. The requirements also cover a battery charger intended to be permanently installed on a boat.

1.2 A battery charger for use with an internal combustion engine driving a centrifugal fire pump shall comply with the requirements of this Standard and the applicable requirements for the end product.

1.3 These requirements do not cover the following types of battery chargers:

a) Battery chargers for use in industrial applications as covered by the Standard for Industrial Battery Chargers, UL 1564;

b) Battery charger systems for use in electric vehicle applications covered by the Standard for Electric Vehicle (EV) Charging System Equipment, UL 2202;

c) Battery chargers for use with portable tools or household appliances as covered by the Standard for Power Units Other Than Class 2, UL 1012, or the Standard for Class 2 Power Units, UL 1310; and

d) Battery chargers for fire protection signaling service.

### 2 Components

2.1 Except as indicated in 2.2, 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.

2.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

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

2.4 Specific components are 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 used only under those specific conditions.

### 3 Units of Measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

3.2 Unless otherwise stated, values of current and voltage are root-mean-square for alternating current and average for direct current.

## 4 Undated References

4.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

## 5 Glossary

5.1 For the purpose of this standard the following definitions apply.

5.2 BATTERY, VALVE REGULATED (VR) – A battery that is sealed with the exception of a valve that opens to the atmosphere when the internal gas pressure in any cell exceeds atmospheric pressure by a preselected amount. VR batteries provide a means for recombination of internally generated oxygen and the suppression of hydrogen gas evolution to limit water consumption. The term VRLA (valve regulated lead-acid) is also used by the industry.

5.3 BATTERY, VENTED – A battery in which the products of electrolysis and evaporation are allowed to escape freely to the atmosphere. These batteries have commonly been referred to as "flooded."

5.4 BATTERY CHARGER – A device used to replenish the capacity of batteries.

5.5 BATTERY CHARGER, AUTOMATIC – A battery charger which senses that the battery has been charged and automatically maintains or terminates the charge.

5.6 BATTERY CHARGER, COMMERCIAL – A battery charger intended or marketed for use in commercial establishments, such as automotive service stations or battery sales outlets.

5.7 BATTERY CHARGER, FIXED – A battery charger that is intended to be permanently connected electrically.

5.8 BATTERY CHARGER, HOUSEHOLD – A battery charger intended or marketed for use in residential environments.

5.9 BATTERY CHARGER, PLUG-IN – A small household battery charger for mounting by insertion of its integral attachment plug blades in a standard wall receptacle.

5.10 BATTERY CHARGER, PORTABLE – A battery charger that:

a) Has no provision for a permanent wiring system; and

b) Can be moved easily from one place to another for use.

5.11 BATTERY CHARGER, STATIONARY – A cord- and plug-connected battery charger that is intended to be fastened in place or located in a dedicated space.

5.12 BATTERY CHARGER, SWITCH MODE – A battery charger employing a high frequency transformer design where transformer operation is dependent on an inverter circuit.

5.13 CLASS 2 TRANSFORMER – A step-down transformer having a secondary voltage of not more than 30 volts rms (42.4 volts peak) under any condition of loading or open circuit and complying with the applicable requirements in the Standard for Low Voltage Transformers – Part 1: General Requirements, UL 5085-1, and the Standard for Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers, UL 5085-3.

5.14 INJURY TO PERSONS – The words "injury to persons" are in reference to physical harm to persons other than the physiological effects of electric shock.

5.15 LINE-VOLTAGE CIRCUIT – A circuit involving a potential of not more than 600 volts, connected to the utility supply, and having circuit characteristics in excess of those described in 5.16.

5.16 LOW VOLTAGE LIMITED ENERGY CIRCUIT (LVLE) – A circuit involving a potential of not more than 30 volts alternating current (42.4 volts peak) supplied by a battery or by a standard Class 2 transformer or other suitable transforming device, or by a suitable combination of transformer and fixed impedance having output characteristics in compliance with what is required for a Class 2 transformer. A circuit obtained by connecting resistance in series with a line voltage supply circuit as a means of limiting the voltage and current is not considered to be a low voltage circuit.

5.17 MEASUREMENT INDICATION UNIT (MIU) – The output voltage (V3) in millivolts rms from the measurement instrument in Figure 26.3 divided by 500 (the value in ohms of the resistance in parallel with V2 in the measurement instrument circuit). (The indication is essentially the rms value of a 60 Hz sinusoidal leakage current in mA. It may not be a direct indication of the rms or other common amplitude quantifier of leakage current when the leakage current is of complex waveform or frequency other than 50 or 60 Hz.)

5.18 OUTPUT RATINGS –

a) Continuous Output Current Rating – Any current rating that the battery charger is intended to provide continuously without causing any of the components of the battery charger to exceed their temperature rating, with the maximum continuous current rating that a battery charger with multiple current output ratings can supply continuously being its maximum continuous current rating.

b) Non-Continuous Current Rating – Any current rating that the battery charger can supply for a limited period of time, which is to be followed by a rest or reduced current period before being reapplied (i.e., a duty cycle). Examples of non-continuous operation include cranking assist, boost charge, engine start, and similar operating modes that involve periods of output in excess of the continuous output current rating.

5.19 RISK OF ELECTRIC SHOCK – A risk of electric shock is considered likely to occur at any part if the potential between the part and earth ground or any other accessible part is more than 42.4 volts peak and the continuous current flow through a 1500 ohm resistor exceeds 5 milliamperes.

5.20 SPECIALIZED VEHICLE CONNECTOR – A connector provided on the battery charger output cord or cable for mating with a receptacle installed in a vehicle during charging. Connectors intended for use with receptacles conforming with Appendix C of SAE J563, Standard for 12 Volt Cigarette Lighters, Power Outlets, and Accessory Plugs, are not considered specialized vehicle connectors (i.e. lighter receptacles and similarly configured power outlet receptacles).

5.21 TOOL – A screwdriver, coin, key, or any other object that may be used to operate a screw, latch, or similar fastening means.

## CONSTRUCTION

### 6 General

6.1 If the operation and maintenance of a battery charger by the user involves a risk of injury to persons, a risk of electric shock, or a risk of fire, means shall be provided to reduce the risk.

6.2 When evaluating a product with respect to the requirement in 6.1, consideration shall be given to reasonably foreseeable misuse of the product.

## 7 Frame and Enclosure

### 7.1 General

7.1.1 A battery charger shall be formed and assembled so that it has the strength and rigidity necessary to resist the abuses to which it may 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.

7.1.2 A battery charger shall be provided with an enclosure acceptable for the application that shall house all live parts other than the power supply cord or primary connector and the output leads or terminals that may increase the risk of fire, electric shock, or injury to persons under any condition of use.

7.1.3 A sheet metal section of the enclosure shall have a thickness not less than that specified in Table 7.1.

*Exception: A part of an enclosure that complies with the requirements in 31.1.1 and 31.1.5 is not required to have the thickness specified in Table 7.1.*

**Table 7.1**
**Minimum acceptable thicknesses of enclosure metal**

| Metal | Minimum thickness, inch (mm) | | | |
|---|---|---|---|---|
| | At surfaces other than those to which a wiring system is to be connected in the field | | At surfaces to which wiring system is to be connected in the field | |
| Uncoated sheet steel | 0.026 | (0.66) | 0.032 | (0.81) |
| Galvanized sheet steel | 0.029 | (0.74) | 0.034 | (0.86) |
| Nonferrous sheet metal other than copper | 0.036 | (0.91) | 0.045 | (1.14) |

7.1.4 An enclosure or part of an enclosure that also serves as a compartment for a rechargeable vented or valve regulated battery shall be ventilated to permit dispersion of gases from the battery. See 5.2 and 5.3.

### 7.2 Mounting

7.2.1 A portable battery charger intended for wall mounting shall employ a keyhole slot or the equivalent as a mounting means.

7.2.2 A barrier or the equivalent may be used to prevent wall-mounting screws from projecting into a compartment containing electrical parts and reducing spacings to less than that specified in Spacings, Section 23.

7.2.3 Mounting instructions shall be furnished with a battery charger intended for permanent mounting. If the mounting hardware is not readily available commercially, the manufacturer shall provide the hardware with the charger.

### 7.3 Integral meters

7.3.1 If an electrical instrument, such as a meter, forms part of the enclosure, the face or the back of the instrument housing, or both together, shall comply with the requirements for an enclosure.

*Exception No. 1: An electrical instrument connected in a secondary circuit need not comply with this requirement if damage to or deterioration of the materials of which the housing is made will not result in a risk of fire or electric shock.*

*Exception No. 2: This requirement does not apply to a meter complying with the requirements in the Standard for Electrical Analog Instruments – Panelboard Types, UL 1437.*

### 7.4 Supporting materials

7.4.1 Material supporting terminals or used as internal electrical insulation of an electrical instrument shall comply with the requirements for Insulating Materials, Section 14. Acceptability of spacings between live and dead metal parts connected to the enclosure within the instrument shall be determined by the Dielectric Voltage Withstand Test, Section 29.

*Exception: An electrical instrument connected in a secondary circuit need not comply with this requirement if damage to or deterioration of the materials will not result in a risk of fire or electric shock.*

7.4.2 Polymeric supporting feet of a battery charger that form part of the enclosure or are necessary for ventilation shall have the aging, physical, and flammability properties of the material investigated. The effect of oil and the absorption of moisture on the mounting feet of the battery charger are also to be considered.

### 7.5 Materials

7.5.1 In addition to the performance tests specified in this Standard, the factors to be considered when evaluating the suitability of a polymeric enclosure are:

a) Material flammability properties;

b) Resistance to arcing properties; and

c) Moisture absorptive properties.

These properties shall comply with the requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C. See also 25.4.

7.5.2 A conductive coating applied to a nonmetallic surface such as the inside surface of a cover, enclosure, and the like shall comply with the appropriate requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, unless it can be determined that flaking or peeling of the coating does not result in a reduction of spacings or the bridging of live parts that may result in a risk of fire, electric shock, or injury to persons.

7.5.3 An adhesive used to attach a cover to a battery charger shall comply with the requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

*Exception: This requirement does not apply to methods utilizing fusion techniques, such as solvent cementing, ultrasonic welding, electromagnetic induction, and thermal welding.*

7.5.4 The material of a part, such as an enclosure, a frame, a guard, or the like, the breakage of which results in a risk of injury to persons, shall have properties that meet the demand of expected loading conditions.

7.5.5 The requirement in 7.5.4 applies to those portions of a part adjacent to a moving part considered to involve a risk of injury to persons.

### 7.6 Barriers

7.6.1 A rotating member, such as a fan blade, the breakage of which results in a risk of injury to persons, shall be enclosed or guarded to reduce the risk of injury.

7.6.2 The combination of enclosure and internal barriers of a battery charger shall reduce the likelihood of molten metal, burning insulation, flaming particles, or the like, falling on combustible materials, including the surface upon which the charger is supported. An internal barrier may be an integral part of a component or of the charger enclosure.

7.6.3 To comply with the requirement in 7.6.2, an enclosure having openings in the bottom shall be provided with a barrier in accordance with 7.6.4 and with Figure 7.1.

*Exception: The following components do not require a barrier:*

*a) An individually enclosed component if it contains arcing parts, such as a switch, relay, or contactor;*

*b) A motor without openings in the bottom of the housing, or a motor constructed in accordance with 7.6.5;*

*c) Internal wiring insulated with neoprene, thermoplastic, fiberglass, or an equally fire-retardant material;*

*d) An individually enclosed fuse, such as an extractor type. Consideration will be given to a fuse enclosed within a transformer winding; and*

*e) A component having a magnetic winding or coil (such as a transformer, relay or solenoid) complying with the applicable abnormal tests of Section 38, Abnormal Tests.*

7.6.4 The barrier mentioned in 7.6.3 shall:

a) Be horizontal;

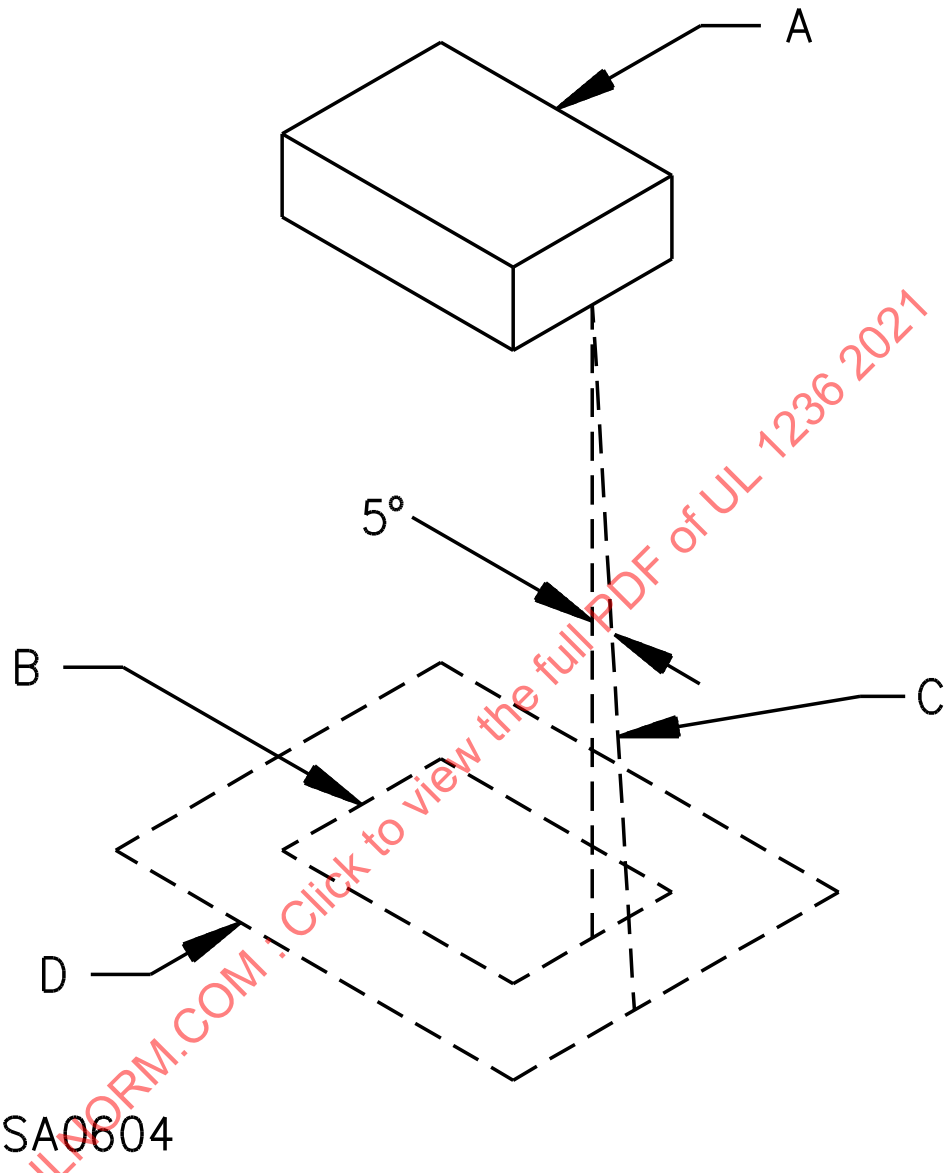
b) Be located as illustrated in Figure; and

c) Have an area in accordance with Figure 7.1.

The barrier may be a perforated metal plate as described in Table; a galvanized or stainless steel screen having a 14- by 14-mesh per inch (25.4-mm) constructed of wire with a diameter of 0.018 inch (0.5 mm) minimum; or other construction complying with the Hot, Flaming Oil Test, Section 45.

**Figure 7.1**

**Location and extent of barrier**






A – Region to be shielded by barrier. This region consists of the entire component if it is not otherwise shielded, and consists of the unshielded portion of a component partially shielded by the component enclosure or equivalent.

B – Projection of outline of component on horizontal plane.

C – Inclined line that traces out minimum area of barrier. When moving, the line is always:

1) Tangent to the component,

2) 5 degrees from the vertical, and

3) So oriented that the area traced out on a horizontal plane is maximum.

D – Location (horizontal) and minimum area for barrier. The area is that included inside the line of intersection traced out by the inclined line C and the horizontal plane of the barrier.

**Table 7.2**
**Perforated metal plates for enclosure bottom**

| Minimum thickness | | Maximum diameter of holes | | Minimum spacings of holes center to center | |
|---|---|---|---|---|---|
| inch | (mm) | inch | (mm) | inch | (mm) |
| 0.026 | (0.66) | 0.045 | (1.14) | 0.067 | (1.70) |
| 233 holes per inch$^2$ (645 mm$^2$) | | | | | |
| 0.026 | (0.66) | 0.047 | (1.19) | 0.093 | (2.36) |
| 0.030 | (0.76) | 0.045 | (1.14) | 0.067 | (1.70) |
| 0.030 | (0.76) | 0.047 | (1.19) | 0.093 | (2.36) |
| 0.032 | (0.81) | 0.075 | (1.91) | 0.125 | (3.18) |
| 72 holes per inch$^2$ (645 mm$^2$) | | | | | |
| 0.035 | (0.89) | 0.075 | (1.90) | 0.125 | (3.18) |
| 0.036 | (0.91) | 0.063 | (1.60) | 0.109 | (2.77) |
| 0.036 | (0.91) | 0.078 | (1.98) | 0.125 | (3.18) |
| 0.039 | (0.99) | 0.063 | (1.60) | 0.109 | (2.77) |
| 0.039 | (0.99) | 0.079 | (2.00) | 0.118 | (3.00) |

7.6.5 As indicated in Exception(b) to 7.6.3, a motor does not require a barrier if:

a) The overload protection provided with the motor is such that no burning insulation or molten material falls to the surface that supports the charger when the motor is energized under each of the following fault conditions:

1) Open main winding;

2) Open auxiliary winding; and

3) Starting switch short-circuited;

b) The motor is provided with a thermal motor protector – a protective device that is sensitive to temperature and current – that prevents the temperature of the motor winding from exceeding:

1) 125°C (257°F) when the motor is running at the maximum load at which it can operate without causing the protector to cycle; and

2) 150°C (302°F) with the rotor of the motor locked; or

c) The motor complies with the requirements for impedance protected motors and the temperature of the motor windings will not exceed 150°C (302°F) during the first 72 hours of operation with the rotor locked.

7.6.6 A component of a cart-type battery charger that may produce arcing, such as a snap switch, a relay, or a receptacle, shall be located at least 18 inches (457 mm) above the floor. Other types of battery chargers for use in commercial garages shall be marked in accordance with 50.6.

## 7.7 Protection against injury to persons

7.7.1 A part that could cause injury to persons shall be enclosed.

7.7.2 A rotating or moving part that, if it should become disengaged may create a risk of injury to persons, shall be provided with a means to retain the part in place under conditions of use.

7.7.3 Whether a guard, a release, an interlock, or the like is required, and whether such a device is adequate, shall be determined from an investigation of the complete battery charger, its operating characteristics, and the likelihood of a risk of injury to persons resulting from a cause other than gross negligence. The investigation shall include consideration of the results of breakdown or malfunction of any component, but not more than one component at a time, unless one event contributes to another. If the investigation shows that breakdown or malfunction of a particular component can result in a risk of injury to persons, that component is to be investigated for reliability.

7.7.4 An opening in a guard or enclosure around a moving part that involves a risk of injury to persons shall have a minor dimension less than 1 inch (25.4 mm), and shall not permit the probe illustrated in Figure 8.1 to contact the part when the probe is inserted with a force of 1 pound (4.4 N) through the opening to its maximum depth in a straight or articulated position.

7.7.5 Among the factors to be considered in judging the acceptability of an exposed moving part posing a risk of injury are:

a) The degree of exposure necessary to perform its intended function;

b) The sharpness of the moving part;

c) The likelihood of unintentional contact;

d) The speed of the moving part; and

e) The likelihood that a part of the body would be endangered or that clothing would be entangled by the moving part.

These factors are to be considered with respect to both intended operation of the battery charger and reasonably foreseeable misuse.

7.7.6 An enclosure, an opening, a frame, a guard, a knob, a handle, or the like shall not be sufficiently sharp to cause a risk of injury to persons in normal maintenance or use.

7.7.7 A guard or portion of an enclosure acting as a guard for a part that may involve a risk of injury to persons shall be either:

a) Mounted to the assembly so that the part cannot be operated with the guard or portion of the enclosure removed;

b) Secured to the assembly using fasteners requiring a tool for removal; or

c) Provided with an interlock to reduce the risk of contacting the part.

*Exception: This requirement does not apply to a commercial battery charger marked as required by 49.10 and 50.14.*

### 7.8 Outdoor enclosures

7.8.1 The enclosure of a battery charger for outdoor use shall be constructed to exclude a beating rain.

7.8.2 The requirements in 7.8.3 – 7.8.8 apply to battery chargers not marked in accordance with 50.9.

7.8.3 An outdoor enclosure shall be subjected to the Water Spray Test, Section 30. Alternatively, an outdoor enclosure shall comply with the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E. When subjected to the Water Spray Test, Section 30, an enclosure designated as:

a) Raintight shall prevent rain from entering the enclosure.

b) Rainproof shall prevent rain from interfering with the successful operation of the battery charger.

7.8.4 An outdoor enclosure shall be marked as specified in 49.9.

7.8.5 A gasket employed in a battery charger, including a cart-type charger as specified in the Exception to 50.9, shall be tested in accordance with Accelerated Aging of Gaskets, Sealing Compounds, and Adhesives, Section 42.

7.8.6 A raintight or rainproof enclosure shall be provided with external means for mounting.

*Exception: A rainproof enclosure may be provided with internal means for mounting if the mounting means is constructed to prevent water from entering the enclosure.*

7.8.7 For a raintight enclosure, all openings for conduit other than in the bottom shall be threaded.

7.8.8 For a rainproof enclosure, openings for conduit shall be threaded unless they are located wholly below the lowest terminal lug or other live part within the enclosure, and there shall be provision for drainage of the enclosure if knockouts or unthreaded holes are provided other than in the bottom.

## 8 Accessibility of Live Parts

8.1 An opening in the enclosure of a battery charger is acceptable if a probe as illustrated in Figure 8.1, when inserted through the opening, cannot be made to touch any uninsulated live part that can cause electric shock. See 5.19.

**Figure 8.1**

**Articulate probe with web stop**