



UL 2595

STANDARD FOR SAFETY

General Requirements for Battery-Powered Appliances

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UL Standard for Safety for General Requirements for Battery-Powered Appliances, UL 2595

First Edition, Dated May 22, 2013

Summary of Topics

This is the First Edition of the Standard for General Requirements for Battery-Powered Appliances, UL 2595.

The new requirements are substantially in accordance with Proposal(s) on this subject dated November 2, 2012 and February 8, 2013.

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The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

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ANSI/UL 2595-2013

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UL 2595

Standard for General Requirements for Battery-Powered Appliances

First Edition

May 22, 2013

This ANSI/UL Standard for Safety consists of the First Edition.

The most recent designation of ANSI/UL 2595 as an American National Standard (ANSI) occurred on May 22, 2013. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

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 <http://csds.ul.com>.

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1 Scope

1.1 This standard applies to battery operated appliances. This standard applies to appliances incorporating detachable, integral and separable battery packs. The maximum rated voltage for appliances and battery packs is 75 V d.c.

1.2 This standard also applies to battery-powered appliances that are also operated and/or charged directly from the mains or a non-isolated source, including appliances provided with integral battery chargers. The additional considerations for these constructions are contained in Additional Requirements for Battery Operated Appliances with a Connection to Mains or a Non-isolated Source, Section 22.

1.3 These requirements are structured so as to be used in conjunction with an end product standard. These requirements are not intended to provide comprehensive evaluation of a battery operated appliance independent of an end-product standard.

1.4 These requirements only address the potential risks unique to the utilization of a battery supply in a product. With the exception of appliances that also have a mains or non-isolated source, these requirements replace or modify the requirements associated with risk of fire and electric shock for mains powered versions of the appliance in the end product standard. See Indent A in Table D1.1.

1.5 Conditions of use of the product that are the basis for test and other evaluations in the standard are retained and applied, as far as practicable, to these products employing a battery supply.

1.6 Battery operated appliances not able to be connected to mains connected power covered by this standard are not considered to be grounded (class I) or double-insulated (class II), appliances and therefore are not required to have basic, supplementary or reinforced insulation. Electric shock hazard is considered to exist only between parts of opposite polarity.

1.7 Battery packs for appliances covered under this standard intended to be charged by a non-isolated charger shall be evaluated by this standard and the requirements for protection against electric shock of the end-product standard. When evaluating a battery pack for protection against electric shock, the construction and test requirements shall be assessed with the battery fitted to the intended charger.

1.8 When evaluating the risk of fire associated with detachable battery packs, consideration has been given to the fact that these battery packs are unattended energy sources and have been evaluated as such in this standard. Detachable battery packs evaluated by this standard are therefore considered to fulfill an effective protection against the risk of fire equivalent to that of the end-product standard.

1.9 Since battery packs for appliances are submitted to different use patterns (such as rough use, high charging and discharging currents) their safety can be evaluated only by this standard and not by using other standards for battery packs, such as the Standard for Household and Commercial Batteries, UL 2054, unless otherwise indicated in this standard.

1.10 This standard does not apply to the safety of battery chargers themselves. However, this standard covers the safe functioning of lithium-ion battery systems.

1.11 This standard also addresses requirements covering the use of lithium-ion cells employed in battery systems in appliances. The following is considered within the context of these requirements:

- a) These requirements address the risk of fire or explosion of these batteries but do not cover any possible hazards associated with toxicity nor potential hazards associated with transportation or disposal.
- b) Battery systems covered by these requirements are not intended to be serviced by the end user.
- c) These requirements are intended to provide comprehensive evaluation of a battery only if used in products covered by this standard.
- d) These requirements refer to and require parameters supplied in reference to the cells that establish conditions for safe use of those cells. Those parameters form the basis of acceptance criteria for a number of tests contained herein. This standard does not independently evaluate the safety of cells. These parameters, taken as a set, constitute the "Specified Operating Region" for a cell. There may be several sets of specified operating region(s).

1.12 This standard is not intended to apply to appliances using general purpose batteries installed by the user, and this standard alone will not be sufficient to ensure all hazards are considered for these products' "battery packs".

1.13 These requirements do not consider the effect of special applications (such as medical appliances) or special environments (such as hazardous locations).

1.14 These requirements have not been assessed for their suitability for product categories other than appliances such as information technology equipment, telecommunications, laboratory equipment, fire alarm, security systems, emergency lighting, and audio-video apparatus, and may be incomplete with respect to those categories.

1.15 These requirements address the safety of battery systems during storage and use including discharge and charge. These requirements are only considered to be supplementary requirements with respect to the risk of fire and electric shock in battery chargers. The safety of battery chargers for appliances are covered by other standards such as the Standard for Power Units Other Than Class 2, UL 1012, the Standard for Class 2 Power Units, UL 1310, or the Standard for Information Technology Equipment Safety – Part 1: General Requirements, UL 60950-1.

1.16 These requirements make frequent reference to the conditions and tests of the end-product standard while also providing minimum conditions or severity of tests. These minimum conditions shall not be construed to imply equivalence to end-product requirements. Conditions or requirements of end-product standards shall prevail over the conditions or requirements of this standard, unless otherwise indicated in this standard.

1.17 This standard is not intended to cover appliances using lithium-metal type cells, and this standard alone will not be sufficient to ensure all hazards are considered for these types of cells. Lithium-ion cells are not lithium-metal cells.

2 General

2.1 Units of measurement

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

2.2 Undated references

2.2.1 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.

3 Terms and Definitions

3.1 For the purpose of this standard, the following definitions apply.

3.2 **APPLIANCE** – A product, which is not a component of another product, whose primary output consists of heat, light, mechanical motion, or the movement of air. Within these requirements, appliance is assumed to refer to an appliance that derives its operating power from a battery. Appliances do not include products or vehicles intended for the transport of people or cargo.

3.3 **BATTERY** – Assembly of one or more cells intended to provide electrical current to the appliance.

3.4 **BATTERY, INTEGRAL** – Battery which is contained within the appliance and is not removed from the appliance for charging purposes. A battery that is to be removed from the appliance for disposal or recycling purposes only is considered to be an integral battery.

3.5 **BATTERY PACK, DETACHABLE** – Battery which is contained in a separate enclosure from the appliance and is intended to be removed from the appliance for charging purposes.

3.6 **BATTERY PACK, SEPARABLE** – Battery which is contained in a separate enclosure from the appliance and is connected to the appliance by a cord.

3.7 **BATTERY SYSTEM** – Combination of a battery, the charging system and the appliance along with the interfaces between them as would exist in use.

3.8 **C₅ RATE** – The current, in amperes, that a cell or battery can be discharged at for 5 h to the voltage cut-off point specified by the cell manufacturer. This is equal to the C₅ capacity divided by 5 hours where C₅ is measured in accordance with Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Secondary Lithium Cells and Batteries for Portable Applications, IEC 61960; Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Portable Sealed Rechargeable Single Cells – Part 1: Nickel-Cadmium, IEC 61951-1; or Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Portable Sealed Rechargeable Single Cells – Part 2: Nickel-Metal Hydride, IEC 61951-2.

3.9 **CELL** – Basic functional electrochemical unit containing an assembly of electrodes, electrolyte, container, terminals, and usually separators that is a source of electrical energy by direct conversion of chemical energy.

3.10 **CELL, SEALED** – Cell where the gases generated from within the cell may not escape to the atmosphere under normal use although they may escape under abnormal conditions through a pressure sensitive vent. Also known as “valve regulated cell”.

3.11 CELL, VENTED – Cell where the gases generated from within the cell may escape to the atmosphere under normal use. Also known as “flooded cell”.

3.12 CHARGER – Part or all of the charging system contained in a separate enclosure. As a minimum, the charger includes at least some of the power conversion circuitry. Not all charging systems include a separate charger as in the case where an appliance may be charged utilizing a mains supply cord or may incorporate a plug for attachment to a mains receptacle.

3.13 CHARGING SYSTEM – Combination of circuitry intended to charge, balance and/or maintain the state of charge of the battery.

3.14 CLASS I (GROUNDED) APPLIANCE – Appliance in which protection against electric shock does not rely on basic, double or reinforced insulation only, but which includes an additional safety precaution in that conductive accessible parts are connected to the protective grounding (earthing) conductor in the fixed wiring of the installation in such a way that conductive accessible parts cannot become live in the event of a failure of the basic insulation. Also considered as class I appliances are appliances with double insulation and/or reinforced insulation throughout, but also having an grounding (earthing) terminal or grounding (earthing) contact.

3.15 CLASS II (DOUBLE INSULATED) APPLIANCE – Appliance in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions, such as double insulation or reinforced insulation, are provided, there being no provision for protective grounding (earthing) or reliance upon installation conditions.

3.16 CLEARANCE (SPACING THROUGH AIR) – Shortest distance between two conductive parts, or between a conductive part and the outer surface of the enclosure, considered as though metal foil were pressed into contact with accessible surfaces of insulating material, measured through air. Examples of the evaluation of clearances are given in Appendix A.

3.17 CREEPAGE DISTANCE (SPACING OVER SURFACE) – Shortest path between two conductive parts, or between a conductive part and the outer surface of the enclosure, considered as though metal foil were pressed into contact with accessible surfaces of insulating material, measured along the surface of the insulating material. Examples of the evaluation of creepage distance are given in Appendix A.

3.18 DETACHABLE PART – Part which can be removed or opened without the aid of a tool, or a part which is removed in accordance with the instruction for use, except externally accessible brush caps, even if removal requires the use of a tool.

3.19 DUTY CYCLE – Intended operating cycle of an appliance, each cycle being composed of an “on” period of operation followed by an “off” period with the appliance switched off.

3.20 ELECTRONIC COMPONENT – Part in which conduction is achieved principally by electrons moving through a vacuum, gas or semiconductor, with the exclusion of neon indicators. Examples of electronic components are diodes, transistors, triacs, and monolithic integrated circuits. Resistors, capacitors and inductors are not considered electronic components.

3.21 EXPLOSION – Failure that occurs when an appliance enclosure or a detachable or separable battery pack opens violently and large pieces are forcibly expelled in a manner that could result in injury.

3.22 FIRE – Emission of flames from a battery.

3.23 FULLY CHARGED – Cell or battery charged to the maximum state of charge permitted by the battery charging system intended for use with the appliance and in accordance with the manufacturer's instructions.

3.24 FULLY DISCHARGED BATTERY/CELL – Battery or cell that has been discharged at C_5 rate until one of the following conditions occurs: discharge terminates due to protective circuitry or the battery (or cell) reaches a total voltage with an average voltage per cell equal to the end discharge voltage for the cell chemistry being used, unless a different end of discharge voltage is specified by the manufacturer. The end of discharge voltages for common cell chemistries are provided in General Conditions for the Tests, Section 5.

3.25 GENERAL PURPOSE BATTERIES/CELLS – Batteries and cells available from a variety of manufacturers, through a variety of outlets intended for a variety of different manufacturers' products. A 12-V automotive battery and AA, C, and D alkaline cells are examples of general purpose.

3.26 HAZARDOUS VOLTAGE – Voltage between parts having an average value exceeding 60 V d.c. or 42.4 V peak when the peak-to-peak ripple exceeds 10% of the average value. This value is 30 V d.c. or 21.2 V peak when the peak-to-peak ripple exceeds 10% of the average value for those appliances where the user's skin is likely to be wet a majority of time in use. See Indent B in Table D1.1.

3.27 HEATING ELEMENT – A device that produces heat as part of the normal, intended function of an appliance. Devices that produce heat as secondary effect of other functions are not considered heating elements.

3.28 ISOLATED SOURCE – Voltage source in which the output is isolated from the mains supply by means of safety isolation complying with the Standard for Power Units Other Than Class 2, UL 1012, the Standard for Class 2 Power Units, UL 1310, or the Standard for Information Technology Equipment Safety – Part 1: General Requirements, UL 60950-1.

3.29 MAINS – The general purpose AC power distribution external to the equipment, provided within the premises to a service disconnecting means at least one pole of which is intended to be referenced to earth ground.

3.30 MAXIMUM CHARGING CURRENT – Highest current that a lithium-ion cell is permitted to pass during charging for a specified range of temperatures In the Standard for Lithium Batteries, UL 1642. This is the maximum current (I_c) used as the basis of the charging current during the abnormal charging test.

3.31 NO LOAD – Operation of the appliance with no additional loading being applied external to the appliance.

3.32 NON-ISOLATED SOURCE – Voltage source in which the output is not conductively isolated from the mains supply.

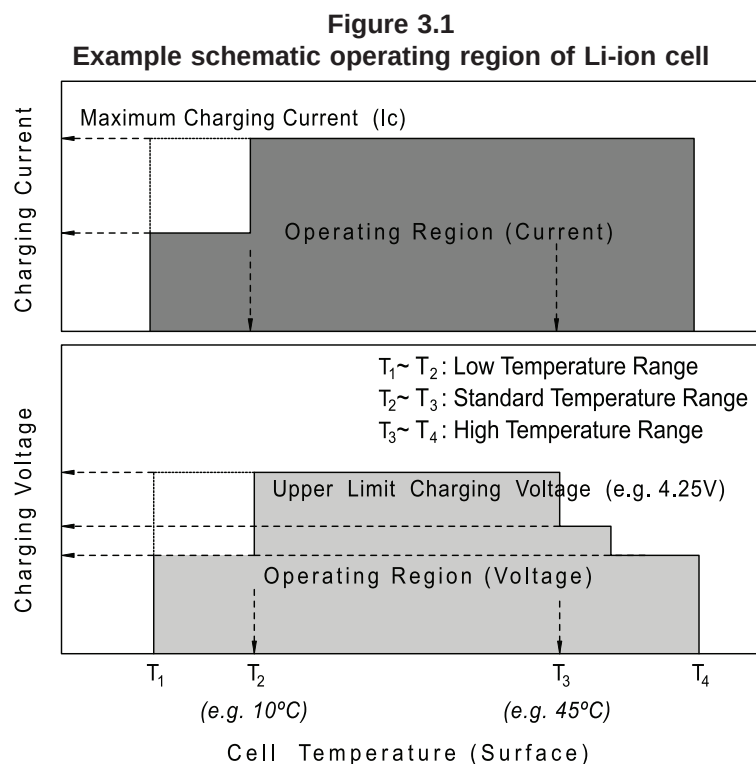
3.33 PROTECTIVE DEVICE – Device, the operation of which prevents a hazardous situation under abnormal operation conditions.

3.34 PROTECTIVE IMPEDANCE – Impedance connected between live parts and accessible conductive parts, and of value so that the current is limited to a safe value.

3.35 SAFETY CRITICAL FUNCTION (SCF) – Function(s) required by this standard, the loss of which would cause the appliance to function in such a manner as to expose the user to a risk that is in excess of the risk that is permitted by this standard or the end product standard under abnormal conditions.

3.36 SPECIFIED OPERATING REGION – Range of permissible operation of lithium-ion cells, expressed by cell parameter limits.

3.37 SPECIFIED OPERATING REGION FOR CHARGING – Conditions during charging in which the lithium-ion cell operates within its voltage and current range as specified by the cell manufacturer and evaluated in accordance with the Standard for Lithium Batteries, UL 1642. In general, the permissible ranges of voltage and current are dependent upon temperature (see Figure 3.1).



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3.38 TEMPERATURE LIMITER – Temperature-sensing device, the operating temperature of which may be either fixed or adjustable, and which, during normal operation, operates by opening or closing a circuit when the temperature of the controlled part reaches a predetermined value. It does not reverse this operation of opening or closing a circuit during the normal duty cycle of the appliance.

3.39 THERMAL CUT-OUT – Device which, during abnormal operation, limits the temperature of the controlled part by automatically opening the circuit, or by reducing the current, the setting of which cannot be altered by the user.

3.40 THERMAL LINK – Thermal cut-out which operates only once, and then requires partial or complete replacement.

3.41 UPPER LIMIT CHARGING VOLTAGE – Highest voltage that a lithium-ion cell is permitted to attain during normal charging for a specified range of temperatures in the Standard for Lithium Batteries, UL 1642. This is the maximum voltage that was employed during the abnormal charging test.

3.42 VENTING – Condition that occurs, when a cell releases excessive internal pressure intended by design to preclude explosion.

4 Classification

4.1 LOW TEMPERATURE (LT) – Detachable or Separable battery pack evaluated for resistance to impact under low ambient temperatures as described in Mechanical Strength, Section 15. See Indent C in Table D1.1.

4.2 EXTRA LOW TEMPERATURE (ELT: t) – Detachable or Separable battery pack, evaluated for resistance to impact under extreme low ambient temperatures as described in Mechanical Strength, Section 15 shall be evaluated to a particular temperature below 0° C and shall be designated ELT: t , where t is the test temperature. (e.g. ELT: -35°C). See Indent C in Table D1.1.

5 General Conditions for the Tests

5.1 Some of the tests may result in fire or explosion. It is therefore important that personnel be protected from the flying fragments, explosive force, sudden release of heat, chemical burns, intense light and noise that may result from such explosions. The test area is to be well ventilated to protect personnel from possible harmful fumes or gases.

5.2 Appliances having more than one rated voltage are tested on the basis of the most unfavorable voltage.

5.3 Unless otherwise specified, a fully charged battery pack shall be used for each test.

5.4 When measuring voltage, the peak value of any superimposed ripple exceeding 10% of the average value shall be included. Transient voltages are ignored, such as a temporary increase in voltage, for example after the battery pack is removed from the charger.

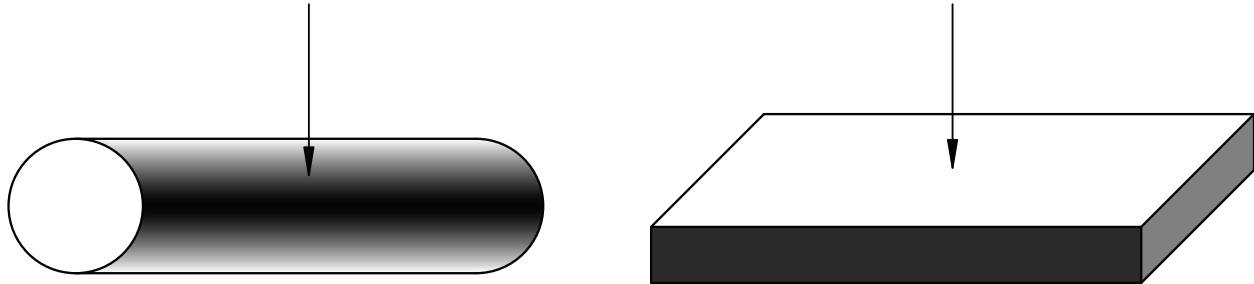
5.5 Measurements of cell voltages during the tests of lithium-ion systems shall be made using a single pole resistive-capacitive low pass filter with a cut-off frequency of 5 kHz $\pm$ 500 Hz. To determine if maximum charging voltages have been exceeded, the peak value of the voltage measured after this network shall be used. The measurement shall have measurement tolerance within $\pm$ 1%.

5.6 Unless otherwise specified, all batteries shall be fully conditioned as follows: batteries shall be either discharged at a rate not to exceed ten times the C_5 rate to the end of discharge voltage or, if discharged in the appliance, until the appliance ceases normal operation and then charged in accordance with the manufacturer's instructions. The sequence shall be repeated one more time with an interval of at least two hours after each discharge.

5.7 The tests are made in a draught-free location and at an ambient temperature of 20 $\pm$ 5°C (68 $\pm$ 9°F), unless otherwise specified. All test samples shall be stabilized to the ambient temperature prior to the test. If the temperature attained by any part is limited by a temperature sensitive device, or is influenced by the temperature, the room temperature is, in case of doubt, maintained at 23 $\pm$ 2°C (73.4 $\pm$ 3.6°F).

5.8 The location of thermocouples for lithium-ion cell temperature measurements shall be on the outer surface, half way along the longest dimension, of the cell that results in the highest temperature. Refer to Figure 5.1 for typical cell configurations and thermocouple locations.

Figure 5.1
Thermocouple location on cell



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5.9 Temperatures are to be measured by thermocouples consisting of wires not larger than 24 AWG (0.21 mm^2) and not smaller than 30 AWG (0.05 mm^2) and a potentiometer-type instrument.

5.10 Currents measured during battery charging shall be average current with the averaging period of 1 – 5 s.

5.11 If not otherwise specified, a fully charged battery shall be used. Before starting a test, the fully charged battery shall be allowed to rest for at least 2 h but no more than 6 h at an ambient temperature of $20 \pm 5^\circ \text{C}$ ($68 \pm 9^\circ \text{F}$) prior to use and after removal from the charging system.

5.12 When a battery comprised of a single cell is employed, instructions in this standard referring to special preparations of a cell in a series configuration shall be ignored.

5.13 For battery designs where there is a series arrangement of parallel clusters of cells, the cluster shall be treated as a single cell for those tests that require altering the amount of charge on a single cell prior to conducting the test.

5.14 Wherever "cheesecloth" is mentioned in the abnormal tests, the cloth shall be bleached cheesecloth, running 14 – 15 yd²/lb (approximately 26 – 28 m²/kg) and having what is known in the trade as a "count of 32 by 28", that is, for any square inch, 32 threads in one direction and 28 threads in the other direction (for any square centimeter, 13 threads in one direction and 11 in the other direction).

5.15 The end of discharge voltages are 0.9 V/cell for nickel cadmium or nickel metal-hydride, 1.75 V/cell for lead acid and 2.5 V/cell for lithium-ion unless the cell manufacturer specifies a different voltage.

6 Markings

6.1 In addition to the safety warnings required in accordance with the applicable end-product standard, a battery-operated appliance shall comply with the applicable marking requirements in 6.2 – 6.8.

6.2 If battery operated appliances and detachable or separable battery packs are marked with voltage information as one means of complying with the requirements of 6.6, the markings shall be as follows:

- a) Voltage(s) or voltage range(s), in volts;
- b) Symbol for nature of supply, either "DC" or the following symbol direct current for battery sources

=== – symbol for direct current (symbol 5031 of ISO 60417)

6.3 Appliances shall be marked with "WARNING – To reduce the risk of injury, user must read instruction manual" or the equivalent.

6.4 The word "WARNING" shall be in capital letters not less than 2.4 mm (0.1 in) high and shall not be separated from the cautionary statement. It may be preceded by the following alert symbol.

△ –the alert symbol (symbol 0434 of ISO 7000)

The term "operator's manual" or "user guide" may be used for the term "instruction manual".

6.5 If the end product standard has a similar required warning, then that may be used to comply with this requirement. Additional markings are allowed, provided they do not give rise to misunderstanding.

6.6 A battery-operated appliance provided with a detachable battery pack or a separable battery pack shall be marked: "For use only with ____ battery (battery pack, etc.)," or the equivalent. The battery pack may be identified by a catalog number, a series identification, or the equivalent. Alternatively, the statement "See Instruction Manual for Additional Battery Packs," or the equivalent may be employed in addition to at least one battery pack referenced by catalog number.

6.7 A detachable battery pack, a separable battery pack, or a battery-operated appliance provided with an integral battery shall be marked "For use only with ____ charger," or the equivalent. The charger may be identified by a catalog number, series identification, or the equivalent. Alternatively, the statement "See Instruction Manual for Additional Chargers," or the equivalent may be employed in addition to at least one charger referenced by catalog number.

6.8 Detachable or separable battery packs shall be marked with additional information as follows:

- a) The manufacturer's name, trade name, or trademark;
- b) A distinctive catalog number or the equivalent; and
- c) The date or other dating period of manufacture not exceeding any three consecutive months. A date-code repetition time cycle shall not be less than 10 years.

Exception No. 1: The manufacturer's identification may be in a traceable code when the appliance is identified by the brand or trademark owned by a private labeler.

Exception No. 2: The date of manufacture may be abbreviated or in an established accepted code, or a code affirmed by the manufacturer. The code shall not require reference to the manufacturer's records to determine when the appliance was produced.

6.9 Separable and detachable battery packs shall also be marked with additional information as follows:

- a) The capacity assigned by the manufacturer in Ah, in accordance with Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Secondary Lithium Cells and Batteries for Portable Applications, IEC 61960; Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Portable Sealed Rechargeable Single Cells – Part 1: Nickel-Cadmium, IEC 61951-1; or Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Portable Sealed Rechargeable Single Cells – Part 2: Nickel-Metal Hydride, IEC 61951-2, as applicable;
- b) For alkaline or other non-acid electrolyte batteries, the type of battery such as Li-Ion, NiCd and NiMH.

7 Instructions

7.1 A battery-operated appliance and detachable or a separable battery pack shall be provided with operating instructions in the instruction manual or the equivalent. The instruction manual shall contain the specific applicable instructions described in 7.2 – 7.6 in addition to the instructions required in the end-product standard. The lettering height used for the signal word "WARNING," and the other wording of the instructions shall be in accordance with the requirements of the end-product standard as applicable to basic cautionary type instructions.

7.2 Instructions shall be legible and contrast with the background. They shall include the name and address of the manufacturer or supplier or any other agent responsible for placing the appliance or battery on the market.

7.3 Instructions may be provided on a blister pack packing card provided the product can be removed without damaging the card containing the instructions.

7.4 The instructions in 7.5 shall be grouped together and be preceded with "WARNING: Read all safety warnings and instructions. Failure to follow the warnings and instructions may result in electric shock, fire and/or serious injury." or equally definitive statement.

7.5 The instruction manual for all battery-operated appliances shall contain the following or equivalent instructions as applicable immediately following any other safety instructions required by the end-product standard. The term "appliance" may be substituted with the name of the actual type of product.

a) Prevent unintentional starting. Ensure the switch is in the off-position before connecting to battery pack, picking up or carrying the appliance. Carrying the appliance with your finger on the switch or energizing appliance that have the switch on invites accidents.

b) Disconnect the battery pack from the appliance before making any adjustments, changing accessories, or storing appliance. Such preventive safety measures reduce the risk of starting the appliance accidentally.

Exception: This instruction is not applicable for batteries that cannot be disconnected from the appliance in normal use.

c) Recharge only with the charger specified by the manufacturer. A charger that is suitable for one type of battery pack may create a risk of fire when used with another battery pack.

d) Use appliances only with specifically designated battery packs. Use of any other battery packs may create a risk of injury and fire.

e) When battery pack is not in use, keep it away from other metal objects, like paper clips, coins, keys, nails, screws or other small metal objects, that can make a connection from one terminal to another. Shorting the battery terminals together may cause burns or a fire.

f) Under abusive conditions, liquid may be ejected from the battery; avoid contact. If contact accidentally occurs, flush with water. If liquid contacts eyes, additionally seek medical help. Liquid ejected from the battery may cause irritation or burns. (This advice is considered correct for conventional NiMH, NiCd, lead acid and lithium-ion cell types. If this advice is incorrect for a cell design that differs from these, then the correct advice may be substituted.)

g) Do not use a battery pack or appliance that is damaged or modified. Damaged or modified batteries may exhibit unpredictable behavior resulting in fire, explosion or risk of injury.

h) Do not expose a battery pack or appliance to fire or excessive temperature. Exposure to fire or temperature above 130°C may cause explosion. The temperature of 130°C can be replaced by the temperature of 265°F.

i) Have servicing performed by a qualified repair person using only identical replacement parts. This will ensure that the safety of the product is maintained.

7.6 The instruction manual shall contain the following information:

a) Instructions regarding battery charging, temperature limits for appliance and battery use and storage, and the recommended temperature range for charging.

b) For a battery-operated appliance intended for use with a detachable battery pack or a separable battery pack: instructions indicating the appropriate battery packs for use, such as by a catalog number, series identification or the equivalent.

c) Instructions indicating the appropriate charger for use, such as by a catalog number, series identification or the equivalent.

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