UL 1230

Underwriters Laboratories Inc.

Standard for Safety

Amateur Movie Lights

UL Standard for Safety for Amateur Movie Lights, UL 1230

Fifth Edition, Dated January 31, 2000

Summary of Topics

These revisions to UL 1230 are being issued to address universal upkeep of UL Standards for Safety. These revisions are considered to be non-substantive and not subject to UL's STP process.

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. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

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that have been revised and that have a future effective date are located after the Standard, and are preceded by a ″SUPERSEDED REQUIREMENTS″ notice.

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UL 1230

Standard for Amateur Movie Lights

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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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INTRODUCTION

1 Scope

1.1 These requirements cover amateur movie and video lights intended to be hand held or attached to a camera. These lights may be cord connected, rated at a nominal 120 V for use with premises wiring systems in accordance with the National Electrical Code, ANSI/NFPA 70, or may be powered by low voltage built-in or separate battery supplies.

1.2 These requirements do not cover movie or video lights intended for professional or commercial use.

1.3 Deleted October 11, 2004

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, 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.

2.1.2 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.

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

2.1.4 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.

2.2 Units of measurement

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

2.3 Undated references

2.3.1 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 Glossary

3.1 AMATEUR MOVIE LIGHT – An assembly consisting of a light source (lamp) and enclosure intended to provide total or fill-in illumination for amateur motion picture or video photography.

3.2 BOUNCE LIGHTING – Provision on a movie light for directing the light beam away from the horizontal while the unit is mounted and used on a horizontally held support (camera).

3.3 EXTERNAL – The outside surface of the enclosure or the plane drawn across the open face of a reflector, but excluding guards and minor projections such as lamp bulb tips, handles, and control knobs.

3.4 NET TOTAL HEAT FLUX DENSITY – The power transferred to a unit area of a surface at room temperature due to both radiation and convection effects.

CONSTRUCTION

4 Frame and Enclosure

4.1 Amateur movie lights shall be so formed and assembled that they will have the strength and rigidity necessary to resist the abuses to which they are 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 or parts, or other serious defects.

4.2 Among the factors which are taken into consideration when determining the acceptability of a nonmetallic enclosure or an enclosure of magnesium are

a) The mechanical strength,

b) Resistance to impact,

c) Moisture-absorptive properties,

d) Combustibility, and

e) Resistance to distortion at temperatures to which the material may be subjected under conditions of intended or abnormal usage.

4.3 Electrical components shall be so located or enclosed as to provide protection against inadvertent contact with uninsulated live parts.

4.4 An opening anywhere in the enclosure of an amateur movie light is acceptable if a probe, as illustrated in Figure 4.1, when inserted point first as far as possible into the opening does not touch any uninsulated live part or coated-magnet wire.

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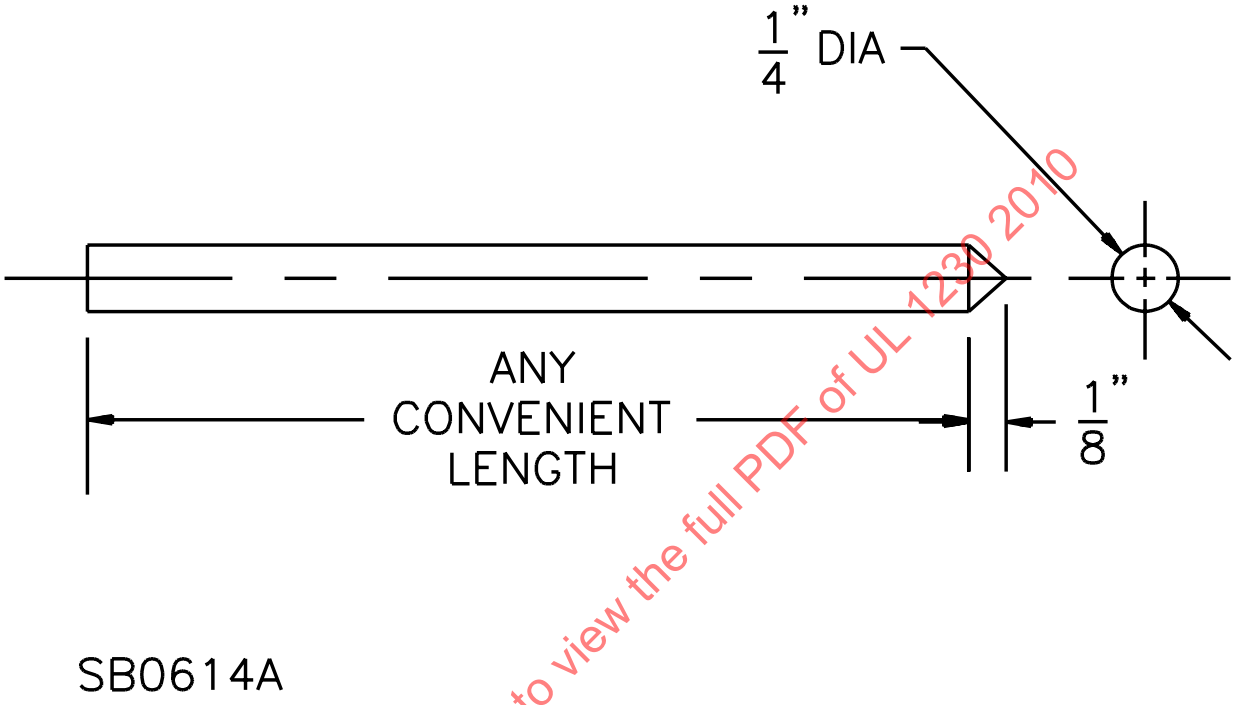
4.5 In connection with the requirement of 4.4, the probe is to be applied with the lamp in place.

4.6 During the examination of a movie light in connection with 4.4, any part of the outer enclosure that may be removed without the use of tools is to be disregarded – that is, it will not be assumed that the part in question affords protection against the risk of electric shock.

Figure 4.1
Articulated accessibility probe



5 Mechanical Assembly

5.1 An amateur movie light shall be so assembled that it will not be adversely affected by the handling involved during intended operation.

5.2 A switch (other than a through-cord switch), a lampholder, or similar component shall be mounted securely and, except as noted in 5.3 shall be kept from turning. See 5.4.

5.3 The requirement that a switch be prevented from turning may be waived if the conditions of (a) – (d) are met:

a) The switch is a plunger or other type that does not tend to rotate when operated (a toggle switch is considered to be subject to forces that tend to turn the switch during intended operation of the switch).

b) The means for mounting the switch makes it unlikely that operation of the switch will loosen it.

c) The spacings are not reduced below the minimum required values if the switch rotates.

d) The intended operation of the switch is by mechanical means rather than by direct contact by persons.

5.4 The means for restricting the turning mentioned in 5.2 is to consist of more than friction between surfaces – for example, a lock washer is acceptable as the means for keeping a small stem-mounted switch or other device, having a single-hole mounting means, from turning.

5.5 A guard intended to limit approach to spaces near a movie light, where the heat flux density exceeds the limits specified in 19.3 and 19.5, shall be of such a configuration that:

a) No part of a 1-1/2 inch (38.1 mm) diameter rod of any convenient length, but considered as of such length as to have no ends (of infinite length), can enter the restricted area when inserted in any manner (see Figure 5.1).

b) No part of a 6 inch (152 mm) diameter cylinder of any convenient length can enter the restricted area when inserted lengthwise along the axis of the light (see Figure 5.2).

5.6 A guard that is relied upon to meet the requirements of 19.3 and 19.5 shall be acceptably secured to the movie light and shall not be removable for the purpose of relamping, cleaning, shipping, or storage unless the construction is such that the movie light cannot be used as intended without the guard in place.

5.7 A guard is considered to be acceptably secured if the use of a tool is required for its removal and the method of removal is not readily apparent to the user either during intended use or during lamp replacement.

Figure 5.1
Rod insertion requirements

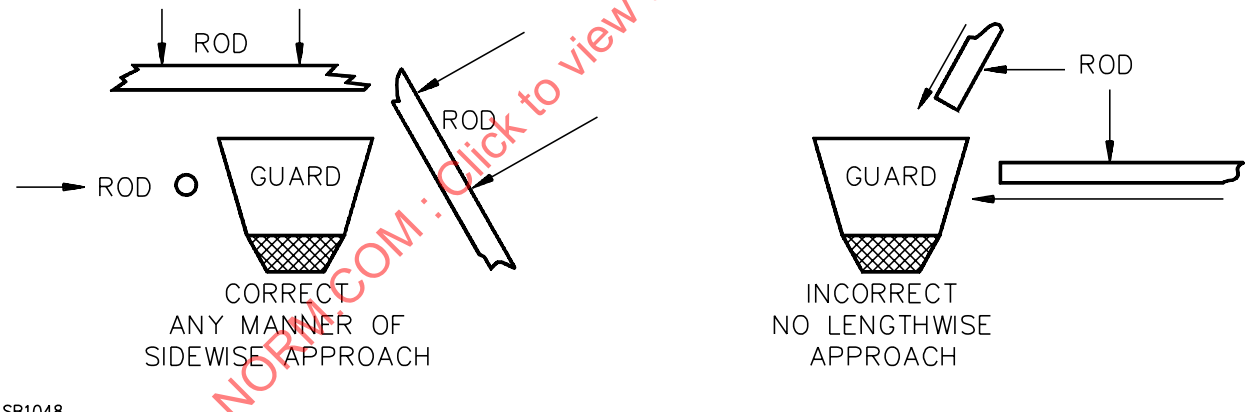
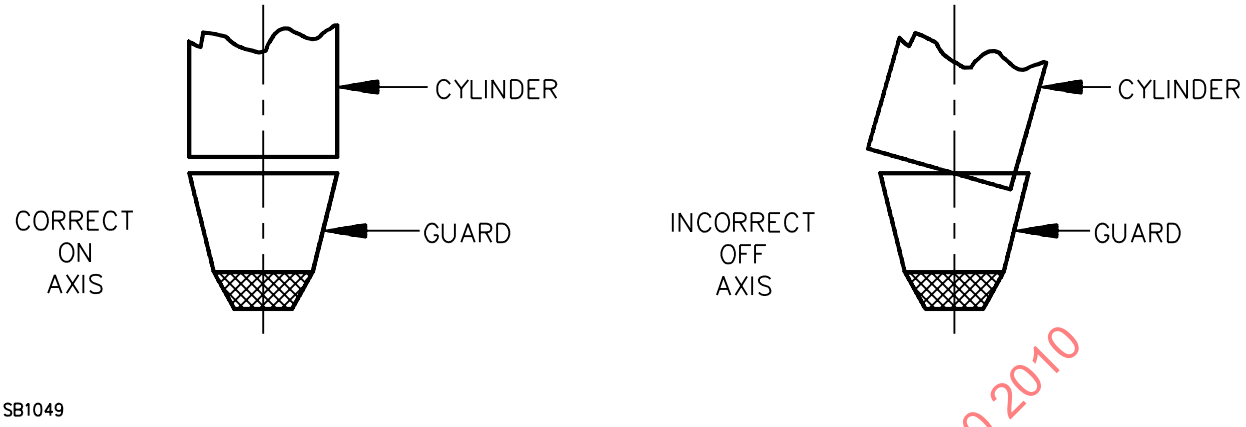


Figure 5.2
Cylinder insertion requirements



6 Corrosion Protection

6.1 Except as noted in 6.2, iron and steel parts shall be protected against corrosion by enameling, galvanizing, plating, or other equivalent means if the failure of such unprotected parts would be likely to result in a risk of fire, electric shock, or injury to persons.

6.2 In certain instances where 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 – surfaces of sheet steel and cast-iron parts within an enclosure may not be required to be protected against corrosion. The requirement in 6.1 does not apply to minor parts of iron or steel, such as washers or screws.

7 Supply Connections

7.1 Cord connected amateur movie lights shall be provided with a length of flexible cord and an attachment plug for connection to a supply circuit.

7.2 The flexible cord shall be rated for use at a voltage not less than the rated voltage of the movie light, and shall have an ampacity, as given in the National Electrical Code, ANSI/NFPA 70, not less than the current rating of the movie light.

7.3 The attachment plug of the power supply cord of an appliance provided with a 15 or 20 A general-use receptacle shall be of the 3-wire grounding type. The attachment plug of the power supply cord of an appliance provided with a manually operated, line-connected, single pole switch for appliance on-off operation, or an Edison-base lampholder shall be of the polarized or grounding type.

7.4 If a 3-wire grounding-type attachment plug or a 2-wire polarized attachment plug is provided, the attachment plug connections shall comply with Figure 7.1 and the polarity identification of the flexible cord shall comply with Table 7.1.

7.5 The conductor of the power supply cord that is intended to be grounded shall have the following items connected to it:

a) The screw shell of an Edison-base lampholder and

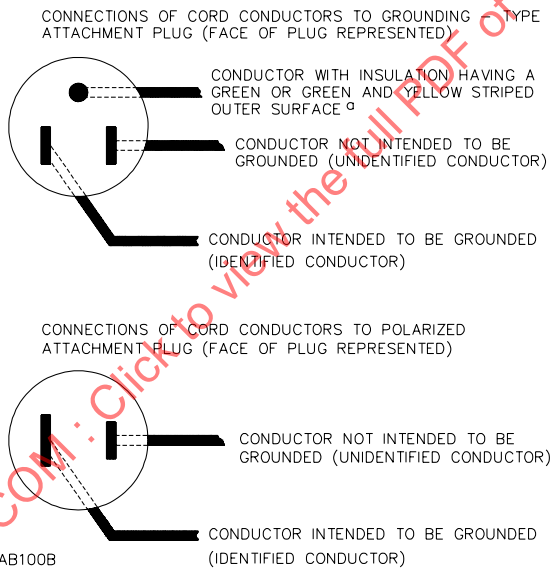
b) The terminal or lead of a receptacle intended to be grounded.

Table 7.1 identifies the supply cord conductor intended to be grounded.

7.6 The attachment plug shall be acceptable for use with a current not less than 125 percent of the rated current, and at the rated voltage of the movie light.

7.7 The flexible cord shall be Type SP-2 or SPT-2, or shall be of a type at least equally serviceable.

Figure 7.1
Connections to attachment plug



[a] In the above illustration, the blade to which the green conductor is connected may have a U-shaped instead of a circular cross section

7.8 When measured from the point of exit from the movie light enclosure to the face of the attachment plug, the length of Type SP-2, SPT-2, SV, or SVT cord shall be 6 – 12 feet (1.83 – 3.6 m) and Type SJ, SJT, or heavier cord shall not be less than 6 feet (1.83 m).

Table 7.1
Polarity identification of flexible cords

Table 7.1 revised October 11, 2004

Method of identification	Acceptable combinations		
	Wire intended to be grounded[d]		All other wires[d]
Color of Braids on individual conductors	A	Solid white or gray – without tracer	Solid color other than white or gray – without tracer
	B	Color other than white or gray, with tracer in braid	Solid color other than white or gray – without tracer
Color of insulation on individual conductors	C[a]	Solid white or gray	Solid color other than white or gray
	C1[e]	Light blue	Solid color other than light blue, white, or gray
Color of separators	D[b]	White or gray	Color other than white or gray
Other means	E[c]	Tin or other white metal on all strands of the conductor	No tin or other white metal on the strands of the conductor
	F[b]	A stripe, ridge, or groove on the exterior surface of the cord	

[a] Only for cords – other than Type SP-2 – having no braid on any individual conductor.

[b] Only for Types SP-2 and SPT-2 cords.

[c] Only for Type SPT-2 cord.

[d] A wire finished to show a green color with or without one or more yellow stripes or tracers is to be used only as an equipment-grounding conductor. See Figure 7.1.

[e] For jacketed cords.

7.9 A metal strain-relief clamp or band is to be used with Type SP-2 rubber-insulated cord only if acceptable auxiliary insulation is provided over the cord for mechanical protection. Auxiliary insulation may be omitted for Type SV or SVO cord. Unless acceptable for the purpose, clamps of any material (metal or otherwise) are not to be used on Types SVT, SVTO, and SPT-2 cords, except that, if the cord is protected by varnished-cloth tubing or the equivalent under the clamp, the construction may be accepted. For heavier types of thermoplastic-insulated cord, clamps may be employed. In such cases, the auxiliary insulation is not required unless it is judged that the design of the clamp is damaging to the cord insulation.

7.10 Means shall be provided to keep the flexible cord from being pushed into the movie light through the cord-entry hole if such displacement is likely to subject the cord to mechanical damage or to exposure 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 acceptable minimum values.

7.11 Strain relief shall be provided in the movie light and in the fittings of the supply cord to keep a stress on the cord from being transmitted to the terminals or wiring inside the light or to the terminals of fittings. See the Strain Relief Test, Section 21.

7.12 If a knot in a flexible cord serves as strain relief, a surface with which the knot may come in contact shall be free from projections, sharp edges, burrs, fins, and similar hazards, that may cause abrasion of the insulation on the conductors.

8 Bushings

8.1 At a point where 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 secured in place, and shall have a smooth, well-rounded surface against which the cord may bear. If the wall or barrier is of metal, or if the construction is such that the cord may be subjected to strain or motion, an acceptable insulating bushing shall be provided.

8.2 If the cord hole is in wood, porcelain, phenolic composition, or other acceptable nonconducting material, a smooth, well-rounded surface is considered to be equivalent to a bushing.

8.3 Ceramic materials and some molded compositions shall be used for an insulating bushing; but separate bushings of wood or of hot-molded shellac-and-tar compositions are not acceptable.

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

8.5 At any point in a movie light, a bushing of the same material as, and molded integrally with, the supply cord is acceptable on the cord 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.

8.6 An insulated metal grommet shall be acceptable instead of an insulating bushing, provided that the insulating material used is not less than 1/32 inch (0.8 mm) thick and fills completely the space between the grommet and the metal in which it is mounted.

9 Live Parts

9.1 A current-carrying part shall be of silver, copper, a copper alloy, or other metal acceptable for the particular application.

9.2 Ordinary iron or steel, if provided with an acceptable corrosion-resistant coating, may be used for a current-carrying part if acceptable in accordance with Components, 2.1, but the use of ordinary iron or steel for current-carrying parts elsewhere in a movie light is not acceptable. The foregoing does not apply to stainless steel.

9.3 Uninsulated live parts shall be secured to the base or mounting surface so that they will be kept from turning or shifting in position, if such motion may result in a reduction of spacings below the minimum acceptable values.

9.4 Friction between surfaces is not sufficient to restrict shifting or turning of live parts, but a properly applied lock washer is acceptable.

10 Internal Wiring

10.1 Wires within an enclosure, compartment, or similar defined area shall be disposed or protected so that no damage to conductor insulation can result from contact with any rough, sharp, or moving part.

10.2 Insulated wires may be bunched and passed through a single opening in a metal wall within the enclosure of a movie light.

10.3 The internal wiring of a movie light shall consist of wires intended for the particular application when considered with respect to the temperature, voltage and other conditions of service to which the wiring is likely to be subjected.

10.4 All splices and connections shall be mechanically secure and shall provide intended electrical contact. A soldered connection shall be made mechanically secure before being soldered if breaking or loosening of the connection may result in a risk of fire, electric shock, or injury to persons.

10.5 A splice shall be provided with insulation equivalent to that of the wires involved if permanence of spacing between the splice and other metal parts is not ensured.

10.6 Insulation consisting of two layers of friction tape, two layers of thermoplastic tape, or one layer of friction tape on top of one layer of rubber tape, is acceptable on a splice. In determining if splice insulation consisting of coated-fabric, thermoplastic or other type of tubing is acceptable, consideration is to 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.

10.7 Aluminum conductors, insulated or uninsulated, used as internal wiring, such as for interconnection between current-carrying parts, shall be terminated at each end by a method that considers the combination of metals involved at the connection point.

10.8 If a wire-binding screw construction or a pressure wire connector is used as a terminating device, it shall be intended for use with aluminum under the conditions involved (for example, temperature, heat cycling, vibration).

11 Insulating Material

11.1 Material for mounting uninsulated live parts shall be porcelain, phenolic composition, or other equivalent material.

11.2 Vulcanized fiber may be used for insulating bushings, washers, separators, and barriers, but not as the sole support for uninsulated live parts where shrinkage, current leakage, or warpage may introduce a risk of fire, electric shock, or injury to persons. Thermoplastic materials generally are not acceptable for the sole support of uninsulated live parts, but may be used if found to have mechanical strength and rigidity, resistance to heat, resistance to flame propagation, dielectric strength, and other properties acceptable for the intended application.

12 Switches

12.1 A switch or other control device shall be intended for the application with a rating not less than that of the load which it controls.

12.2 A switch that controls a tungsten-filament lamp shall be intended for use with that type of lamp or shall have a current rating not less than six times the steady state tungsten load.

12.3 A switch of the single-pole type shall not be connected in the conductor intended to be grounded, as described in Table 7.1.

13 Spacings

13.1 Except as noted in 13.2 and 13.3, the spacing between uninsulated live parts of opposite polarity and between uninsulated live parts and a dead metal part that is exposed to contact by persons or that may be grounded, shall not be less than 3/32 inch (2.4 mm) for both through air and over surface. If an uninsulated live part is not rigidly fixed in position (by means other than friction between surfaces), or if a movable dead metal part is in proximity to an uninsulated live part, the construction shall be such that the required minimum spacing will be maintained.

13.2 The spacing requirements of 13.1 do not apply to the inherent spacings of a component of a movie light, such as a snap switch. These spacings are judged on the basis of the requirements for the component in question.

13.3 If an isolated dead metal part is interposed between or is in close proximity to:

a) Live parts of opposite polarity,

b) A live part and an exposed dead metal part, or

c) A live part and a dead metal part that may be grounded,

the spacing shall not be less than 3/64 inch (1.2 mm) between the isolated dead metal part and any one of the other parts mentioned. This is provided the total spacing between the isolated dead metal part and the two other parts is not less than 3/32 inch (2.4 mm).

13.4 Except as noted in 13.5, an insulating lining or barrier of vulcanized fiber or similar materials used where spacing would otherwise be insufficient shall not be less than 0.028 inch (0.71 mm) thick. It shall be so located or of such material that it will not be adversely affected by arcing. Vulcanized fiber not less than 0.013 inch (0.33 mm) thick may be used in conjunction with an air spacing of not less than 50 percent of the spacing required for air alone.

13.5 Insulating material having a thickness less than that specified in 13.4 may be used, if upon investigation, it is found to be acceptable for the particular application.

14 Grounding

14.1 If a grounding means is provided in the supply cord, all exposed dead metal parts and all dead metal parts that are exposed to contact during any user servicing (such as relamping) and are likely to become energized shall be reliably connected to the grounding conductor.

14.2 Where grounding is provided, the supply cord shall include a grounding conductor that shall be:

a) Green with or without one or more yellow stripes,

b) Connected to the grounding blade of an attachment plug of the grounding type, and

c) Connected to the metal enclosure of the movie light by means of a screw not likely to be removed during user servicing, or by other equivalent means. Solder alone is not acceptable for making this connection.

14.3 The screw specified in 14.2(c), shall be of corrosion resistant material, or shall be resistant to corrosion in a manner which will not inhibit electrical conductivity between the screw and any other conductor. A lock washer shall be used to keep the screw from becoming loosened due to handling involved in the intended use of the product.

PERFORMANCE

15 General

15.1 The performance of amateur movie lights shall be investigated by subjecting samples to the tests outlined in Sections 16 – 24.

16 Leakage Current Test

16.1 The leakage current of a movie light, when tested in accordance with 16.3 – 16.6, shall not be more than 0.5 mA.

16.2 Leakage current refers to all currents, including capacitively coupled currents, which may be conveyed between exposed conductive surfaces of a movie light and ground or other exposed conductive surfaces of a movie light.

16.3 All exposed conductive surfaces are to be tested for leakage current. The leakage current from these surfaces is to be measured to the grounded supply conductor individually as well as collectively where simultaneously accessible, and from one surface to another where simultaneously accessible. Parts are considered to be exposed surfaces unless guarded by an enclosure found acceptable for protection against the risk of electric shock as defined in 4.3 and 4.4. 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.

16.4 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 4 by 8 inches (10 by 20 cm) in contact with the surface. Where the surface is less than 4 by 8 inches (10 by 20 cm), 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 a movie light.

16.5 The measurement circuit for leakage current is to be as shown in Figure 16.1. The measurement instrument is as specified in (a) – (d). The meter actually used for a measurement shall only indicate the same numerical value for a particular measurement as would the defined instrument. The meter used is not required to have all the attributes of the defined instrument.

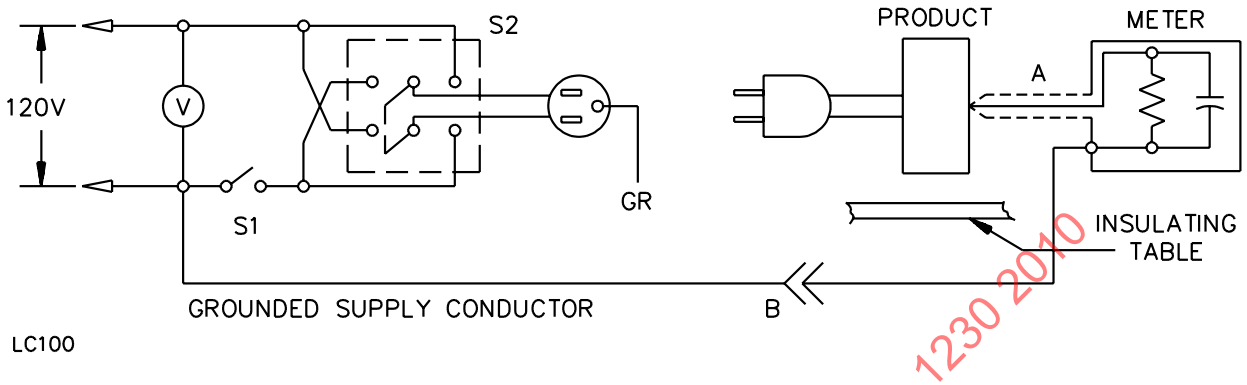
a) The meter is to have an input impedance of 1500 ohms resistive shunted by a capacitance of 0.15 µF.

b) The meter is to indicate 1.11 times the average of the full-wave rectified composite waveform of the 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) equal to the ratio of the impedance of a 1500 ohm resistor shunted by a 0.15 µF 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 movie light to another, the meter is to be connected between the accessible parts and the grounded supply conductor.

Figure 16.1
Leakage-current measurement circuit



A – Probe with shielded lead.

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

16.6 A sample of a movie light is to be tested for leakage current starting with the as received condition, that condition being without prior energization except as may occur as part of the production line testing. The supply voltage is to be adjusted to 120 V. The test sequence, with reference to the measurement circuit (Figure 16.1), is to be as specified in (a) – (c):

a) With switch S1 open, a movie light is to be connected to the measurement circuit. Leakage current is to be measured using both positions of switch S2, and with the movie light switching devices in the intended operating positions.

b) Switch S1 is then to be closed, energizing the movie light, and within a period of 5 seconds the leakage current is to be measured using both positions of switch S2 and with the movie light switching devices in their intended positions.

c) Leakage current is to be monitored for 15 minutes. Both positions of switch S2 are to be used in determining this measurement.

17 Input Test

17.1 The wattage input to an amateur movie light shall not be more than 105 percent of the rated value when the light is operated while connected to a supply circuit of 120 V and 60 Hz.

18 Temperature Test

18.1 A movie light when energized at 120 V, 60 Hz shall not attain a temperature at any point sufficiently high to constitute a risk of fire or to damage any materials used in a movie light, nor shall a movie light indicate greater temperature rises at specific points than those indicated in Table 18.1. A movie light shall be energized continuously and operated until temperatures become constant.

18.2 A temperature is considered to be constant when three successive readings, taken at intervals of 10 percent of the previously elapsed duration of the test, but not less than 5 minute intervals, indicate no change.

18.3 All values for temperature rises in Table 18.1 are based on an assumed ambient temperature of 25°C (77°F). Tests shall be conducted at any ambient temperature within the range of 10 – 40°C (50 – 104°F). If a movie light incorporates a reel for the power-supply cord, one-third of the length of the cord is to be extended for the temperature test.

18.4 Temperatures are to be measured by thermocouples consisting of wires not larger than No. 24 AWG (0.21 mm^2) and not smaller than No. 30 AWG (0.05 mm^2). When thermocouples are used in determining temperatures in electrical equipment, it is common practice to use thermocouples consisting of No. 30 AWG iron and constantan wire and a potentiometer-type instrument. Such equipment is to be used whenever referee temperature measurements by thermocouples are necessary.

18.5 The thermocouples and related instruments are to be accurate and calibrated in accordance with established laboratory practice. The thermocouple wire is to conform with the requirements for special thermocouples as listed in the Initial Calibration Tolerances for Thermocouples table in the Standard for Temperature-Measurement Thermocouples, ANSI/ISA MC96.1.

18.6 A rubber- or thermoplastic-insulated flexible cord exposed to a temperature of more than 60°C (140°F), such as at terminals, is acceptable if supplementary heat-resistant insulation of adequate dielectric strength is used on the individual conductors of the cord to reduce the deterioration of the conductor insulation.

18.7 Temperatures on outer enclosures of amateur movie lights and parts subject to operator handling shall be limited to the maximum specified in Table 18.2 at any time until temperatures become constant during intended operation at 120 V as indicated in 18.1. If the test is conducted at a room temperature other than 25°C (77°F), the results are to be corrected to that temperature.

Table 18.1
Maximum acceptable temperature rises

Materials and component parts	°C	(°F)
1. Varnished-cloth insulation	60	108
2. Fiber used as electrical insulation	65	117
3. Wood and other combustible material	65	117
4. Class 105 insulating systems		
Thermocouple method	65	117
5. Class 130 insulating systems		
Thermocouple method	85	153
6. Phenolic composition used as electrical insulation or as a part whose failure would result in a risk of fire, electric shock or injury to persons	125[a]	225[a]
7. Rubber- or thermoplastic-insulated wires and cords	35[a]	63[a]
8. Capacitors		
Electrolytic	40	72
Other types	65[b]	117[b]
9. Sealing compound	c	c

[a] The limitations on phenolic composition and on rubber and thermoplastic insulation do not apply to compounds which have been investigated and found to have special heat-resistant properties.

[b] A capacitor which operates at a temperature rise of more than 65°C (117°F) may be judged on the basis of its marked temperature limit.

[c] Unless a thermosetting material, the maximum sealing compound temperature, when corrected to a 25°C (77°F) ambient temperature, is 15°C (27°F) less than the softening point of the compound as determined by the Test Method for Softening Point by Ring and Ball Apparatus, ASTM E28-92.

Table 18.2
Maximum surface temperatures

Location	Composition of Surface[a]			
	Metal,		Nonmetallic,	
	°C	(°F)	°C	(°F)
Handles or knobs which are grasped for lifting, carrying, or holding	50	122	60	140
Handles or knobs which are contacted but do not involve lifting, carrying, or holding and other surfaces subject to contact in operation and user maintenance	60	140	85	185
Surfaces other than a heating function surface and known to be hot due to proximity to the heating function surface	70	158	95	203

[a] A handle, knob, or similar part made of a material other than metal, which is plated or clad with metal having a thickness of 0.005 inch (0.13 mm) or less is considered to be and is judged as a nonmetallic part.

19 Heat Flux Density Test

19.1 Operation of an amateur movie light for the heat flux density test is considered to be operation of the light at a voltage necessary to produce $(120/\text{rated volts})^2 \times 1.05 \times$ rated wattage for lamps rated within the range of 100 – 120 V and 1.05 times rated wattage for lamps of any other voltage rating. The lamps shall be the size for which the unit is designed and marked. Multi-lamp movie lights shall be fitted with lamps that, at the same rated voltage, are within 2 percent of each other in watts consumed. All operator controls and the position of the lamp bulb in its socket or holder may be adjusted through all positions which allow intended operation of the unit to determine that the maximum heat flux density is measured.

19.2 Lamp samples, used in the test, which are subject to darkening with use shall not have an accumulated operating time history that results in greater than a 5 percent loss in output radiant energy at the time readings are taken. A comparison of heat flux density readings taken at any one conveniently reproducible reference location [such as 6 inches (152 mm) in front of the lamp on the light beam axis] when the lamp is brand new, and after use in testing, can be used to establish whether darkening exceeds the specified 5 percent limit.

19.3 Heat flux density readings shall be taken after 15 minutes of operation or when the lamp and its reflector and/or housing have reached thermal equilibrium, whichever occurs sooner. During conditions of intended operation, and with the light beam directed in a horizontal plane, a movie light shall not produce a net total heat flux density exceeding:

a) 2.0 watts/square centimeter at any point beyond the external surface of the light.

b) 1.5 watts/square centimeter at any point 3 inches (76.2 mm) or more beyond the external surface of the light.

c) 1.0 watts/square centimeter at any point 6 inches (152 mm) or more beyond the external surface of the light.

d) 0.5 watts/square centimeter at any point 12 inches (305 mm) or more beyond the external surface of the light.

e) 0.3 watts/square centimeter at any location likely to be occupied by the head or hands of the operator of the unit during normal operation.

19.4 If a guard (refer to 5.5 and 5.6, and the Guard Abuse Tests, Section 23) is used to limit the approach distance of the lighting unit to combustible materials and persons, the minimum distance to be used for the individual heat flux density measurements of 19.3 and 19.5 are to be the stated distances, or the distance permitted by the guard, as determined by the probe described in 5.5, whichever is greater.

19.5 A movie light having provision for and adjusted for bounce lighting shall, in addition to the requirements of 19.3, not produce a net total heat flux density during intended operation for 15 minutes or thermal equilibrium (see 19.3) exceeding:

a) 2.0 watts/square centimeter at any point 3 inches (76.2 mm) or more beyond the external surface of the light.

b) 1.0 watts/square centimeter at any point 12 inches (305 mm) or more beyond the external surface of the light.

c) 0.3 watts/square centimeter at any location likely to be occupied by the head or hands of the operator of the unit during normal operation.

19.6 During the test to determine compliance with 19.5, the light beam of the unit is to be directed in any direction from horizontal up to, and including, the maximum angle permitted by the mounting of the unit. The test is to be performed in a draft-free room.

19.7 Compliance with the limits noted in 19.3 and 19.5 are determined by measurements of heat flux density with an instrument system which:

a) Produces an average reading of the total radiant plus convection heat flux density incident on a circular or square flat receiving area of not less than 1 or more than 2 square centimeters.

b) Has a field of view at the receiving surface which encompasses all of the available radiant energy emitting areas of the source under test.

c) Has an overall diameter not exceeding 1 inch (25.4 mm) so as not to additionally alter convective air flow patterns when used for the tests to determine compliance with requirements in 19.5.

d) Has provision for the determination or compensation of the temperature of the receiving surface at the time of the heat flux density measurement so that the radiant and convective heat flux densities may be computed as that transferred relative to a room temperature 25 ±5°C (77 ±9°F) black receiving body.

e) Has a calibrated response to all radiant energy within the wave lengths of 0.3 to 20 microns.

19.8 The instrument system shall be capable of measuring net total heat flux densities of 0.5, 1.0, 1.5, and 2.0 watts/square centimeter within the specified wave length spectrum with an error not exceeding 10 percent.

20 Ignition Test

20.1 A movie light shall not cause ignition of combustible surfaces upon which it may be placed immediately after use.

20.2 To determine compliance with 20.1, a movie light is to be operated at 120 V for 15 minutes. The power is to be turned off and the movie light immediately placed in the position producing the most adverse effect on a surface consisting of two layers of white duck, having a mass of 8 oz/yd^2, (270 g/m^2) supported on a 1 inch (25.4 mm) thick felt pad. There shall be no ignition or glowing of the material.

21 Strain Relief Test

21.1 The strain relief means provided on an attached 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 movie light disconnected.

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

22 Adhesion of Labels Test

22.1 To determine if the adhesion of a pressure-sensitive label is adequate for the intended use, representative specimens are to be subjected to the tests described in 22.2 – 22.5. Test panels are to be used in each of the tests for adhesion. To form test panels, specimens of the label shall be applied to the surface of sections of the material used in the intended application.

22.2 Three specimens of the test panels shall be placed in an air oven and maintained at the temperatures indicated in Table 22.1 for 240 hours.

22.3 Six specimens of the test panels shall be placed in a controlled atmosphere and maintained at 23 ±2°C (73.4 ±3.6°F) with a 50 ±5 percent relative humidity for 24 hours. Three of the specimens shall then be immersed in water and the other three specimens in ASTM No. 3 oil and maintained at a temperature of 21 ±2°C (69.8 ±3.6°F) for 48 hours.

Table 22.1
Oven temperatures

Maximum temperature of surface of applied label, °C	(°F)	Test temperature, °C	(°F)
60	140	87	189
80	176	105	221
100	212	121	250
125	257	150	302
150	302	180	356

22.4 Three specimens of the test panels shall be placed in a controlled atmosphere and maintained at 23 ±2°C (73.4 ±3.6°F) with a 50 ±5 percent relative humidity for 72 hours.

22.5 The adhesion of the pressure-sensitive labels is considered to comply with the requirements of 22.3 and 22.4 if immediately following each test, and subsequently after 24 hours, each test label:

a) Demonstrates intended adhesion and the edges are not curled.

b) Resists defacement or removal as determined by scraping across the test panel, using moderate pressure, with a flat metal blade 1/32 inch (0.8 mm) thick, held at a right angle to the test panel.

c) Retains legible printing and is not defaced by rubbing with moderate finger pressure.

23 Guard Abuse Tests

23.1 A guard shall have the strength and rigidity necessary to resist the abuses to which it might be subjected without increasing the risk of fire, electric shock, or injury to persons of a movie light.

23.2 To determine compliance with 23.1, the tests described in 23.3 and 23.4 are to be performed. If, as a result of the tests, the guard is in any way substantially altered in shape, the heat flux density measurement tests outlined in 19.3 and 19.5 shall be repeated on the sample following the mechanical abuse tests.

23.3 Each of three samples of a movie light, using a guard, shall be subjected to an impact resulting from being dropped from a distance of 3 feet (0.9 m) so that the guard will strike a hardwood surface in positions most likely to produce adverse results to the guard.

23.4 Each of three samples of a movie light, with the guard attached, shall be placed between two rigid, flat, steel plates in a compression machine whose jaws close at the rate of approximately 1/2 inch (12.7 mm) per minute. The force shall be increased to a maximum of 20 lbf (89 N) and then removed.

24 Dielectric Voltage-Withstand Test

24.1 While at maximum operating temperature, amateur movie lights shall be capable of withstanding for 1 minute, without breakdown, the application of a 60 Hz essentially sinusoidal potential of 1000 V between live parts and dead metal parts.

24.2 To determine compliance with the requirement in 24.1, a movie light is to be tested by a 500 VA or larger transformer, the output voltage of which is essentially sinusoidal and can be varied. Starting at zero, the applied potential is to be increased until the required test value is reached, and is to be held at that value for 1 minute. The increase in the applied potential is to be at a substantially uniform rate and as rapidly as consistent with its value being correctly indicated by a voltmeter.

MANUFACTURING AND PRODUCTION TESTS

25 Production-Line Dielectric Voltage-Withstand Test

25.1 Each movie light shall withstand without electrical breakdown, as a routine production-line test, the application of a 40 – 70 Hz potential between:

a) The primary wiring, including connected components and accessible dead metal parts which could be energized and

b) Between primary wiring and accessible low voltage (42.4 V peak or less) metal parts, including terminals.

25.2 The test potential shall be 1200 V. The test potential shall be applied for 1 second. The test voltage may be reduced to 1000 V if the time of application is increased to 1 minute.

25.3 A movie light may be in a heated or unheated condition for the test.

25.4 The test shall be conducted when a movie light is complete or when it is complete except for parts such as snap covers or friction-fit knobs which would interfere with the performance of the test.

Exception: The test shall be conducted before final assembly, if the test performed represents that for a completed movie light. It is not intended that a movie light be unwired, modified, or disassembled for the test.

25.5 When the movie light uses a solid-state component that can be damaged by the dielectric potential, the test may be conducted before the component is electrically connected provided that a random sampling of each day's production is tested at the potential and time specified in 25.2. The circuitry may be rearranged for the purpose of the test to minimize the likelihood of solid-state-component damage while retaining representative dielectric stress of the circuit.

25.6 The test equipment shall include a transformer having an essentially sinusoidal output, a means of indicating the test potential, an audible or visual indicator of electrical breakdown, and either a manual reset device to restore the equipment after electrical breakdown or an automatic reject feature of any unacceptable unit.

25.7 If the output of the test equipment transformer is less than 500 VA, the equipment shall include a voltmeter in the output circuit to directly indicate the test potential.

25.8 If the output of the test equipment transformer is 500 VA or larger, the test potential may be indicated by:

a) A voltmeter in the primary circuit or in a tertiary-winding circuit,

b) By a selector switch marked to indicate the test potential, or

c) In the case of equipment having a single test-potential output by a marking in a readily visible location to indicate the test potential. When marking is used without an indicating voltmeter, the equipment shall include a positive means, such as an indicator lamp, to indicate that the manual-reset switch has been reset following a dielectric breakdown.

25.9 Test equipment, other than that described by 25.6 – 25.8, may be used if found capable of accomplishing the intended factory control.

25.10 During the test, the primary switch is to be in the on position, both sides of the primary circuit of the movie light are to be connected together and to one terminal of the test equipment, and the second test-equipment terminal is to be connected to the accessible dead metal.

Exception: A movie light (resistive, high-impedance winding, and the like) having circuitry not subject to secondary-voltage build-up in case of electrical breakdown during the test shall be tested:

a) With a single-pole primary switch, if used, in the off position or

b) With only one side of the primary circuit connected to the test equipment when the primary switch is in the on position.

26 Production-Line Grounding-Continuity Test

26.1 Each appliance that has a power-supply cord having a grounding conductor shall be tested, as a routine production-line test, to ensure grounding continuity between the grounding blade of the attachment plug and the accessible dead metal parts of the appliance that are likely to become energized.

26.2 Only a single test is required if the accessible metal selected is conductively connected by design to all other accessible metal.

26.3 Any indicating device (an ohmmeter, a battery-and-buzzer combination, or similar devices) may be used to determine compliance with the grounding continuity requirement in 26.1.

RATINGS

27 Details

27.1 Amateur movie lights shall be rated in watts and volts. If required, the rating shall include the frequency due to relay coils, transformers, or other components.

MARKINGS

28 Details

28.1 A movie light shall be plainly and permanently marked where the marking will be clearly and legibly visible. The marking shall include: the manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product may be identified; a distinctive catalog number or an equivalent identification; and the electrical rating. The frequency, if required, shall be expressed in one of the following terms: Hertz, Hz, cycles-per-second, CPS, cycles/sec, or C/S.

28.2 A movie light producing greater than 0.5 watts/square centimeter at any point beyond the external surface of the light shall be marked as follows, or with equally definitive wording:

DANGER –

NOT TO BE HANDLED BY CHILDREN.

EMITS INTENSE HEAT AND LIGHT.

USE WITH CAUTION TO REDUCE THE RISK OF FIRE OR INJURY TO PERSONS.

DO NOT DIRECT LIGHT AT PERSONS OR MATERIALS FROM LESS THAN FOUR FEET DURING USE AND UNTIL COOL.

DISCONNECT WHEN NOT IN USE.

28.3 A movie light with a replaceable lamp shall be marked as follows, or with equally definitive wording:

a) ″DANGER– TO PREVENT POSSIBLE BURN HAZARD, DISCONNECT SUPPLY CORD AND ALLOW LAMP TO COOL BEFORE REPLACING.″

b) ″DANGER– REPLACE ONLY WITH _____(type designation) LAMP, TO REDUCE THE RISK OF FIRE.″

28.4 The markings required by 28.2 and 28.3 may be combined. The equally definitive wording mentioned in 28.2 and 28.3 shall use the signal word ″DANGER″.

28.5 The marking shall adhere firmly to a movie light unit without flaking, peeling, or smearing. The lettering shall be legible, shall contrast with either a light or dark background, and shall be situated where it will be readily visible to the user. The lettering for the word ″DANGER″ shall not be less than 1/8 inch (3.2 mm) in height.

28.6 Usage, handling, and storage of a movie light shall be considered in determination of permanence of the markings using pressure sensitive labels. See the Adhesion of Labels Test, Section 22.

28.7 If a manufacturer produces or assembles amateur movie lights at more than one factory, each finished light shall have a distinctive marking – which may be in code – by means of which it shall be identified as the product of a particular factory.

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SUPPLEMENT SA - BATTERY POWERED AMATEUR MOVIE AND VIDEO LIGHTS

INTRODUCTION

SA1 Scope

SA1.1 The requirements in this supplement cover low-voltage battery-operated products that are energized by a battery supply as specified in (a), and with either (b) or (c).

a) The battery supply terminal voltage is 30 V DC or less.

b) The battery supply is capable of delivering 15 W or more, for 5 seconds or more, to an externally connected variable resistor.

c) The battery supply is capable of delivering 8 A or more, for 1 minute or more, to an externally connected variable resistor or short-circuit.

SA1.2 This supplement does not contain requirements for:

a) The internal construction of specific batteries and

b) Stand alone battery charging equipment (that is, battery charging circuitry not integral to the end-product circuitry).

SA1.3 These requirements do not cover risks that may be unique to certain cell chemistries, such as the fire and explosion risks of lithium batteries. Additional investigations may be required to evaluate such risks.

SA2 Glossary

SA2.1 BATTERY SUPPLY – One or more unitcell or multicell batteries that together supply power to a battery-operated product. A battery supply may consist of a collection of individually and separately replaceable unitcell or multicell batteries in a series or parallel array, or both, or may consist of a series or parallel array, or both, of permanently interconnected and not separately replaceable unitcell or multicell batteries (for example, a ″battery pack″).

SA2.2 BATTERY SUPPLY CABLE – Electrically insulated conductors connecting a battery supply to a battery operated product. The conductors may be separate and individually insulated, or grouped together with an outer insulating jacket.

SA2.3 CHARGING – The process of supplying electrical energy of correct polarity and higher potential to a secondary cell for the purpose of conversion to stored chemical energy.

SA2.4 DISCHARGE – Withdrawal of electrical energy from a cell or battery.

SA2.5 PRIMARY BATTERY – A battery not intended to be recharged.

SA2.6 RATED VOLTAGE – The nominal terminal voltage delivered by the cell or battery during normal discharge, and normally marked on the battery jacket.

SA2.7 SECONDARY BATTERY – A battery that can be recharged after being discharged under specific conditions of use.

CONSTRUCTION

SA3 General

SA3.1 Unless otherwise specified in these requirements, materials and components employed in the construction of a battery-operated circuit shall comply with the appropriate paragraphs of this Standard.

SA4 Battery Supply Interchangeability

SA4.1 Consideration shall be given to the physical interchangeability of different types of battery supplies (for example, certain sizes of carbon zinc and alkaline batteries). If the physical configuration of the end-product readily allows substitution of more than one type of battery supply, then the evaluation of the product shall take into account the possible use of each substitute battery.

Exception: A battery-operated product marked in accordance with SA16.3 is required to be evaluated on the basis of the use of the battery supply identified for use with the product.

SA4.2 With reference to SA4.1, the physical configuration of the end-product is considered to readily allow battery substitution if such substitution can be achieved without altering the construction of the end-product, that is, without cutting or splicing wires, modifying terminals (on the battery or in the product), unsoldering connections, altering the shape or size of the battery compartment.

SA5 Battery Supply Enclosure

SA5.1 A battery supply shall be provided with an enclosure, case, or compartment that complies with the requirements in SA5.2 – SA5.6, as applicable for the type of battery supply employed.

SA5.2 A battery supply enclosure, together with the battery mounting means, shall be constructed to limit the following:

a) Externally caused mechanical damage to the jacket of a battery provided with the product, if such damage might result in user contact with battery electrolyte.

b) Dislodging of the battery from its intended position, if such dislodging could result in:

1) Internal short-circuiting of the battery supply,

2) Bridging or reduction of required spacings, or

3) Short-circuiting of the battery terminals.

c) Accidental or unintentional short-circuiting of the battery terminals after battery installation and during any other user servicing operation not involving battery replacement.

SA5.3 Compliance with the requirements as specified in SA5.2 (a) – (c) may be determined by subjecting the complete product to the tests described in the Battery Supply Enclosure Tests, Section SA14.

SA5.4 The enclosure or compartment housing a wet cell battery (not sealed), such as a lead-acid storage battery, shall be so constructed as to limit electrolyte from,

a) Reaching the outer surface of the end-product where contact with the user is possible,

b) Contaminating adjacent electrical components or materials, and