

UL 588

ISBN 0-7629-0589-1

Seasonal and Holiday Decorative Products



Underwriters Laboratories Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096

UL Standard for Safety for Seasonal and Holiday Decorative Products, UL 588

Eighteenth Edition, Dated August 21, 2000

Revisions: This Standard contains revisions through and including July 18, 2003.

SUMMARY OF TOPICS:

This revision of UL 588 is being issued to include the clarification of requirements for Series-Connected Lighting Strings Employing Individual-Flashing Lamps.

Announcement Bulletin: This Standard contains the announcement bulletin dated March 20, 2001. The announcement bulletin is located at the end of the Standard.

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Text that has been changed in any manner 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 following table lists the future effective dates with the corresponding item.

Future Effective Dates	References
February 13, 2004	Paragraph 13.2.4

The revised requirements are substantially in accordance with UL's Bulletin on this subject dated April 22, 2003.

The revisions dated July 18, 2003 include a reprinted title page (page1) for this Standard.

As indicated on the title page (page 1), this UL Standard for Safety is an American National Standard. Attention is directed to the note on the title page of this Standard outlining the procedures to be followed to retain the approved text of this ANSI/UL Standard.

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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

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

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This Standard consists of pages dated as shown in the following checklist:

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AUGUST 21, 2000
(Title Page Reprinted: July 18, 2003)



ANSI/UL 588

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UL 588

Standard for Seasonal and Holiday Decorative Products

The First through Seventeenth Editions were titled Christmas-Tree and Decorative-Lighting Outfits.

First Edition – October, 1921
Second Edition – December, 1921
Third Edition – January, 1922
Fourth Edition – March, 1922
Fifth Edition – January, 1931
Sixth Edition – June, 1934
Seventh Edition – April, 1937
Eighth Edition – May, 1941
Ninth Edition – October, 1948
Tenth Edition – February, 1961
Eleventh Edition – January, 1966
Twelfth Edition – November, 1969
Thirteenth Edition – November, 1974
Fourteenth Edition – April, 1980
Fifteenth Edition – January, 1986
Sixteenth Edition – October, 1990
Seventeenth Edition – January, 1996

Eighteenth Edition

August 21, 2000

The most recent designation of ANSI/UL 588 as an American National Standard (ANSI) occurred on July 9, 2003.

This ANSI/UL Standard for Safety, which consists of the Eighteenth Edition with revisions through July 18, 2003, is under continuous maintenance, whereby each revision is ANSI approved upon publication. Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Written comments are to be sent to UL-MEL Standards Department, 1285 Walt Whitman Road, Melville, NY 11747.

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

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

ISBN 0-7629-0589-1

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FOREWORD

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

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

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

D. A product employing materials or having forms of construction which conflict with specific requirements of the Standard cannot be judged to comply with the Standard. A product employing materials or having forms of construction not addressed by this Standard may be examined and tested according to the intent of the requirements and, if found to meet the intent of this Standard, may be judged to comply with the Standard.

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

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

INTRODUCTION

1 Scope

1.1 These requirements cover temporary-use, seasonal decorative-lighting products and accessories with a maximum input voltage rating of 120 V to be used in accordance with the National Electrical Code, ANSI/NFPA 70. Temporary-use is considered to be a period of installation and use not exceeding 90 days.

1.2 These requirements cover factory-assembled seasonal lighting strings with push-in, midget-screw, or miniature-screw lampholders connected in series for across-the-line use or with candelabra- or intermediate-screw lampholders connected in parallel for direct-connection use. These requirements also cover factory-assembled seasonal decorative outfits such as wreaths, stars, light sculptures, crosses, candles or candle sets without lamp shades, products in the shape of, or in resemblance to, a Christmas tree provided with simulated branches and needles not exceeding 30 inches in height, blow-molded figures or objects, animated figures, tree tops, controllers, tree stands, and motorized decorative displays. These requirements cover products which are portable and not permanently connected to a power source.

1.3 These requirements additionally cover ornaments which are provided with an adapter for connection to a push-in lampholder and are intended to replace a push-in lamp in a series-connected decorative-lighting string or decorative outfit.

1.4 These requirements do not cover strings employing lampholders larger than intermediate-screw, non-seasonal lighting, non-seasonal products, permanently connected products, non-decorative lighting intended for illumination only, cord sets, or temporary power taps.

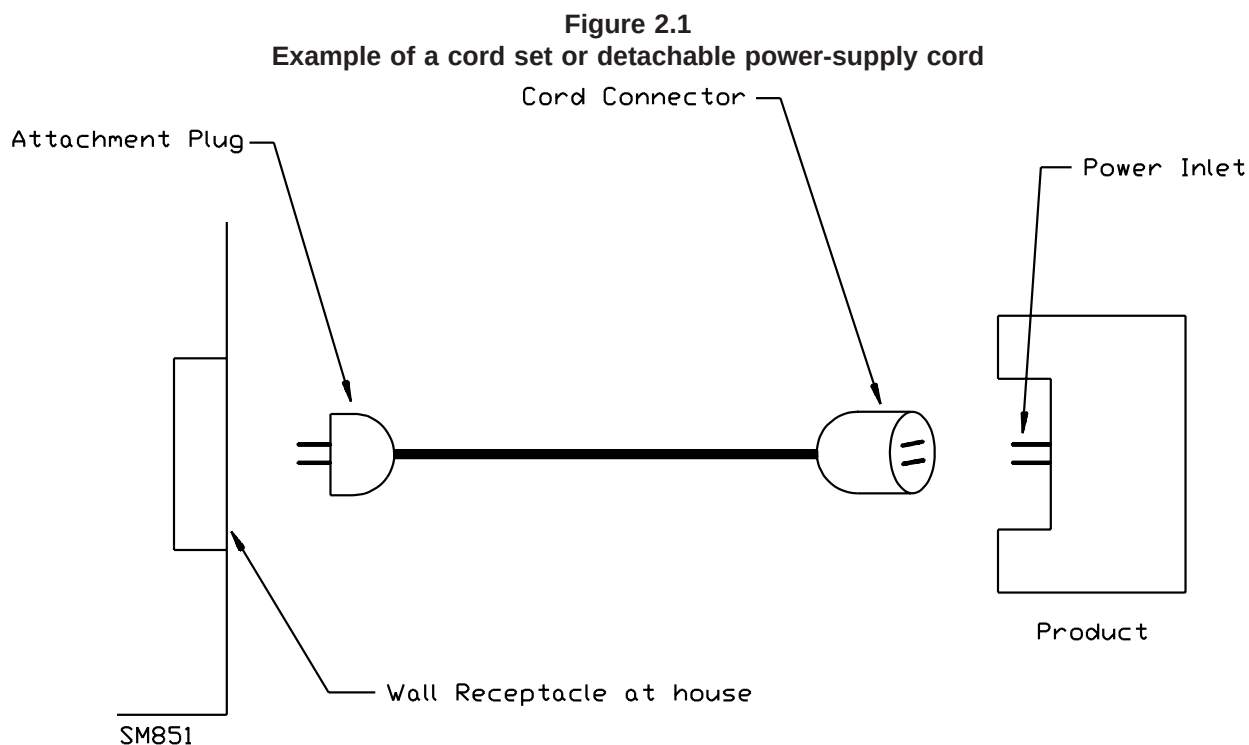
1.5 *Deleted November 21, 2001*

1.5 revised November 21, 2001

2 Glossary

2.1 For the purposes of this standard, the following definitions apply.

2.2 ATTACHMENT PLUG – A male contact device, which may be provided with integral overcurrent protection, for the temporary connection of a flexible cord or cable to a receptacle, cord connector, or other outlet device. See Figure 2.1.



2.3 BUBBLE LIGHT – A light assembly consisting of a liquid filled container assembled to a housing which contains a lamp. The lamp is used to heat and brighten the liquid producing an illuminated bubbling effect.

2.4 CLASS 2 CIRCUIT – A circuit powered from the output of a Class 2 transformer or a Class 2 power unit. See 18.1.

2.5 CONTROLLER – A product designed to electronically or electromechanically vary the power to or the on/off cycle of the seasonal decorative lighting product or products which it is intended to control. A controller may additionally provide sound effects. A controller may be a separate unit or an integral part of a string or decorative outfit.

2.6 CORD CONNECTOR – A female contact device which is part of a cord set, string, or detachable power-supply cord for connection to a male contact device such as an attachment plug, current tap, or power inlet. See Figure 2.1.

2.7 CORD SET – A length of flexible cord assembled with an attachment plug or current tap as a line fitting and a cord connector as a load fitting. A cord set is sometimes referred to as an extension cord. See 1.4.

2.8 CURRENT TAP – A male and female contact device that, when connected to an outlet receptacle, provides multiple load fittings. A load fitting may consist of a slot configuration and provision for the connection of a flexible cord. A current tap may be provided with integral overcurrent protection. See 13.3.4.

2.9 DECORATIVE LIGHTING HARNESS – A factory-assembled lighting assembly employing candelabra-, intermediate-, or medium-screw lampholders connected in parallel across the line and neutral blades of the attachment plug or current tap. A decorative lighting harness is employed in a decorative outfit and it is provided with overcurrent protection.

2.10 DECORATIVE OUTFIT – A factory-assembled, electrically-powered unit providing a seasonal theme such as a wreath, star, light sculpture, cross, candle or candle set without lamp shades, a product in the shape of, or in resemblance to, a Christmas tree provided with simulated branches and needles not exceeding 30 inches in height, a blow-molded figure or object, such as a pumpkin, a snowman, or a tree, an animated figure, a tree top, a tree stand, and a motorized decorative display having illumination or other decorative effects. It is provided with overcurrent protection and a means for attachment to an electrical outlet. It may be provided with either a lighting string as part of the illumination of the decorative outfit, or with a controller, or both. A lighting string provided with decorative covers over the lamps is a decorative outfit.

2.11 DIRECT PLUG-IN UNIT – A power unit which employs a blade assembly on its enclosure for connection to the branch circuit and a means for connection to a seasonal lighting product. The unit may employ a transformer if the seasonal product requires a low-voltage supply source. A controller may be a direct plug-in unit.

2.12 ENCLOSURE – Any surface or surrounding structure that reduces the likelihood of access to any or all parts of the product that may otherwise present a risk of electric shock or injury to persons and reduces the likelihood of propagation of flame initiated by electrical disturbances occurring within. See 10.1.1 and 12.1.

2.13 FUSEHOLDER – A device which holds an overcurrent-protective fuse.

2.14 LAMP, BALLAST – A series-connected lamp used in conjunction with an individual-flashing lamp to limit the current flow to less than 0.6 A if all individual-flashing lamps were in their shorted state. See 28.3 and 28.4.

2.15 LAMP, CANDELABRA-BASE (E12) – A lamp employing a screw base approximately 0.47 inches (12 mm) in diameter. An E12 lamp is the ANSI designation for a candelabra-base lamp.

2.16 LAMP, FLASHING – A series- or parallel-connected lamp that automatically cycles on and off by means of a bimetallic strip connected in series with the filament. For series-connected strings, the flashing lamp causes all lamps connected in series with it to flash. For parallel-connected strings, only the flashing lamp is intended to flash.

2.17 LAMP, INDIVIDUAL-FLASHING – A series-connected lamp that automatically cycles on and off by means of a bimetallic strip connected in parallel with the filament. The cycling of the bimetallic strip causes only the individual-flashing lamp to flash by momentarily placing a short across the filament to

turn the lamp on and off. An individual-flashing lamp is intended to be used in combination with a ballast lamp unless used in a light string whose construction is described in the Exception to 28.3. See 28.3 and 28.4.

2.17 revised September 25, 2002

2.18 LAMP, INTERMEDIATE-BASE (E17) – A lamp employing a screw base approximately 0.67 inches (17 mm) in diameter. An E17 lamp is the ANSI designation for an intermediate-base lamp.

2.19 LAMP, MEDIUM-BASE (E26) – A lamp employing a screw base approximately 1.02 inches (26 mm) in diameter. An E26 lamp is the ANSI designation for a medium-base lamp.

2.20 LAMP, MIDGET-BASE (E5) – A lamp employing a screw base approximately 0.20 inches (5 mm) in diameter. An E5 lamp is the ANSI designation for a midget-base lamp.

2.21 LAMP, MINIATURE-BASE (E10) – A lamp employing a screw base approximately 0.39 inches (10 mm) in diameter. An E10 lamp is the ANSI designation for a miniature-base lamp.

2.22 LAMP, PUSH-IN – A low-voltage lamp, intended for series connection, with a glass envelope provided with wire leads for electrical connection to the lampholder. The glass envelope is provided with an adapter which separates the leads and secures the entire assembly into the lampholder by push-in friction fit. The adapter may be provided with a positive latching mechanism.

2.22A LAMP, PUSH-IN LED – A light emitting diode (LED), intended for series connection, provided in an encapsulating enclosure with wire leads for electrical connection to the lampholder. The enclosure is provided with an adapter which separates the leads and secures the entire assembly into the lampholder by push-in friction fit. The adapter may be provided with a positive latching mechanism.

2.22A added February 14, 2001

2.23 LAMP, SCREW-BASE (EDISON-SCREW) – A lamp provided with an Edison-screw base for electrical and mechanical connection to the lampholder.

2.24 LAMPHOLDER, CANDELABRA-SCREW (E12) – A screw-type lampholder which accepts a candelabra-base (E12) lamp. An E12 lampholder is the ANSI designation for a candelabra-screw lampholder.

2.25 LAMPHOLDER, INTERMEDIATE-SCREW (E17) – A screw-type lampholder which accepts an intermediate-base (E17) lamp. An E17 lampholder is the ANSI designation for an intermediate-screw lampholder.

2.26 LAMPHOLDER, MEDIUM-SCREW (E26) – A screw-type lampholder which accepts a medium-base (E26) lamp. An E26 lampholder is the ANSI designation for a medium-screw lampholder.

2.27 LAMPHOLDER, MIDGET-SCREW (E5) – A screw-type lampholder which accepts a midget-base (E5) lamp. An E5 lampholder is the ANSI designation for a midget-screw lampholder.

2.28 LAMPHOLDER, MINIATURE-SCREW (E10) – A screw-type lampholder which accepts a miniature-base (E10) lamp. An E10 lampholder is the ANSI designation for a miniature-screw lampholder.

2.29 LAMPHOLDER, SEASONAL LIGHTING – A lampholder that is restricted for use with seasonal-lighting strings and decorative-lighting outfits and which, by its construction and intended application, is not suitable for general use.

2.30 LAMPHOLDER, SKELETON-TYPE – An Edison-screw lampholder that does not use conductive screw shell threads to make electrical contact with the lamp screw base. Electrical contact with the lamp screw base is made with one or more separate contacts in the side wall of the lamp base cavity or a contact in the bottom of the lamp base cavity, such as ring contact. The lampholder also employs a center contact.

2.31 LIGHTING STRING – A factory-assembled series, series-parallel, or parallel string of replaceable lamps consisting of an attachment plug or current tap, lampholders, lamps, wire, and overcurrent protection. A lighting string optionally may be provided with a load fitting (cord connector), a controller, or both. A lighting string is intended to be draped over or around an object to provide a decorative effect. A lighting string may also be a factory-assembled series- or series-parallel string consisting of non-replaceable lamps without shunts, an attachment plug, wire, and overcurrent protection. See 28.1 and 29.1.

2.31 revised June 29, 2001

2.32 LIGHTING STRING, PARALLEL-CONNECTED – A lighting string employing either candelabra- or intermediate-screw lampholders connected in parallel across the line and neutral blades of the attachment plug or current tap.

2.33 LIGHTING STRING, SERIES-CONNECTED – A lighting string employing push-in, midget-screw, or miniature-screw lampholders or non-replaceable lamps connected in series with each other. The series-connected assembly is connected across the line and neutral by means of an attachment plug or current tap. Lighting strings configured in the shape of a net (see Exception No. 2 to 13.2.4), as icicles, or other configurations, are series-connected lighting strings.

2.33 revised June 29, 2001

2.34 LIGHTING STRING, SERIES-PARALLEL-CONNECTED – A lighting string consisting of two or more series-connected strings of lampholders or non-replaceable lamps connected in parallel to each other and across the line and neutral by means of an attachment plug or current tap.

2.34 revised June 29, 2001

2.35 LIGHT SCULPTURE – A polymeric or coated metallic rigid or flexible frame to which lampholders and lamps are attached. The lamps provide outline illumination of the figure or object created by the frame.

2.36 LIVE PART – A current-carrying component other than a Class 2 circuit.

2.37 LOAD FITTING – A female contact device, such as a cord connector or dedicated receptacle, which is part of a lighting string or decorative outfit and is intended for connection to an attachment plug.

2.38 ORNAMENT – A unit provided with a lampholder adapter or input leads and an adapter intended to take the place of a push-in lamp in a series-connected lighting string or decorative outfit. An ornament may be electronically- or non-electronically-operated.

2.39 ORNAMENT, ELECTRONICALLY-OPERATED – An ornament which employs a motor, a printed wiring assembly, electronic components, or similar item. This type of ornament may produce sound, be illuminated, animated, or similar effect, or a combination of the above.

2.40 ORNAMENT, NON-ELECTRONICALLY-OPERATED – An ornament provided with a wiring assembly consisting of only a lamp and lampholder on one end and an adapter on the other end. This type of ornament is illuminated only.

2.41 POWER INLET (MOTOR ATTACHMENT PLUG) – A male contact device to be mounted on the product to provide an integral blade configuration for the connection of a cord connector. See Figure 2.1.

2.42 RECEPTACLE, DEDICATED – A receptacle that is intended for connection to the attachment plug or current tap of a specific product such as a decorative-lighting string or a decorative outfit and which is not for general use.

2.43 SEASONAL (HOLIDAY) PRODUCT – A product painted in colors to suggest a holiday theme or a snow covering, a figure in a holiday costume, or any decoration associated with a holiday or particular season of the year.

2.44 SHUNT, LAMP – A device used in series-connected lamps to provide a current path when the filament of a lamp opens so that the remaining lamps in the series-connected string or decorative outfit remain illuminated. A shunt typically consists of several turns of aluminum wire wound around the pair of filament support posts. The aluminum oxide coating on the wire acts as an insulator, allowing current to normally flow through the filament. When the filament of the lamp opens, a high voltage

No Text on This Page

(approximately 120 V) is present across the support posts causing the oxide coating of the shunt to break down. The shunt then becomes electrically connected to the support posts and allows current to continue to flow through the shunt despite the open filament.

2.45 TERMINAL, INSULATION-PIERCING – A terminal having a contact pin that punctures the conductor insulation and penetrates between the conductor strands. This does not include an insulation-displacement terminal which has a contacting member that forces the conductor insulation aside and presses against the side of the conductor to make contact.

2.46 WIRING DEVICE – A device which is wired on flexible cord for temporary connection of the cord to a receptacle, cord connector, or other outlet device, to make a detachable electrical connection to an attachment plug, to provide multiple outlet configurations, or similar connection. An attachment plug, current tap, cord connector, and load fitting are examples of a wiring device.

3 Components

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

3.2 A component 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.

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

3.4 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.

4 Units of Measurement

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

5 References

5.1 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.

CONSTRUCTION

ALL PRODUCTS

6 General

6.1 If a product employs a component or another product as part of its construction, each part of the product shall comply with its applicable construction requirements. For example, if a series-connected string employs a controller, construction requirements for a series-connected string, controller, cord-connected wiring device, and series-connected lampholder and lamp shall all be applied.

6.2 The wire type and overcurrent protection requirements for a seasonal lighting product are summarized in Tables 6.1 and 6.2.

Table 6.1
Wire types and overcurrent protection ratings for series-connected seasonal lighting products

	Non-polarized fittings		Polarized fittings	
	With load fitting	Without load fitting	With load fitting	Without load fitting
Minimum wire size, AWG (mm ²)	22 (0.32) ^a	22 (0.32) ^a	20 (0.52) ^a	22 (0.32) ^a
Wire type	CXTW ^a	CXTW ^a	CXTW ^a	CXTW ^a
Minimum wire temperature	105°C	105°C	105°C	105°C
Maximum current rating, Amperes	0.6	0.6	0.6	1.8
Total maximum number of strings allowed to be connected together, end-to-end	3	—	6	—
Fuse rating, Amperes	3	3	5	3
Fuse location	Grounded and ungrounded conductor	Grounded and ungrounded conductor	Ungrounded conductor (hot)	Ungrounded conductor (hot)
On/Off switch and type (if located in other than a Class 2 circuit)	Double-pole in both conductors	Double-pole in both conductors	Single-pole ungrounded conductor (hot)	Single-pole ungrounded conductor (hot)
See Figure	7.4, 7.6, 7.15	7.3, 7.7, 7.13	7.6, 7.10, 7.16	7.5, 7.9, 7.14
^a A motorized product shall employ minimum No. 18 AWG Type SPT-2 wire for the supply connections. See Figures 7.11 – 7.16.				

Table 6.2
Wire types and overcurrent protection ratings for parallel-connected seasonal lighting products

	With load fitting		Without load fitting	
Minimum wire size, AWG (mm ²)	20 (0.52) ^a	18 (0.82) ^b	20 (0.52) ^a	18 (0.82) ^b
Wire type	XTW	SPT-1, SP-2, SPT-2, S, ST, SE, SO, SOO, SJ, SJT, SJE, SJO, SJO	XTW	SPT-1, SP-2, SPT-2, S, ST, SE, SO, SOO, SJ, SJT, SJE, SJO, SJO
Minimum wire temperature	105°C		105°C	
Maximum current rating, Amperes	1.75		3.5	
Fuse rating, Amperes	5		5	
Fuse location	Ungrounded conductor (hot)		Ungrounded conductor (hot)	
On/Off switch and type (if located in other than a Class 2 circuit)	Single-pole ungrounded conductor (hot)		Single-pole ungrounded conductor (hot)	
See Figure	7.2, 7.12		7.1, 7.11	
^a A motorized product shall employ minimum No. 18 AWG Type SPT-2 wire for the supply connections. (See Figures 7.11 – 7.16.				
^b The wire Type for products intended for outdoor use shall be SPT-1W, SP-2W, SPT-2W, STW, SEW, SOW, SOOW, SJTW, SJEW, SJOW, or SJOOW.				

7 Overcurrent Protection

7.1 A product covered by this standard shall be provided with integral overcurrent protection which complies with the Standard for Low-Voltage Fuses – Part 1: General Requirements, UL 248-1, and the Standard for Low-Voltage Fuses – Part 14: Supplemental Fuses, UL 248-14.

Exception No. 1: An ornament need not be provided with integral overcurrent protection.

Exception No. 2: A product employing a direct plug-in Class 2 power unit which complies with the applicable requirements in the Standard for Class 2 Power Units, UL 1310, need not be provided with integral overcurrent protection.

7.2 A product employing a power inlet intended for use with a cord set or a detachable power-supply cord shall be provided with fusing in accordance with this Section:

- a) In the power inlet or adjacent to the point of connection to the power-supply source provided by the product, and
- b) In the detachable power-supply cord if provided.

7.3 The overcurrent protection shall be either an integral part of the attachment plug or current tap, or of a through-cord design (in-line fuseholder) located so that there is not more than 6 inches (152 mm) between the face of the attachment plug or current tap and the side of the fuseholder furthest from the attachment plug or current tap. If a through-cord design is employed, a minimum No. 20 AWG (0.52 mm²) wire shall be used between the attachment plug or current tap and the fuseholder.

7.4 The rating of the overcurrent protection shall be as indicated in Tables 6.1 or 6.2.

Figure 7.1
Parallel-connected string with a polarized line fitting and without a load fitting
(See note 1)

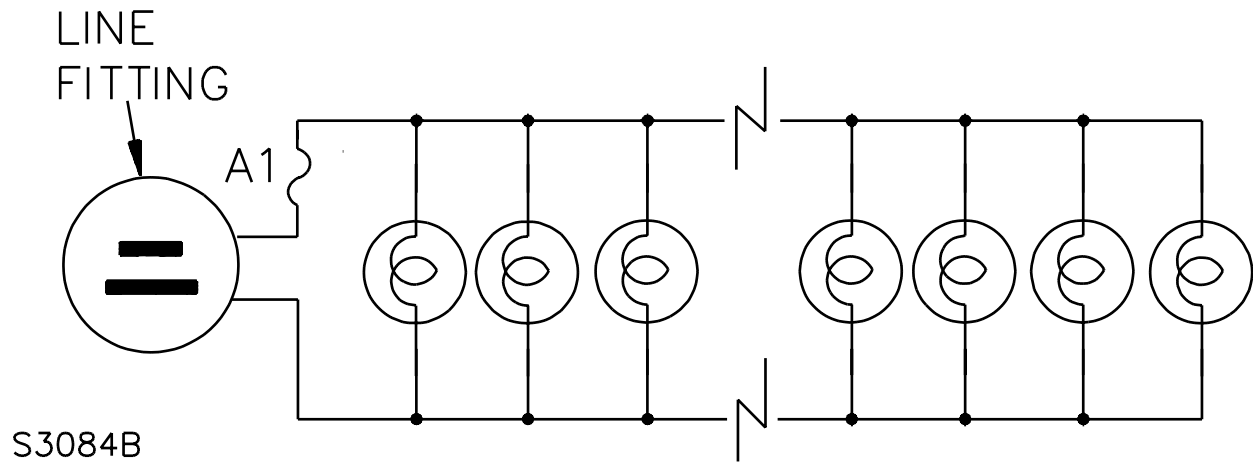


Figure 7.2
Parallel-connected string with a polarized line and load fitting
(See note 1)

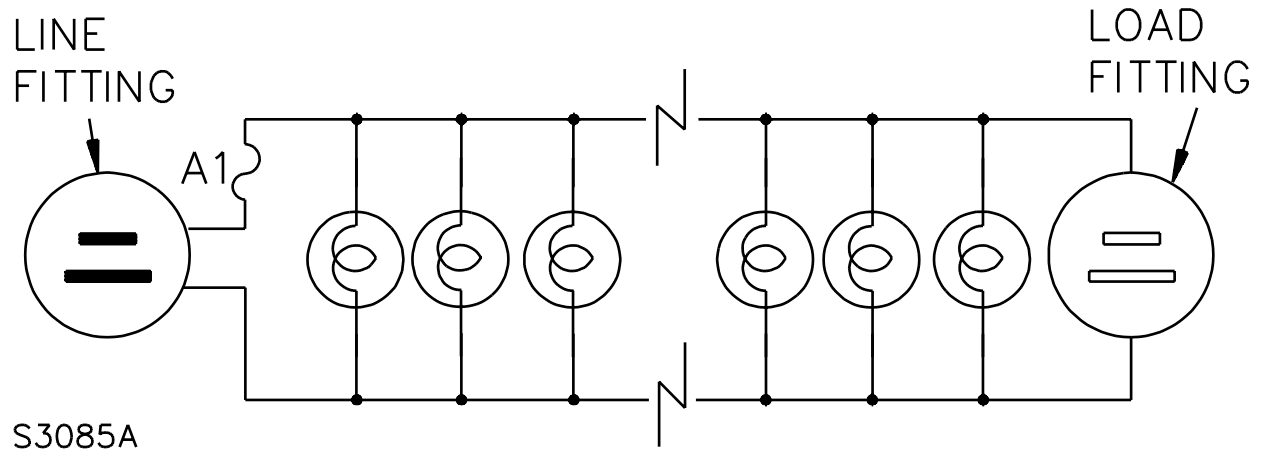


Figure 7.3
Series-connected string with a non-polarized line fitting and without a load fitting
(See note 1)

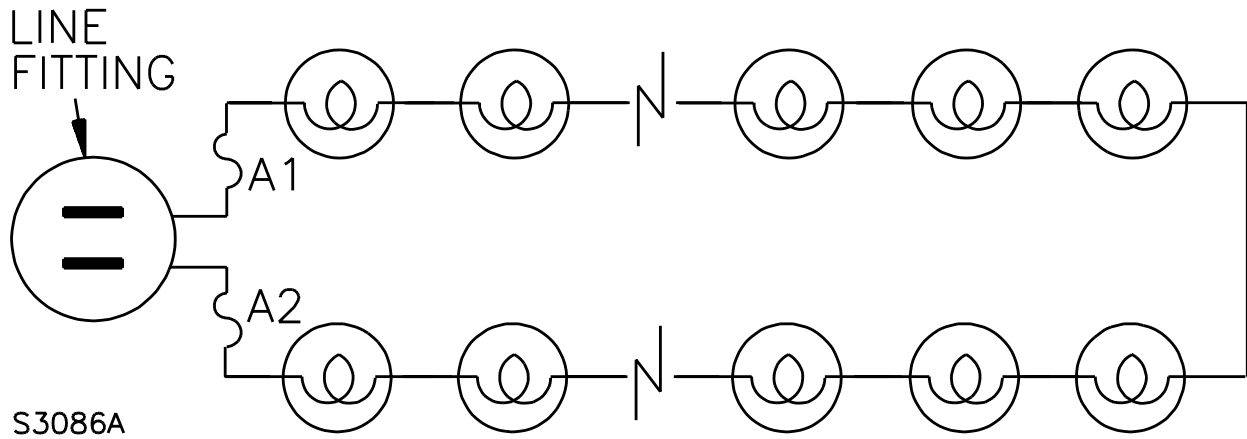


Figure 7.4
Series-connected string with a non-polarized line and load fitting
(See notes 1, 2, 3)

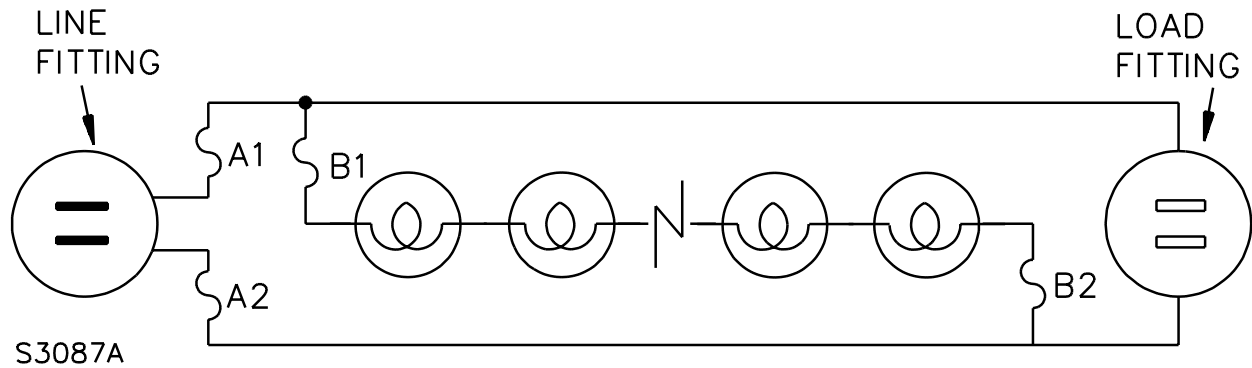


Figure 7.5
Series-connected string with a polarized line fitting and without a load fitting
(See note 1)

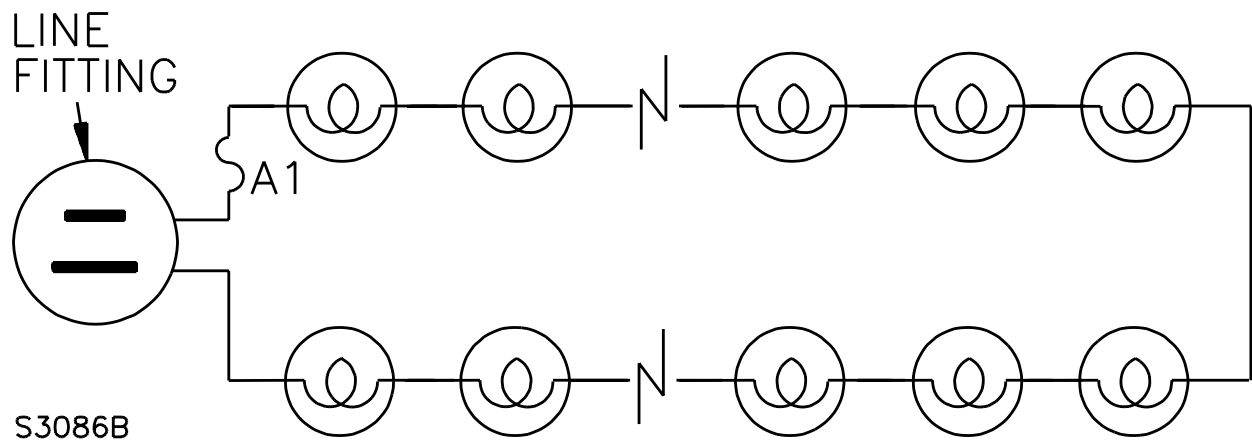


Figure 7.6
Series-connected string with a polarized line and load fitting
 (See note 1)

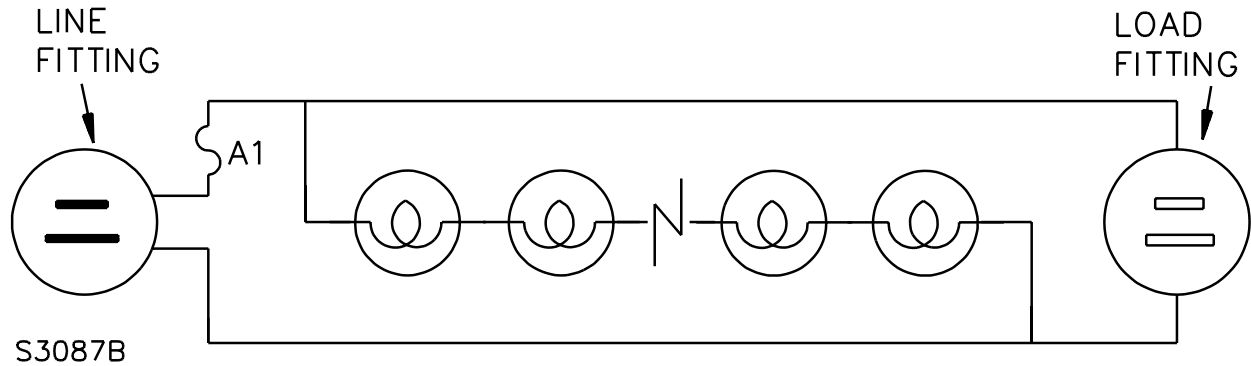


Figure 7.7
Series-parallel-connected string with a non-polarized line fitting and without a load fitting
 (See notes 1, 2, 3)

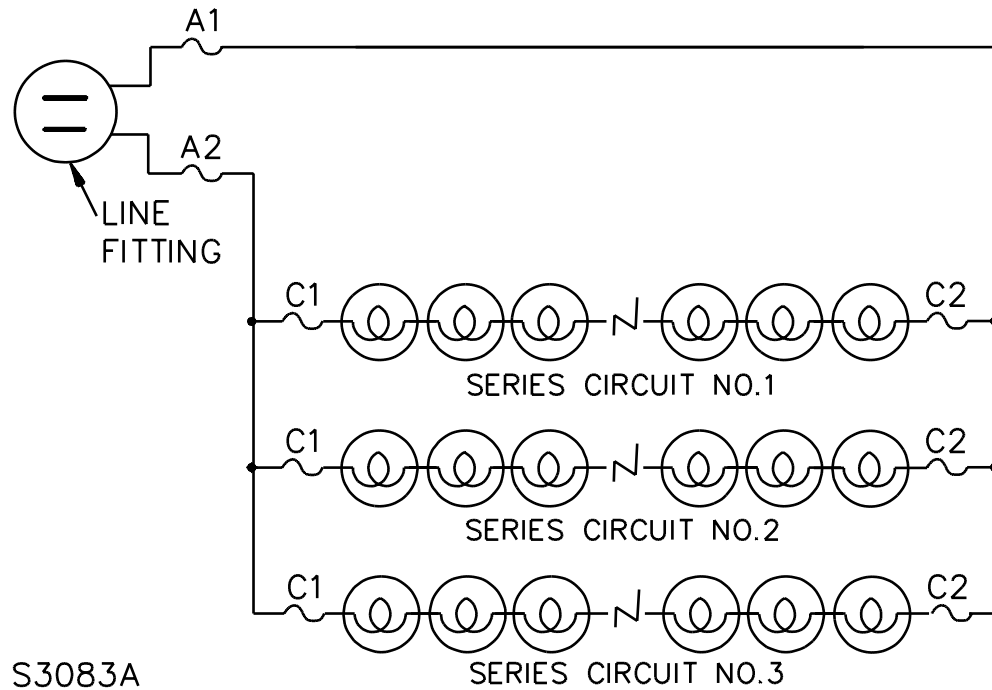


Figure 7.8
Series-parallel-connected string with a non-polarized line and load fitting
(See notes 1, 2, 3)

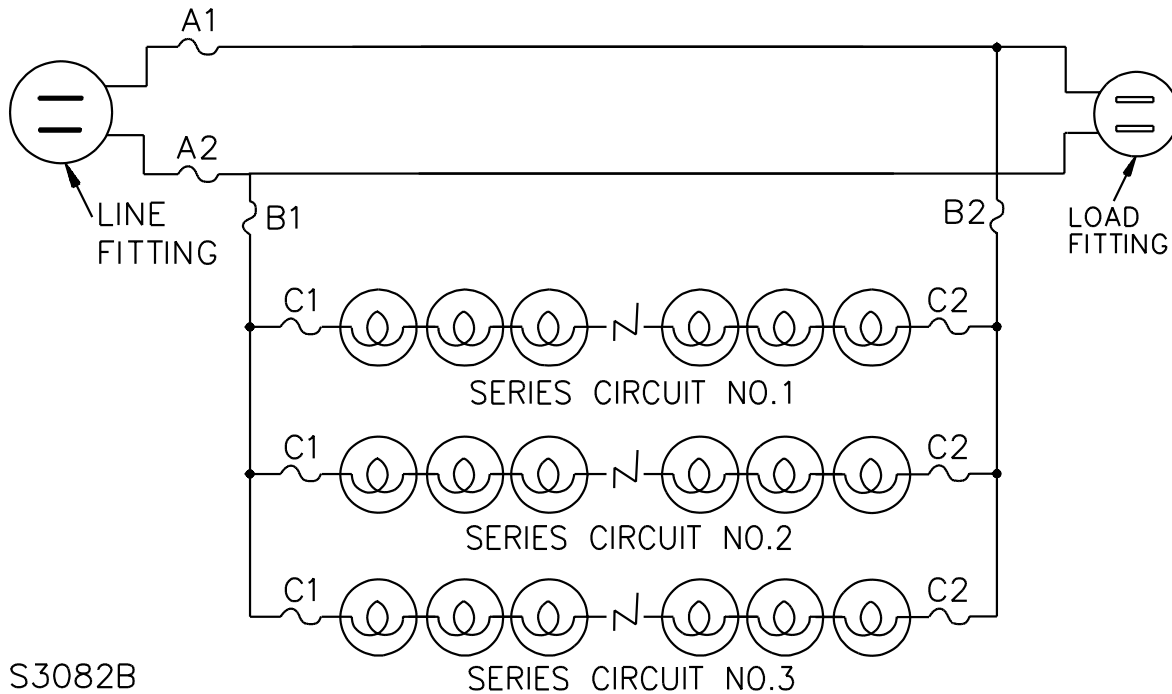


Figure 7.9
Series-parallel-connected string with a polarized line fitting and without a load fitting
(See note 1)

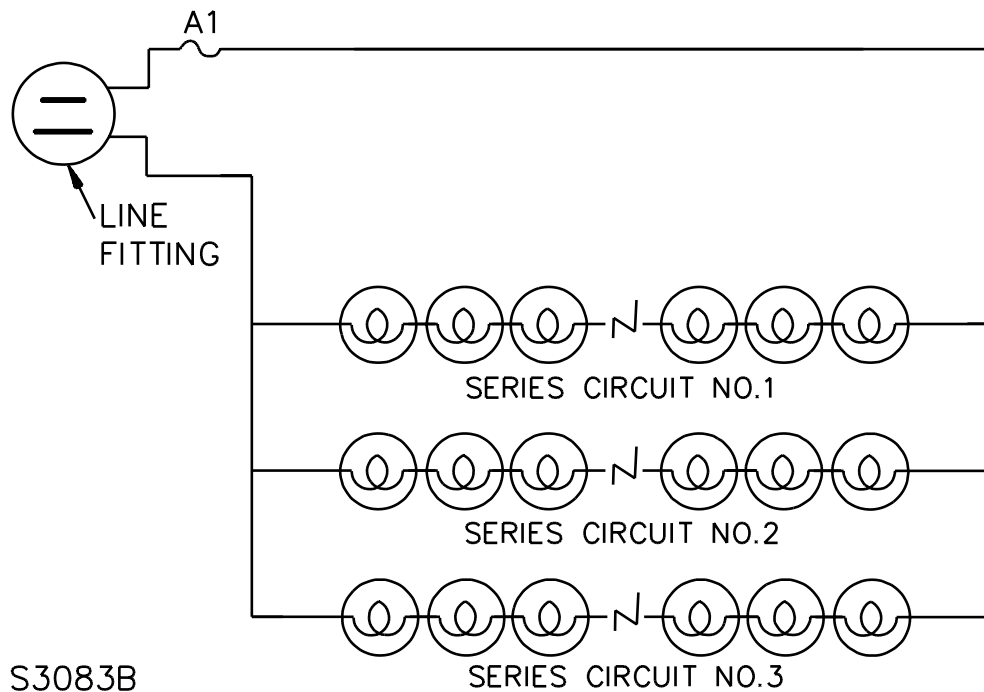


Figure 7.10
Series-parallel-connected string with a polarized line and load fitting
 (See note 1)

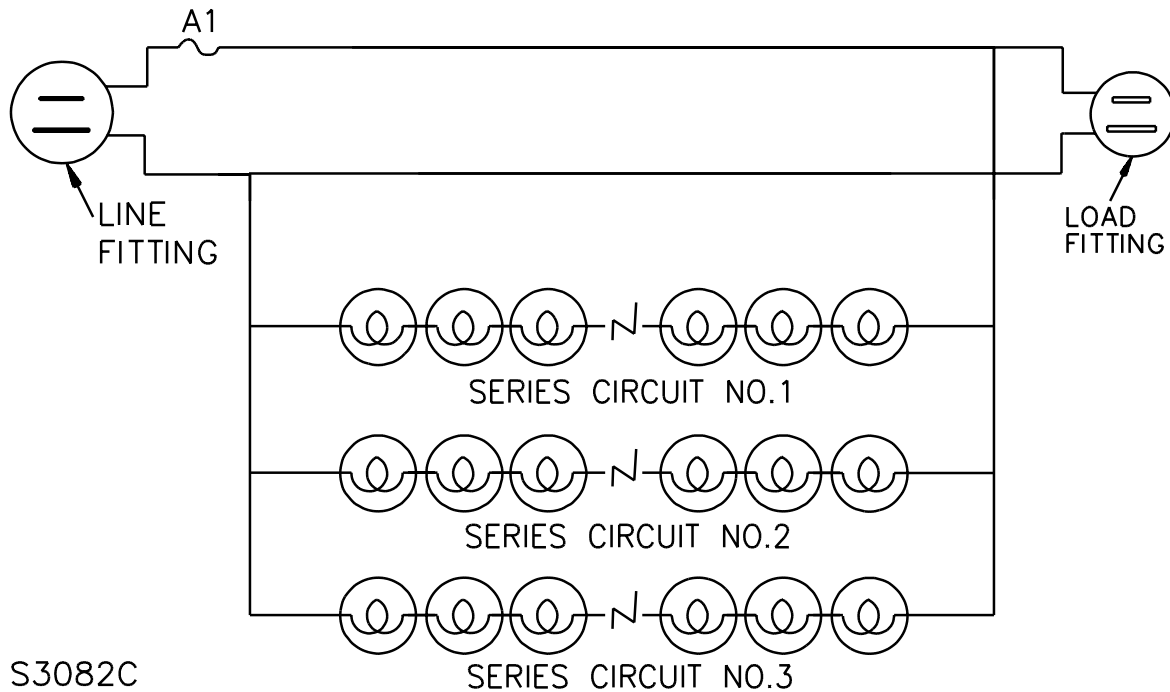


Figure 7.11
Decorative outfit or tree stand without a load fitting
 Decorative lighting harness or parallel-connected string
 (See notes 1, 4)

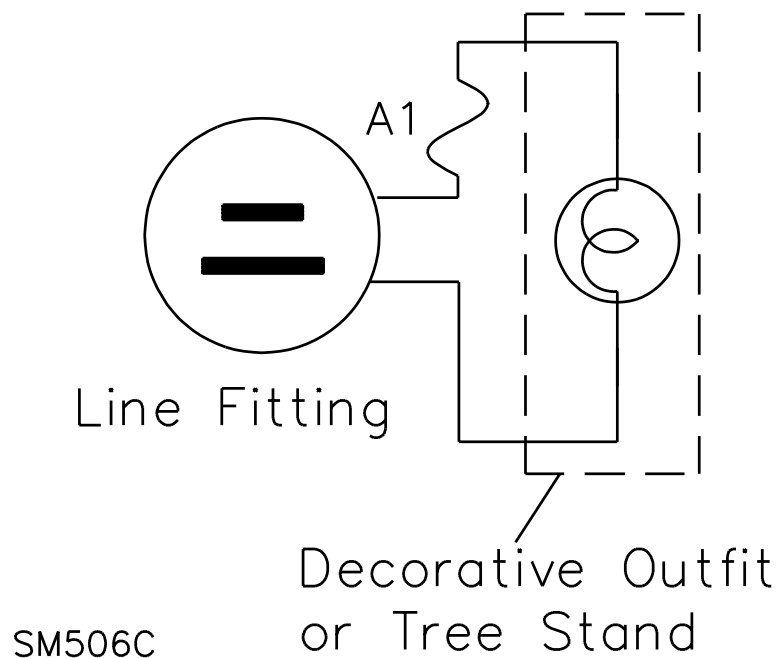


Figure 7.12
Decorative outfit or tree stand with a load fitting
Parallel-connected string
(See notes 1, 4)

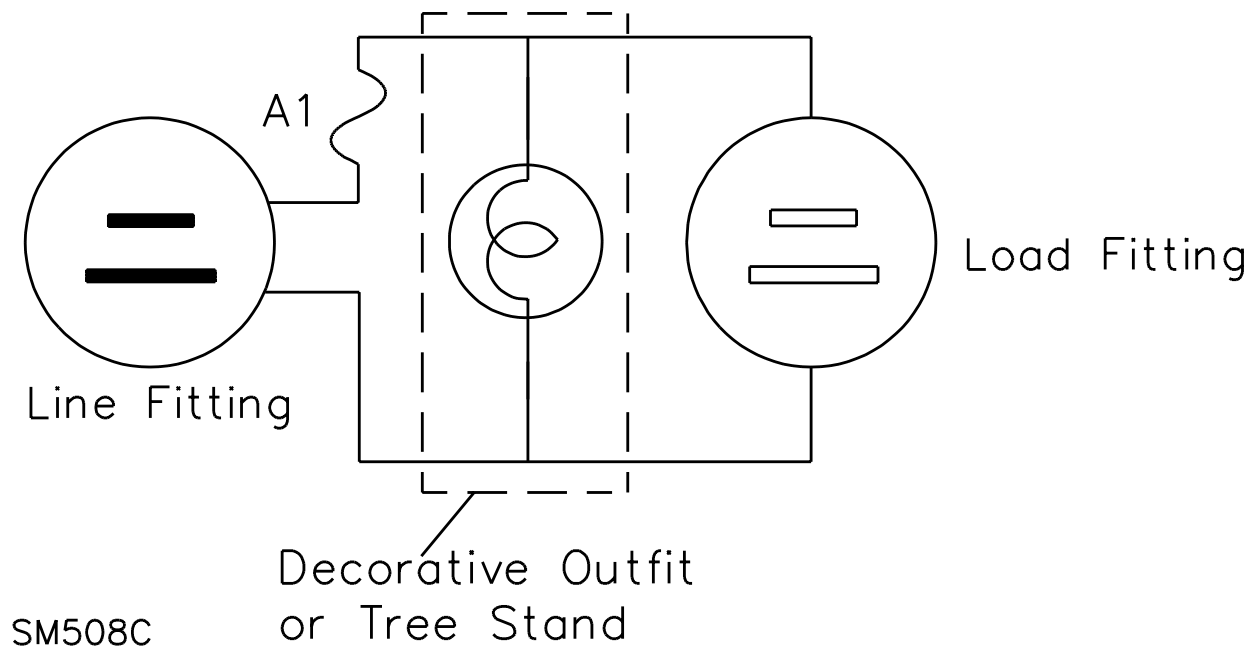


Figure 7.13
Decorative outfit or tree stand with a non-polarized line fitting without a load fitting
Series-connected string
(See notes 1, 4, 5)

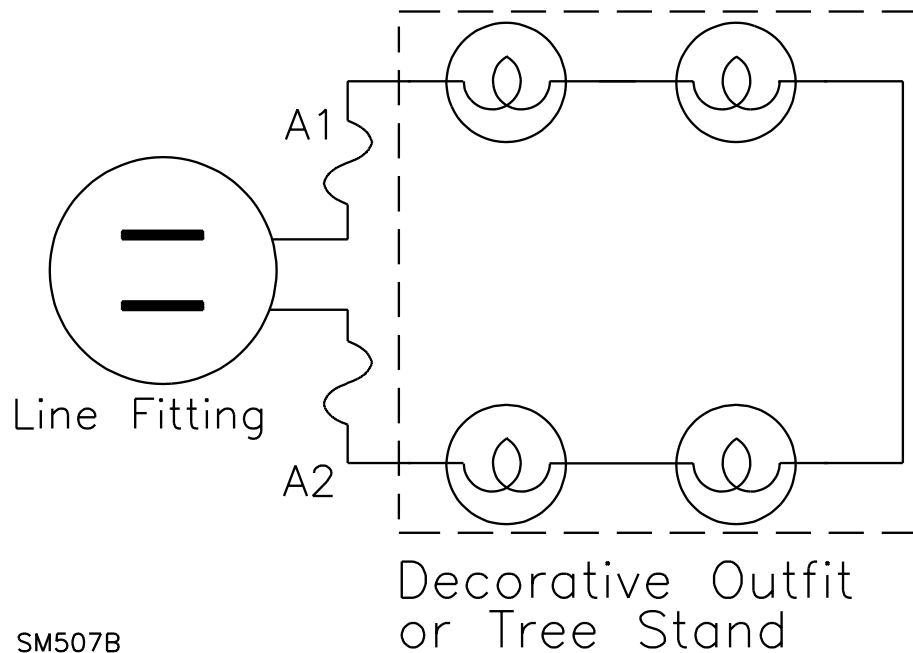


Figure 7.14
Decorative outfit or tree stand with a polarized line fitting and without a load fitting
Series-connected string
(See notes 1, 4, 5)

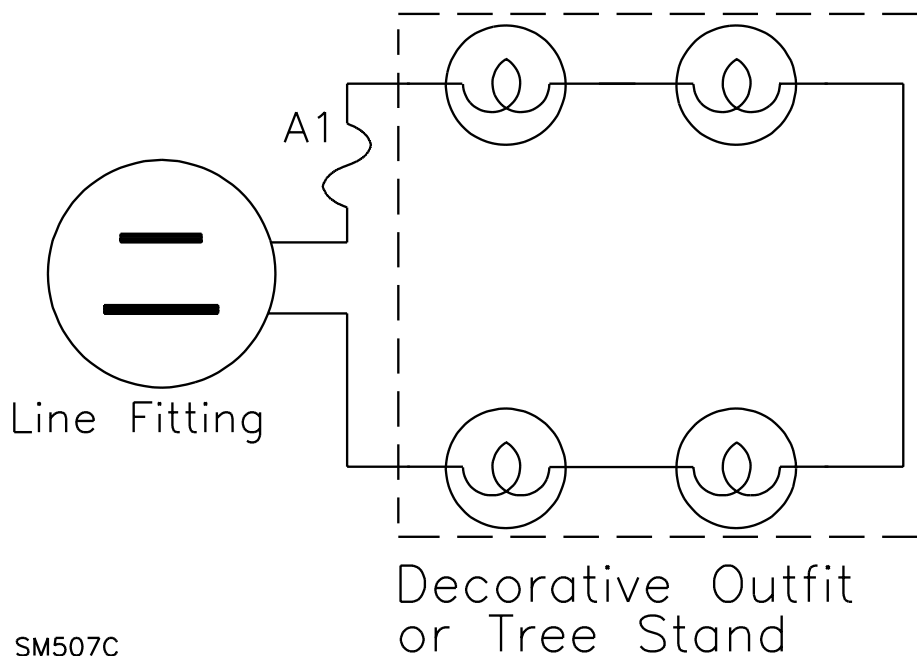


Figure 7.15
Decorative outfit or tree stand with a non-polarized line and load fitting
Series-connected string
(See notes 1, 2, 3, 4, 6)

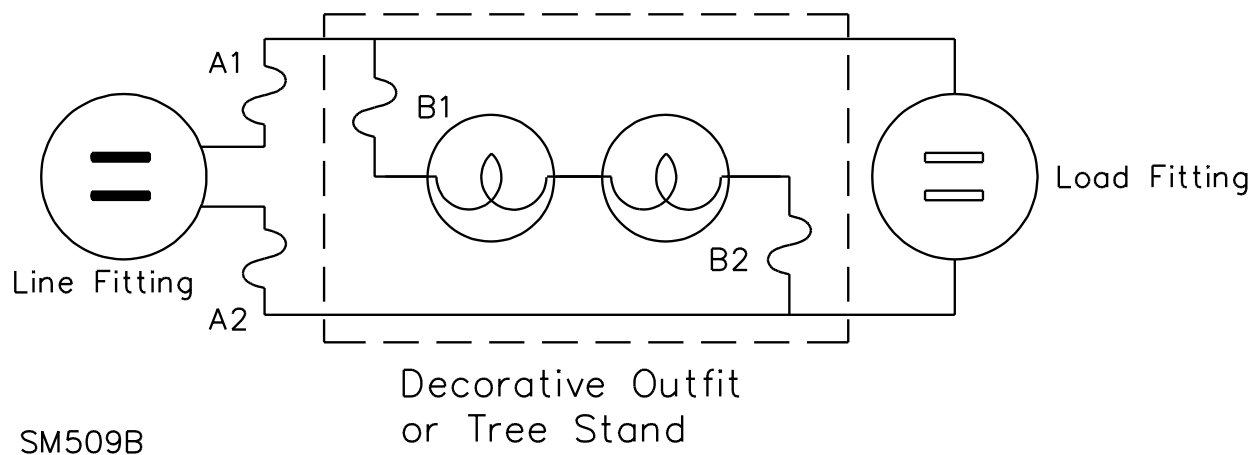
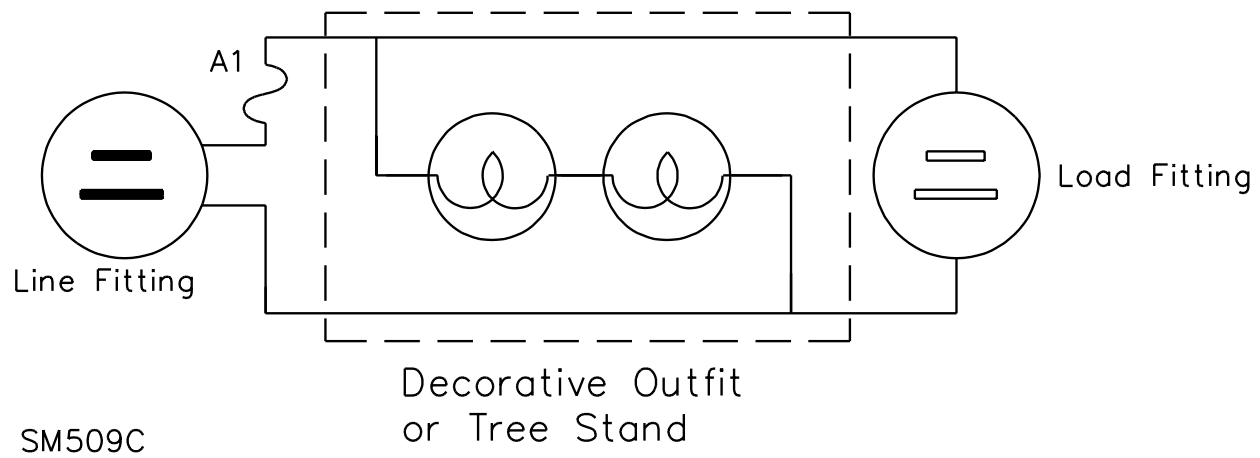


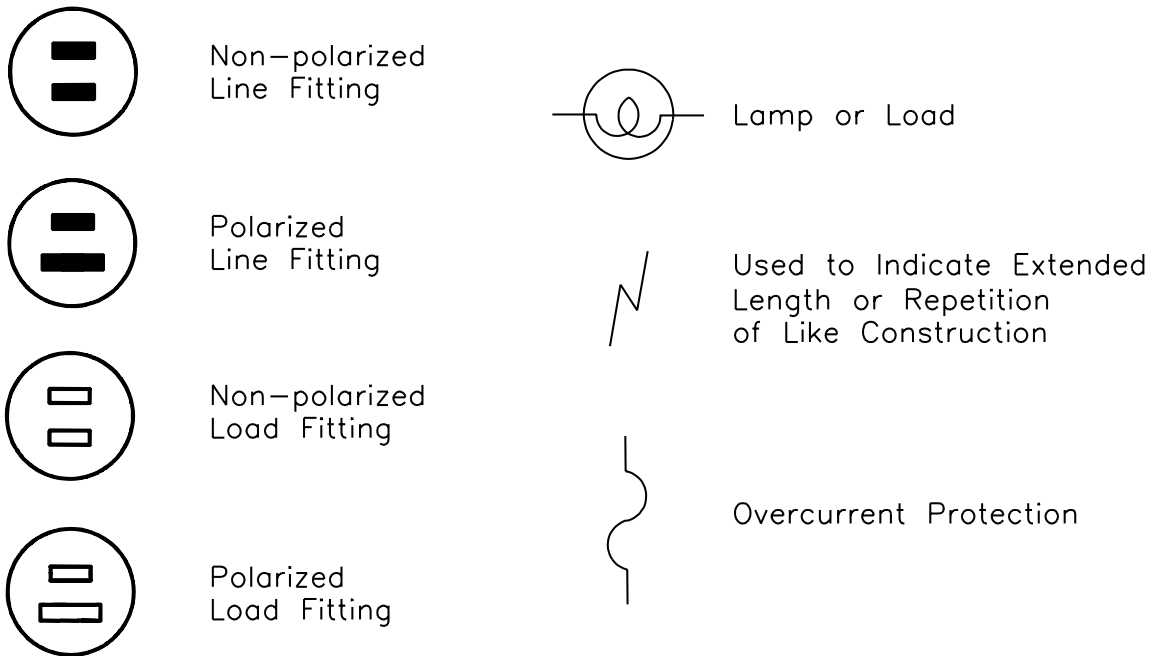
Figure 7.16
Decorative outfit or tree stand with a polarized line and load fitting
Series-connected string
(See notes 1, 2, 3, 4, 6)



Notes 1 – 6 for Figures 7.1 to 7.16, applicable as indicated in each figure:

1. Represents overcurrent protection provided in accordance with this section.
2. If all wire is the same gauge size, fuse A1 or both fuses A1 and A2 may serve to protect the entire assembly.
3. If wire of varying gauge size is used, fuses B1 and B2 or C1 and C2 shall be provided and rated in accordance with Tables 6.1 and 6.2.
4. This figure represents a decorative outfit or tree stand that may employ a motor.
5. See Figure 7.7 for series-parallel combination without load fitting.
6. See Figure 7.8 for series-parallel combination with load fitting.

7. The following is a key for Figures 7.1 – 7.16:



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7.5 A product provided with a polarized line fitting shall employ one fuse which shall be connected to the ungrounded (narrow) blade of the attachment plug or current tap, and be replaceable.

Exception: Fuses provided with a series- or series-parallel lighting string provided with a polarized line fitting need not be replaceable.

7.5 revised November 21, 2001

7.6 A product employing a replaceable fuse shall be provided with at least one spare fuse.

Exception: A decorative outfit without a load fitting need not be provided with a spare fuse if it does not employ:

- a) A series-connected string as described in 28.1, or*
- b) A parallel-connected string as described in 29.1.*

7.7 A product provided with a non-polarized line fitting shall employ two fuses, one connected to each conductor, which are not required to be replaceable.

8 Materials

8.1 A shade, diffuser, or decorative part employed in a seasonal lighting product shall be constructed of a material with a maximum vertical downward burning rate of 4 inches (102 mm) per minute as determined by the Downward Burning Rate Test, Section 50.

8.2 Simulated needles, leaves, small twigs, and other loose decorative parts shall be constructed of insulating material, as determined by compliance with the Conductivity of Decorative Parts Test, Section 51, if they are:

- a) Located within 2 inches (51 mm) of a lampholder employed in a seasonal product, or
- b) Employed in a seasonal product to which one or more lighting strings may be attached.

8.3 A polymeric material used to provide all or any part of an enclosure employed in a seasonal lighting product shall comply with the requirements for Enclosures, Section 10.

8.4 No edge, point, or burrs of an uninsulated live part shall contact the insulation of the wire or the insulation of the conductor of a cord that is connected at opposite polarity.

8.5 Insulation on which current-carrying parts are mounted shall be of cold-molded or phenolic composition or of an equivalent insulating material.

8.6 Hard fiber is acceptable for insulating bushings, washers, separators, and barriers, but not for the sole support of live parts.

9 Mechanical Assembly

9.1 A splice, a non-enclosed motor, a printed wiring board, a switch without enclosed terminals, and any wiring shall be located in an enclosure which complies with the requirements in Enclosures, Section 10.

Exception: Type CXTW, parallel conductor XTW, SPT-1, SPT-2, SJ, SJT, S, and ST wire of the minimum gauge specified in Supply Connections, Section 13, need not be enclosed.

Revised 9.1 effective January 1, 2001

9.2 A controller, splice compartment, direct plug-in unit, or electronically-operated ornament shall employ an enclosure which complies with the requirements in Enclosures, Section 10.

9.3 A seasonal lighting product or accessory shall have all parts reliably secured in place.

9.4 An adhesive used to secure parts of the enclosure of a product shall comply with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, and the Adhesive Test, Section 63.

Exception: An adhesive used to secure parts of the enclosure of an ornament need comply only with the Adhesive Test, Section 63.

9.5 If a seasonal lighting product or component employs an enclosure, the unit shall be constructed such that it is not necessary to open or remove the enclosure when the unit is used as intended. If the enclosure is held together by screws, then commonly removable fasteners, such as flathead or cross recessed, square recessed, or star recessed head screws or a combination thereof, or a standard bolt pattern, shall not be used.

9.6 Each switch, receptacle, lampholder, and similar device shall be mounted securely such that it is kept from turning. A means, other than friction alone, shall be provided to prevent the device from turning. This means may consist of a lockwasher for a device employing a single hole mounting means.

Exception No. 1: The turning of a switch, receptacle or other similar device is permitted if the turning of such a device is part of the design of the unit and introduces no additional risk of fire or electric shock, such as a reduction of spacings below the minimum acceptable values, or stress on a connection.

Exception No. 2: A lampholder need not be mounted such that it is kept from turning if it is likely to be held by hand during relamping.

9.7 A switch in the primary circuit or an overcurrent-protective device shall be located within an enclosure in such a manner as to not be accessible or exposed to tampering, or subject to damage during normal use. A switch shall also comply with Switches, Section 19.

9.8 The actuating means of a switch, such as a toggle, handle, or similar device, shall comply with the requirement in 9.7 if dislodging such a part results in the exposure of live parts (see 12.1) or film-coated magnet wire as determined by contact with the probe illustrated in Figure 9.1.

9.9 If the exterior part of the switch or control forms part of an enclosure, the part shall comply with the requirement in 10.3.4(b) and shall be mechanically secured in place.

10 Enclosures

10.1 General

10.1.1 An enclosure employed in a seasonal lighting product shall be formed and assembled with the strength and rigidity necessary to resist the abuses to which it is likely to be subjected, without increasing the risk of fire, electric shock, or injury to persons due to total or partial collapse of the enclosure with a resulting reduction of spacings, loosening or displacement of parts, or other defects.

10.1.2 The enclosure of a controller, direct plug-in unit, or electronically-operated ornament shall be constructed of a polymeric material which complies with 10.3.1– 10.3.10.

10.1.3 The enclosure of an open-winding motor or transformer, splices, or wiring other than the power-supply cord shall be constructed of metal or a polymeric material which complies with 10.2.1 – 10.3.10.

Exception: The enclosure of fixed internal wiring that does not include splices or taps need not be enclosed if it provides mechanical protection for the wiring, and if the wiring consists of CXTW, parallel-conductor XTW, SPT-1, SPT-2, or jacketed flexible cord. See Supply Connections, 13, for the minimum gauge required.

Revised 10.1.3 effective January 1, 2001

10.1.4 Means shall be provided to prevent external wires from being pushed into the enclosure of the product. Compliance shall be determined by the Wire Push-Back Relief Test, Section 47.

10.2 Metallic enclosures

10.2.1 An enclosure of sheet metal shall be constructed either of uncoated steel, whose thickness is not less than 0.032 inch (0.81 mm), or of another metal that provides strength and rigidity equivalent to that of 0.032 inch (0.81 mm) steel.

10.2.2 Sheet steel shall be coated with a corrosion-resistant material such as zinc, paint, enamel, or lacquer.

10.3 Polymeric enclosures

10.3.1 A thermoplastic or thermosetting material used to provide all or any part of the enclosure as specified in 10.1.1 and 12.1, or to provide structural support in the product, shall comply with the requirements in 10.3.4 – 10.3.10.

10.3.2 Polymeric materials employed in an attachment plug, current tap, power inlet, load fitting, or in-line fuseholder shall comply with the requirements in 10.3.4– 10.3.10.

10.3.3 Lampholders constructed of polymeric materials shall comply with 10.3.10 in addition to the requirements in Lampholders, Section 22. When electronic circuitry is encapsulated in a polymeric material employed inside a lampholder the polymeric material shall also comply with 10.3.10.

10.3.3 revised November 21, 2001

10.3.4 A material used to enclose or provide structural support for electrical live parts shall be considered acceptable if:

- a) The material has a minimum flammability rating as specified in 10.3.10,
- b) The enclosure complies with the Drop Test, Section 59, and the Impact Test, Section 60, and
- c) The enclosure complies with the Enclosure Mold Stress Relief Test, Section 58.

10.3.5 The impact evaluation of a polymeric enclosure of outdoor units, described in 10.3.4(b), shall be performed after low-temperature conditioning at minus 35°C (minus 31°F) as described in the Cold Impact Test, Section 61.

10.3.6 During either of the tests specified in 10.3.4(b), snap fit parts of the enclosure shall not separate as a result of the impact if it exposes live parts.

10.3.7 In addition to the applicable requirements in this section, a polymeric enclosure employed in a product intended for outdoor use shall comply with the requirements for Outdoor-Use Products, Section 27.

10.3.8 The ultraviolet (UV) conditioning described in the Ultraviolet (UV) Light Exposure and Water Immersion Tests, Section 89, shall be conducted on outdoor units in which polymeric material is used as an enclosure or for structural support, and all other units subjected to ultraviolet radiation from integral fluorescent lamps.

Exception: An enclosure fabricated of material evaluated for resistance to ultraviolet light in accordance with the requirements specified in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, need not be further evaluated.

10.3.9 With regard to consideration of thermal endurance in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, the material shall possess a mechanical temperature index, with impact, as a result of long term aging or a generic temperature index of at least the measured temperature in the Temperature Test, Section 43.

10.3.10 Polymeric materials employed for an enclosure, attachment plug, current tap, load fitting, in-line fuseholder, or series-connected lampholder, or any device not mounted within an enclosure shall have a minimum flammability rating as indicated in Table 10.1. The flammability rating is to be determined by the applicable tests in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

Exception: Polymeric materials, other than those used in lampholders less than 0.15 inch³(2500 mm³) in volume employed in series or series-parallel connected strings, may comply with either of the following end product flame tests if they have a minimum HWI (hot-wire resistance to ignition) Performance Level Category (PLC) of 3 and a minimum HAI (high-current arc resistance to ignition) PLC of 3:

- a) If the component material is greater than 0.15 inch³(2500 mm³) in volume, the flame tests contained in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, shall be performed. Specifically, products required to comply with the V-0 or V-1 flame rating shall be subjected to the 3/4-inch or 12-mm flame test as applicable. At the conclusion of the test there shall not be openings large enough to enable a 1/4-inch (6.4-mm) diameter rod to enter the hole in order to provide flame containment and there shall not be ignition of the cotton indicator. The indicator is to be absorbent, 100 percent cotton thinned to approximately 2 by 2 inches (50 by 50 mm) and a maximum thickness of 0.24 inches (6 mm). The cotton is to be placed horizontally 11.8 ± 0.39 inches (300 ± 10 mm) below the component material; or*
- b) If the component material is less than or equal to 0.15 inch³(2500 mm³) in volume, it shall be subjected to the Flammability Test for Small Components specified in the Standard for Test for Flammability of Small Polymeric Component Materials, UL 1694. Total consumption of the component or specimen or ignition of the cotton indicator by flaming particles or drops shall not be allowed.*

Effective date for 10.3.10 changed from January 2, 2002 to January 2, 2003

Table 10.1
Material flammability requirements

Material and application^a	Minimum required flammability rating^b	Minimum HWI (PLC)^d	Minimum HAI (PLC)^d
Polymeric materials used as a non-decorative part of the enclosure for all products ^c	V-1	3	3
	V-0	not required	not required
Polymeric materials used as a non-decorative part of the enclosure for a product which employs a Class 2 circuit with a maximum available power of 15 Watts ^f	e	not required	not required

Table 10.1 Continued on Next Page

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Table 10.1 Continued

Material and application ^a	Minimum required flammability rating ^b	Minimum HWI (PLC) ^d	Minimum HAI (PLC) ^d
^a A decorative part of a product shall comply with the requirements in Materials, Section 8. ^b Alternative end product flammability tests may be performed in accordance with the Exception to 10.3.10. ^c Refer to Seasonal-Lighting Lampholders, Supplement SB, for parallel-connected lampholders. ^d The HWI and HAI performance level categories (PLC) are described in the Standard for Polymeric Materials – Short Term Property Evaluations, UL 746A. ^e Material shall have a maximum vertical downward burning rate of 4 inches (102 mm) per minute as determined by the Downward Burning Rate Test, Section 50. ^f Maximum available power as measured in 49.2 – 49.4.			

11 Enclosure Openings

11.1 There shall not be openings in the enclosure except for the passage of wiring, a rotating shaft, or a power-supply cord, if employed, or for ventilation. These openings shall not be larger than necessary and shall comply with 11.2. Any opening in the enclosure shall not permit accessibility of live parts as determined by contact with the probe illustrated in Figure 9.1. A ventilation opening shall also comply with 11.3 – 11.6.

Exception: A product or device which contains a replaceable fuse may employ an opening not larger than necessary to determine if the fuse is intact and shall comply with the Fault Current Test, Section 66.

11.2 If wiring passes through an opening in a metal wall, it shall be protected by a bushing, a grommet, or by rolling the edge of the metal at the opening not less than 120 degrees. The edges of an opening shall be free of burrs, fins, and other sharp edges. See 21.1.

11.3 A ventilation opening employed in the enclosure of a product shall be of such size and shape that the opening does not exceed a major dimension of 0.15 inches (3.8 mm).

11.4 A ventilation opening employed in the enclosure of a product shall be provided with a barrier between the opening and any live part or possible source of arcing, such as a switch, fuse, printed wiring board, splice, or similar device. A ventilation opening shall comply with 11.5 and 11.6.

Exception: A ventilation opening with a major dimension of 0.02 inches (0.5 mm) or less need not be provided with a barrier.

11.5 A ventilation opening shall not be located in any horizontal surface of the product. A horizontal surface is considered to be any surface in which the included angle is less than 45 degrees as measured between the inside surface of the enclosure containing the ventilation opening and the horizontal.

11.6 The barrier specified in 11.4 shall be of such dimensions and located such that a straight line drawn from any live part or arcing part, past the edge of the barrier, will intersect the enclosure a minimum of 0.25 inch (6.4 mm) from the edge of the opening. A live part shall not be located below the opening. Examples of both unacceptable and acceptable constructions are illustrated in Figure 11.1.

Exception: For a ventilation opening with a major dimension between 0.04 inches (1 mm) and 0.02 inches (0.5 mm), the 0.25 inch distance may be reduced proportional to the maximum major dimension of 0.15 inches (3.8 mm).

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