

## **SUMMARY OF TOPICS**

*The following changes in requirements are being proposed:*

- 1. Clarification of requirements for conductor material**
- 2. Revision of battery operated requirements**
- 3. Clarification of packaging instructions for light sculptures**

## **COMMENTS AND STP BALLOTS DUE: July 16, 2007**

For your convenience in review, proposed additions to existing requirements are shown underlined and proposed deletions are shown ~~lined-out~~.

### **1. Clarification of requirements for conductor material**

#### **RATIONALE**

Proposal submitted by: Anthony Tassone, UL

Currently, 14.1 of UL 2388 states that the conductors shall be either copper or copper alloy. The term copper alloy is not specifically defined in the standard. Specifying copper alloy in UL 2388 without further definitions, restrictions and requirements may lead to confusion. The copper alloy would need to comply with the same dc resistance test required to determine the acceptability of conductor size described in the Standard for Flexible Cords and Cables, UL 62 and the Reference Standard for Electrical Wires, Cables, and Flexible Cords, UL 1581 for a copper conductor. The proposed revisions are intended for clarification.

#### **PROPOSAL**

##### **14 Conductors**

14.1 ~~All conductors shall be copper or copper alloy.~~ Conductors shall be made of annealed copper in compliance with the Standard Specification for Soft or Annealed Copper Wire, ASTM B 3 or annealed coated copper in compliance with the Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes, ASTM B 33.

14.2 All conductors, other than integral lamp leads and series connection type, shall be stranded size 18 or 16 AWG minimum, and stranded. The size of the individual strands shall be a minimum of 36 AWG 0.0049 in (0.125 mm) and a maximum of 30 AWG 0.010 in (0.254 mm).

14.4 The conductor size shall be determined by either:

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- a) The cross-sectional area complying with the minimum values given in Table 14.2 when determined in accordance with the method specified in the Reference Standard for Electrical Wires, Cables, and Flexible Cords, UL 1581, Sections 200 or 210; or
- b) The maximum dc resistance complying with the values in Table 14.2. In case of dispute, dc resistance shall be the referee method.

**Table 14.2**  
**Maximum resistance and minimum cross-sectional area of conductors**

| <u>Wire gauge, AWG<br/>(mm<sup>2</sup>)</u> | <u>Maximum resistance,<br/>Ohms per 1000 ft at<br/>20°C</u> | <u>Maximum resistance,<br/>Ohms per 1000 m at<br/>20°C</u> | <u>Cross-sectional area</u> |                       |
|---------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------|-----------------------------|-----------------------|
|                                             |                                                             |                                                            | <u>circular mils</u>        | <u>mm<sup>2</sup></u> |
| <u>18 (0.824)</u>                           | <u>7.20</u>                                                 | <u>23.6</u>                                                | <u>1570</u>                 | <u>0.796</u>          |
| <u>16 (1.31)</u>                            | <u>4.54</u>                                                 | <u>14.9</u>                                                | <u>2500</u>                 | <u>1.27</u>           |

## 2. Revision of battery operated requirements

### RATIONALE

Proposal submitted by: Anthony Tassone, UL

The proposed requirements have been developed to address battery operated ropelights. The requirements are similar to the requirements described in the Standard for Seasonal and Holiday Decorative Products, UL 588.

### PROPOSAL

#### 21C Battery Operated Products

21C.1 When a flexible lighting product utilizes the number and type of batteries shown in Table 21C.1, the product shall comply with all the requirements in this standard for Class 2 circuits having more than a 15 W output.

**Table 21C.1**  
**Output capabilities of common sizes and types of batteries<sup>c</sup>**

| <u>Battery</u>     |                       |                                |                      | <u>8 A output at 1 minute<br/>(batteries in parallel)<sup>b</sup></u> |
|--------------------|-----------------------|--------------------------------|----------------------|-----------------------------------------------------------------------|
| <u>Type</u>        | <u>Size</u>           | <u>Designation<sup>a</sup></u> | <u>Rated voltage</u> |                                                                       |
| <u>Carbon-zinc</u> | <u>N</u>              | <u>N</u>                       | <u>1.5</u>           | <u>NA</u>                                                             |
|                    | <u>AAA</u>            | <u>AAA</u>                     | <u>1.5</u>           | <u>NA</u>                                                             |
|                    | <u>AA</u>             | <u>AA</u>                      | <u>1.5</u>           | <u>6</u>                                                              |
|                    | <u>C</u>              | <u>C</u>                       | <u>1.5</u>           | <u>5</u>                                                              |
|                    | <u>D</u>              | <u>D</u>                       | <u>1.5</u>           | <u>6</u>                                                              |
|                    | <u>E</u>              | <u>=</u>                       | <u>1.5</u>           | <u>2</u>                                                              |
|                    | <u>G</u>              | <u>=</u>                       | <u>1.5</u>           | <u>1</u>                                                              |
|                    | <u>6</u>              | <u>6</u>                       | <u>6.0</u>           | <u>1</u>                                                              |
|                    | <u>9-V transistor</u> | <u>1604</u>                    | <u>9.0</u>           | <u>NA</u>                                                             |
|                    |                       |                                |                      |                                                                       |

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Table 21C.1 Continued on Next Page



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**Table 21C.1 Continued**

| <b>Battery</b>                |                |                                |                      | <b>8 A output at 1 minute<br/>(batteries in parallel)<sup>b</sup></b> |
|-------------------------------|----------------|--------------------------------|----------------------|-----------------------------------------------------------------------|
| <b>Type</b>                   | <b>Size</b>    | <b>Designation<sup>a</sup></b> | <b>Rated voltage</b> |                                                                       |
| Alkaline-manganese<br>dioxide | N              | L20                            | 1.5                  | NA                                                                    |
|                               | AAA            | L30                            | 1.5                  | NA                                                                    |
|                               | AA             | L40                            | 1.5                  | 2                                                                     |
|                               | C              | L70                            | 1.5                  | 2                                                                     |
|                               | D              | L90                            | 1.5                  | 1                                                                     |
|                               | 9-V transistor | 1604A                          | 9.0                  | 2                                                                     |
| Nickel-cadmium                | N              | KR115/XXX                      | 1.2                  | NA                                                                    |
|                               | AAA            | =                              | 1.2                  | NA                                                                    |
|                               | AA             | KR142/XXX                      | 1.2                  | 1                                                                     |
|                               | C              | KR257/XXX                      | 1.2                  | 1                                                                     |
|                               | D              | KR334/XXX                      | 1.2                  | 1                                                                     |
|                               | 9-V transistor | =                              | 8.4                  | NA                                                                    |

<sup>a</sup> This designation corresponds to that in the Standard for Portable Primary Cells and Batteries with Aqueous Electrolyte – General and Specifications, ANSI C18.1M, Part 1.

<sup>b</sup> Denotes minimum number of batteries capable of delivering 8 A DC or more to external resistive load for minimum 1 minute.

<sup>c</sup> The measured power output of a battery not included in the table shall be less than 15 watts as determined by the Power Measurement Test.

21C.2 When a flexible lighting product utilizes fewer than the number of batteries shown in Table 21C.1, the product shall be evaluated using the requirements for Class 2 circuits having less than a 15 W output. In addition, each of the products described above shall comply with the marking requirements in Sections 41A and 41B.

#### **41A Battery Operated Product Markings**

41A.1 A battery-operated product investigated for use only with a specific user replaceable battery supply shall be marked, "CAUTION: Replace only with \_\_\_\_\_ type batteries." The blank is to be filled in with both the appropriate size and type of battery, for example, AA Alkaline, C Carbon Zinc, AAA Ni-Cad, and similar type batteries.

41A.2 The marking described in 41A.1 shall be located on the product where it will be visible during replacement of the battery supply, such as in the compartment housing the battery supply, or on the access cover of a battery supply compartment, or near a receptacle intended for connection of an external battery supply by means of a battery cable. If it is not practical to include the markings directly on the surfaces mentioned above because of the size of the battery, battery enclosure, or both, the marking may be provided on a tag. If a tag is used to display the marking, it shall be attached so that it will remain with the product unless or until it is intentionally removed by the user.

#### **41B Battery Supply Polarity Identification Markings**

41B.1 Unless the physical configuration of the battery supply and battery-operated products prevents reverse polarity during battery supply installation, the polarity of the connections between a user-replaceable battery supply and a battery-operated product shall be plainly marked on the battery-operated product with:

- The words "positive" and "negative;"
- The signs "+" for positive and "-" for negative;

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- c) The color coding red for a positive lead and black for a negative lead; or
- d) A pictorial representation (such as an illustration on a label) illustrating the proper polarity and orientation of the battery supply, as applicable for the type of battery supply involved.

### 3. Clarification of packaging instructions for light sculptures

#### RATIONALE

Proposal submitted by: Anthony Tassone, UL

Since lighting sculptures are shipped with the ropelight attached to the frame and for consistency with the exception for cord tag markings in 40.3, it is being proposed that 44.2 be revised to allow the exception for lighting sculptures.

#### PROPOSAL

44.2 The following shall be marked on the packaging in letters not less than specified in 40.2, "WARNING – Risk of fire and electric shock. Uncoil flexible light prior to plugging into receptacle."

Exception: This marking is not required for light sculptures.

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# UL 2388

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## Flexible Lighting Products

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UL Standard for Safety for Flexible Lighting Products, UL 2388

First Edition, Dated July 3, 2002

Revisions: This Standard contains revisions through and including February 11, 2005.

### **SUMMARY OF TOPICS**

***This revision to ANSI/UL 2388 is issued to update the Title Page to indicate the latest approval as an American National Standard.***

UL Standards for Safety are developed and maintained in the Standard Generalized Markup Language (SGML). SGML -- an international standard (ISO 8879-1986) -- is a descriptive markup language that describes a document's structure and purpose, rather than its physical appearance on a page. Due to formatting differences resulting from the use of UL's new electronic publishing system, please note that additional pages (on which no requirements have been changed) may be included in revision pages due to relocation of existing text and reformatting of the Standard.

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 reference.

| Future Effective Date | References                                                  |
|-----------------------|-------------------------------------------------------------|
| January 2, 2006       | Paragraphs 7.2, 40.2, and 44.2, Sections 21A, 36A, and 36B. |

The revisions dated February 11, 2005 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.

The UL Foreword is no longer located within the UL Standard. For information concerning the use and application of the requirements contained in this Standard, the current version of the UL Foreword is located on ULStandardsInfoNet at: <http://ulstandardsinfonet.ul.com/ulforeword.html>

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

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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:

| Page          | Date               |
|---------------|--------------------|
| 1 .....       | February 11, 2005  |
| 2-7 .....     | June 28, 2004      |
| 8 .....       | September 27, 2002 |
| 9 .....       | June 28, 2004      |
| 10-12 .....   | September 27, 2002 |
| 13-20B .....  | June 28, 2004      |
| 21-23 .....   | September 27, 2002 |
| 24-26D .....  | June 28, 2004      |
| 27-28 .....   | September 27, 2002 |
| 29 .....      | June 28, 2004      |
| 30-32 .....   | September 27, 2002 |
| 33-34 .....   | June 28, 2004      |
| A1-A2 .....   | June 28, 2004      |
| SR1-SR2 ..... | June 28, 2004      |

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**JULY 3, 2002**  
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**ANSI/UL 2388-2005**

**1**

**UL 2388**

**Standard for Flexible Lighting Products**

**First Edition**

**July 3, 2002**

The most recent designation of ANSI/UL 2388 as an American National Standard (ANSI) occurred on February 2, 2005.

This ANSI/UL Standard for Safety, which consists of the First edition with revisions through February 11, 2005 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-RTP Standard Department, 12 Laboratory Dr., P.O. Box 13995, Research Triangle Park, NC, 27709-3995.

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.

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## CONTENTS

### INTRODUCTION

|                              |   |
|------------------------------|---|
| 1 Scope .....                | 7 |
| 2 Components .....           | 7 |
| 3 Units of Measurement ..... | 8 |
| 4 Undated References .....   | 8 |
| 5 Glossary .....             | 8 |

### CONSTRUCTION

|                                                      |    |
|------------------------------------------------------|----|
| 6 Assembly and Packaging .....                       | 8  |
| 7 Enclosures .....                                   | 9  |
| 8 Polymeric Decorative Parts .....                   | 11 |
| 9 Light Sculptures .....                             | 11 |
| 10 Accessibility of Current Carrying Parts .....     | 11 |
| 11 Insulating Materials .....                        | 13 |
| 12 Electrical Spacing .....                          | 13 |
| 13 Lamps .....                                       | 13 |
| 14 Conductors .....                                  | 13 |
| 15 Splices and Connections .....                     | 14 |
| 16 Attachment Plugs .....                            | 15 |
| 17 Interconnecting Means .....                       | 15 |
| 18 Switches, Fuses, and Controllers .....            | 16 |
| 19 Power Supply Cord and Interconnecting Cords ..... | 16 |
| 20 Strain Relief .....                               | 17 |
| 21 Mounting Means .....                              | 17 |
| 21A Outdoor Use Products .....                       | 17 |

### PERFORMANCE

|                                            |     |
|--------------------------------------------|-----|
| 22 Input Test .....                        | 18  |
| 23 Normal Temperature Test .....           | 18  |
| 24 Abnormal Operation Test .....           | 20  |
| 25 Insulation Resistance Test .....        | 20  |
| 26 Dielectric Voltage Withstand Test ..... | 20A |
| 27 Crush Test .....                        | 20A |
| 28 Ball Impact Test .....                  | 21  |
| 29 Flexing Test .....                      | 22  |
| 30 Oven Conditioning Test .....            | 23  |
| 31 Cold Bend Test .....                    | 23  |
| 32 Strain Relief Test .....                | 23  |
| 33 Crimp Connection Secureness Test .....  | 24  |
| 34 End Cap Pull Test .....                 | 24  |
| 35 Rain Test .....                         | 24  |
| 36 Test for Permanence of Cord Tag .....   | 25  |
| 36.1 General .....                         | 25  |
| 36.2 Test conditions .....                 | 26  |
| 36.3 Test method .....                     | 26A |
| 36A Gasket Test .....                      | 26A |
| 36B Gasket Adhesion Test .....             | 26B |

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**MANUFACTURING AND PRODUCTION TESTS**

|                                       |     |
|---------------------------------------|-----|
| 37 Production-Line Spark Test .....   | 26B |
| 38 Operational Test .....             | 29  |
| 39 Polarization Continuity Test ..... | 29  |

**MARKING**

|                               |    |
|-------------------------------|----|
| 40 General .....              | 29 |
| 41 Outdoor Use Markings ..... | 30 |

**INSTRUCTIONS**

|                                              |    |
|----------------------------------------------|----|
| 42 Installation and Use Instructions .....   | 31 |
| 43 Outdoor Use Instructions .....            | 32 |
| 44 Packaging Instructions and Markings ..... | 33 |

**APPENDIX A**

|                               |    |
|-------------------------------|----|
| Standards for Components..... | A1 |
|-------------------------------|----|

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## INTRODUCTION

### 1 Scope

1.1 This standard covers portable flexible lighting products with a maximum input voltage rating of 120 volts to be used in accordance with the National Electrical Code, ANSI/NFPA 70. These products are provided with a power supply cord and are intended for outline and decorative lighting use.

Effective date for 1.1 changed from July 3, 2003 to November 1, 2003

1.2 These requirements cover lighting products incorporating non-replaceable series and series/parallel connected lamps enclosed within a flexible polymeric tube or extrusion.

Effective date for 1.2 changed from July 3, 2003 to November 1, 2003

1.3 These requirements also cover flexible lighting products used in light sculptures.

Effective date for 1.3 changed from July 3, 2003 to November 1, 2003

1.4 These requirements do not cover lighting products with replaceable lamps.

Effective date for 1.4 changed from July 3, 2003 to November 1, 2003

1.5 These requirements do not cover the temporary-use, seasonal decorative-lighting products and accessories with a maximum input voltage rating of 120 V that are covered by the Standard for Seasonal and Holiday Decorative Products, UL 588.

1.5 revised June 28, 2004

### 2 Components

2.1 Except as indicated in 2.2, a component of a products covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components used in the products covered by this standard.

Effective date for 2.1 changed from July 3, 2003 to November 1, 2003

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

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

Effective date for 2.2 changed from July 3, 2003 to November 1, 2003

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

Effective date for 2.3 changed from July 3, 2003 to November 1, 2003

2.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

Effective date for 2.4 changed from July 3, 2003 to November 1, 2003