



ANSI/CAN/UL 8802:2023

JOINT CANADA-UNITED STATES
NATIONAL STANDARD

STANDARD FOR SAFETY

Ultraviolet (UV) Germicidal Equipment and Systems



SCC FOREWORD

National Standard of Canada

A National Standard of Canada is a standard developed by a Standards Council of Canada (SCC) accredited Standards Development Organization, in compliance with requirements and guidance set out by SCC. More information on National Standards of Canada can be found at www.scc.ca.

SCC is a Crown corporation within the portfolio of Innovation, Science and Economic Development (ISED) Canada. With the goal of enhancing Canada's economic competitiveness and social well-being, SCC leads and facilitates the development and use of national and international standards. SCC also coordinates Canadian participation in standards development, and identifies strategies to advance Canadian standardization efforts.

Accreditation services are provided by SCC to various customers, including product certifiers, testing laboratories, and standards development organizations. A list of SCC programs and accredited bodies is publicly available at www.scc.ca.

UL Standard for Safety for Ultraviolet (UV) Germicidal Equipment and Systems, ANSI/CAN/UL 8802

First Edition, Dated November 16, 2023

Summary of Topics

This is the First Edition of ANSI/CAN/UL 8802, Standard for Ultraviolet (UV) Germicidal Equipment and Systems, dated November 16, 2023.

The requirements are substantially in accordance with Proposal(s) on this subject dated April 28, 2023 and August 25, 2023.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of ULSE Inc. (ULSE).

ULSE provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will ULSE be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if ULSE or an authorized ULSE representative has been advised of the possibility of such damage. In no event shall ULSE's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

Users of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold ULSE harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

No Text on This Page



ANSI/UL 8802-2023

NOVEMBER 16, 2023



1

ANSI/CAN/UL 8802:2023

Standard for Ultraviolet (UV) Germicidal Equipment and Systems

First Edition

November 16, 2023

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

The most recent designation of ANSI/UL 8802 as an American National Standard (ANSI) occurred on November 16, 2023. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, Preface or SCC Foreword.

This standard has been designated as a National Standard of Canada (NSC) on November 16, 2023.

COPYRIGHT © 2023 ULSE INC.

No Text on This Page

CONTENTS

Preface 5

INTRODUCTION

1 Scope 7
2 Components 8
3 Units of Measurement 9
4 Referenced Publications 9
5 Glossary.....10
6 Organization and Application 13

PART 1 – UV GERMICIDAL EQUIPMENT

7 General 13
8 Photobiological Assessment 14
9 Ozone 16
10 Safety Instructions.....16
11 Additional Markings and Instructions 17

PART 2 – UV EMITTER ASSEMBLIES

12 General 19
13 Photobiological Assessment 19
14 Ozone 20
15 Safety Instructions.....20
16 Additional Markings and Instructions 21

PART 3 – GERMICIDAL SYSTEMS

17 General 23
18 Safeguards 24
19 Safeguard Assessment.....26
20 Safety Instructions.....27
21 Additional Markings and Instructions.....28
22 Warning Labels 30

PART 4 – UV GERMICIDAL RETROFIT KITS

23 General 30
24 Photobiological Assessment 31
25 Ozone 32
26 Additional Markings and Instructions.....32

PART 5 – CONTAINED UV GERMICIDAL EQUIPMENT

27 General 32
28 Photobiological Assessment 33
29 Ozone 33
30 Stability 34
31 Safety Instructions.....34
32 Additional Markings and Instructions.....35



ANNEX A – SAFETY MARKING TRANSLATIONS (Normative for Canada and Informative for the U.S.)

ANNEX B (Normative) – SAFETY-RELATED ELECTRONIC CIRCUIT (SREC) REQUIREMENTS

B1	Scope	38
B2	Glossary.....	38
B3	General.....	39
B4	Reliability Evaluation	40

ANNEX C (Normative) – SIZE AND LOCATION DESIGNATIONS FOR MARKINGS

ANNEX D (Normative) – MOTION DETECTORS Determination of Coverage Area

D1	Scope	42
D2	Glossary	42
D3	Determination of Coverage Area	43
	D3.1 Test environment.....	43
	D3.2 Test setup.....	43
	D3.3 Test subject	44
	D3.4 Test procedure	44

ANNEX E (Normative) – INTERLOCKS

E1	General.....	51
----	--------------	----

ANNEX F (Informative) – BEST PRACTICES FOR GERMICIDAL EQUIPMENT INSTALLATION

F1	General.....	53
----	--------------	----

ANNEX G (Informative) – METRIC CONVERSION

Preface

This is the First Edition of ANSI/CAN/UL 8802, Standard for Ultraviolet (UV) Germicidal Equipment and Systems.

ULSE is accredited by the American National Standards Institute (ANSI) and the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

This Standard has been developed in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization.

This ANSI/CAN/UL 8802 Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

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 the Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

Our Standards for Safety are copyrighted by ULSE Inc. Neither a printed nor electronic copy of a Standard should be altered in any way. All of our Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of ULSE Inc.

This edition of the standard has been formally approved by the Technical Committee (TC) on Ultraviolet (UV) Germicidal Equipment and Systems, TC 8802.

This list represents the TC 8802 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

TC 8802 Membership

Name	Representing	Interest Category	Region
Carl Bloomfield	Intertek	Testing & Standards Org.	USA
Juan M. Caamano	UL Solutions	Testing & Standards Org.	USA
Fred Carpenter	Acuity Brands Lighting INC	Producer	USA
Mike Chou	Great Consultant Service (GCS) Co., Ltd.	General Interest	USA
Sandu Cusmariu	Viscor INC	Producer	Canada
Jeremy Kuempel	R-Zero Systems Inc.	Producer	USA
Paul Jensen	FAI	General Interest	USA
David Lemaux	CSA Group	Testing & Standards Org.	Canada
Darren McArthur	Broan-NuTone LLC	Supply Chain	USA
Julio Morales	UL Standards & Engagement	TC Project Manager – Non-voting	USA

TC 8802 Membership Continued on Next Page



TC 8802 Membership Continued

Name	Representing	Interest Category	Region
Michael O'Boyle	Signify	Producer	USA
Joseph O'Neill	Wilger Testing	General Interest	USA
Bill Palmer	AeroMed	Producer	USA
Deborah R. Prince	UL Standards & Engagement	TC Chair – Non-voting	USA
Michael Savage	Marion County, FL	AHJ	USA
David Sliney	Standards Individuals	General Interest	USA
Paul Smith	GE Lighting, a Savant Company	Supply Chain	USA
Ronnie Teo	Singapore Institute Of Manufacturing Technology	General Interest	Singapore
Jason Tuenge	PNNL	Government	USA
Jeremy Yon	Current Lighting	Producer	USA
Ken Zhang	SGS-CSTC STANDARDS TECHNICAL SERVICES CO LTD	Testing & Standards Org.	China

International Classification for Standards (ICS): 91.160.10

For information on ULSE Standards, visit <https://www.shopulstandards.com>, call toll free 1-888-853-3503 or email us at ClientService@shopULStandards.com.

This Standard is intended to be used for conformity assessment.

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

INTRODUCTION

1 Scope

1.1 These requirements apply to ultraviolet germicidal irradiation (UVGI) equipment and systems intended for installation and use in accordance with the U.S. National Electrical Code (NEC), NFPA 70 and in accordance with the Canadian Electrical Code, Part I (CEC), CSA C22.1. These requirements cover:

a) UV Germicidal Equipment – These devices emit uncontained UV energy into the surrounding area while the space or room being treated may be occupied. The UV overexposure risk may be mitigated by one or more safeguards. Examples of such safeguards include a fixed installation at a minimum height above the floor, and directional baffling to minimize direct UV emissions towards the occupied space when direct emission is not permitted. This equipment may also produce visible light. See Part 1 of this standard.

b) UV Emitter Assemblies – These devices emit UV uncontained energy into the surrounding area while the space being treated is vacant (i.e., not occupied by persons). Alternatively, these devices can be built into germicidal equipment as components. These assemblies are not considered stand-alone devices; they are intended for use as part of a UV germicidal system. This equipment may also produce visible light. See Part 2 of this standard.

c) UV Germicidal Systems – These systems are intended to expose surfaces within an unoccupied area with uncontained UV energy where the exposure dose would otherwise pose a risk of personal injury to occupants. System components include UV emitters, switches, sensors and other controls acting as site or equipment safeguards. The installation and operating instructions are considered an integral system component. A system may also include devices that produce visible light. See Part 3 of this standard.

d) UV Germicidal Retrofit Kits – These devices are retrofit kits which facilitate replacement of the light source of a General Lighting Service (GLS) luminaire with a UV emitter assembly. These retrofit kits emit UV energy into the surrounding area while the space being treated may be occupied. The UV overexposure risk may be mitigated by the exclusive use of UV sources that are compliant with 'Risk Group 0 (Exempt)' level(s) in accordance with the photobiological assessment for the device. The UV source may also produce visible light. See Part 4 of this standard.

e) Contained UV Germicidal Equipment – These devices include an integral enclosed UV source(s) to treat air flowing through it. The UV overexposure risk may be mitigated through UV source containment by the use of baffles, louvers or similar means to minimize UV emissions from the equipment. This equipment also produces visible light. See Part [5](#) of this standard.

NOTE – Contained UV Germicidal Equipment that does not produce visible light is generally covered under CSA C22.2 No. 113/UL 507 or CSA C22.2 No. 187/UL 867.

1.2 Parts 1 through 4 of this standard do not cover:

- a) Equipment intended for use in dwellings; or
- b) Portable equipment.

NOTE: In regard to item 'a', dwelling refers to the defined term from NFPA 70 and hence does not exclude spaces of transient occupancy where the equipment is expected to be installed and maintained by qualified service personnel.

1.3 This standard does not cover hand-held equipment.

1.4 Products generating ultraviolet radiation are intended for use in accordance with Title 21 Code of Federal Regulations (CFR), Parts 1000 through 1004, and section 1005.25.



Documents

Document Sharing Hub

NOTE: These regulations include reporting of Accidental Radiation Occurrences, notification to FDA and customers of a radiation safety defect and corresponding plan for corrective action for FDA approval, and designation of a U.S. agent for imported lamps.

1.5 This standard does not apply to UV equipment covered by other (UL or CSA) standards for safety. The equipment not covered by this standard include:

- a) Laboratory and health care equipment with UV emitters are covered under the scope of the CSA C22.2 No. 61010 or UL 61010 series of standards; and
- b) Horticultural luminaires with UV emitters covered under the scope of UL 8800.

1.6 Equipment that emit electromagnetic energy with wavelengths outside of the 200 – 400 nm range are not fully addressed by this standard, and may require an additional evaluation.

1.7 These requirements address risk of personal injury due to overexposure to UV emissions. To address other safety considerations (e.g., risk of fire or electric shock, or personal injury risks besides UV overexposure) this standard shall be used in conjunction with one of the luminaire standards specified below for devices covered in their respective scopes absent electromagnetic emissions outside of the visible light spectrum. All construction, performance and marking requirements of the standards specified below (see Referenced Publications) shall also apply unless specifically superseded by a requirement in this standard:

- a) CSA C22.2 No. 250.0 / UL 1598, for Part 1 – Part 5 devices;
- b) CSA C22.2 No. 250.2 / UL 2108, for Part 1 – Part 5 devices; or
- c) CSA C22.2 No. 250.4 / UL 153, for Part 5 devices.

1.8 In this standard, the CSA standard reference applies to products intended for use in Canada, while the UL standard reference applies to products intended for use in the United States. Combined references are separated by a slash (“ / ”).

2 Components

2.1 A component of a product covered by this Standard shall:

- a) Comply with the requirements for that component as specified in this Standard;
- b) Be used in accordance with its rating(s) established for the intended conditions of use; and
- c) Be used within its established use limitations or conditions of acceptability.

2.2 A component of a product covered by this Standard is not required to comply with a specific component requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product;
- b) Is superseded by a requirement in this Standard; or
- c) Is separately investigated when forming part of another component, provided the component is used within its established ratings and limitations.

2.3 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.

2.4 A component that is also intended to perform other functions such as overcurrent protection, ground-fault circuit-interruption, surge suppression, any other similar functions, or any combination thereof, shall comply additionally with the requirements of the applicable standard(s) that cover devices that provide those functions.

3 Units of Measurement

3.1 The values given in SI (metric) units are normative. Any other values are for information purposes only. See Annex G, Conversion, for metric conversion multipliers.

3.2 Temperatures are given in degrees Celsius only.

3.3 Unless indicated otherwise, all voltage and current values specified in this Standard are root-mean-square (rms).

4 Referenced Publications

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

4.2 The following standards are referenced in this Standard, Portions of these referenced standards may be essential for compliance.

CSA C22.2 No. 14, *Industrial Control Equipment*

CSA C22.2 No. 205, *Signal Equipment*

CSA C22.2 No. 250.0, *Luminaires*

CSA C22.2 No. 250.1, *Retrofit Kits for Luminaire Conversion*

CSA C22.2 No. 250.2, *Lighting Systems*

CSA C22.2 No. 250.4, *Portable luminaires*

CSA E 60730-1, *Automatic Electrical Controls – Part 1: General Requirements*

CSA C22.2 No. 60947-1, *Low-voltage switchgear and controlgear - Part 1: General rules*

CSA C22.2 No. 61010, *Electrical Equipment for Measurement, Control, and Laboratory Use*

CSA C22.2 No. 61058-1, *Switches for Appliances – Part 1: General Requirements*

CSA E61496-1, *Safety of Machinery – Electro-Sensitive Protective Equipment*

CSA C22.2 No. 62471, *Photobiological Safety of Lamps and Lamp Systems*

IEC 60417 (DATABASE), *Graphical Symbols for Use On Equipment*

IEC 62471, *Photobiological Safety of Lamps and Lamp Systems*

IEC 62471-6, *Photobiological safety of lamps and lamp systems – Part 6: Ultraviolet lamp products*

IES RP-27.1, *Recommended Practice for Photobiological Safety for Lamps & Lamp Systems – General Requirements*

IES RP-44, *Recommended Practice: Ultraviolet Germicidal Irradiation (UVGI)*

UL 153, *Portable luminaires*

UL 248-1, *Low Voltage Fuses, and its Series of Standards*

UL 294, *Access Control System Units*

UL 508, *Industrial Control Equipment*

UL 639, *Intrusion-Detection Units*

UL 867, *Electrostatic Air Cleaners*

UL 916, *Energy Management Equipment*

UL 969, *Marking and Labeling Systems*

UL 1598, *Luminaires*

UL 1598C, *Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits*

UL 2108, *Low-voltage Lighting Systems*

UL 8800, *Horticultural Lighting Equipment and Systems*

UL 60730-1, *Automatic Electrical Controls – Part 1: General Requirements*

UL 60730-2-9, *Automatic Electrical Controls for Household and Similar Use, Part 2-9: Particular Requirements for Temperature Sensing Controls*

UL 60947-1, *Low-Voltage Switchgear and Controlgear – Part 1: General Rules*

UL 61010-1, *Electrical Equipment for Measurement, Control, and Laboratory Use*

UL 61058-1, *Switches for Appliances – Part 1: General Requirements*

UL 61496-1, *Electro-Sensitive Protective Equipment – Part 1: General Requirements and Tests*

ULC S306, *Intrusion-detection Units*

ULC 60839-11-1, *Alarm and Electronic Security Systems – Part 11-1: Electronic Access Control Systems – System and Components Requirements*

5 Glossary

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

5.2 CONTAINED (CONTAINMENT) – Refers to a design practice where the device’s integral UV source is enclosed, louvered, baffled or otherwise protected in order to ensure that UV emissions into the surrounding environment are within the Risk Group 0 (Exempt) limits defined by the referenced photobiological standards. In this standard the terms ‘contained’ and ‘uncontained’ identify whether the device utilizes containment as a measure to mitigate UV overexposure.

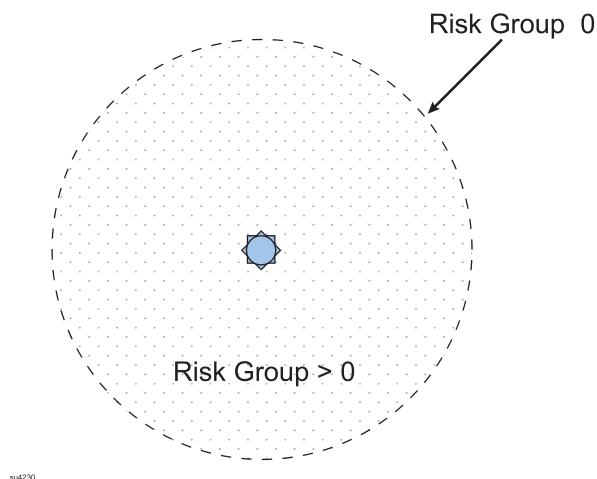
5.3 CONTAINED GERMICIDAL EQUIPMENT – Equipment with a contained integral UV source to treat air flowing through it. The enclosure may have vent openings to channel air past the UV source for treatment. This equipment also produces visible light.

5.4 DEVICE – Unless otherwise specified, this is a generic term for any UV equipment or component.

5.5 EMITTER – A device component that produces UV radiation.

5.6 EXEMPT PERIMETER – The boundary around a single device formed by the line-of-sight distance from its geometric center to points where UV emissions are considered Risk Group 0 (Exempt). These points are drawn on the horizontal plane formed by the floor. See [Figure 5.1](#) for a graphical representation of this perimeter.

Figure 5.1
Graphical Representation of Exempt Perimeter



NOTES:

1. This boundary is declared by the manufacturer and verified by test. By definition, persons standing at the edge of this boundary do not require additional safeguards against UV overexposure, as defined by IEC 62471, CSA-C22.2 No. 62471, or IES RP-27.1, when the emitter is operating.

2. This figure is for reference purposes only. The perimeter’s shape will depend on device design and may not be circular or symmetrical. In addition, when the line-of-sight distances for actinic and near UV are different, the larger of the two values are used to determine the exempt perimeter.

5.7 GENERAL USE DISTANCE – For equipment marked with a minimum mounting height, this is the shortest vertical distance between the lowest point of emissive surface on the device when mounted at this minimum marked height and the measurement plane above and parallel to the finished floor.

NOTE: Examples of general use distance are illustrated in [Figure 8.1](#) of Part 1.

5.8 INSTRUCTED OPERATOR – An individual charged to operate the equipment or system who has been provided with adequate training to operate the system, but may need to call on a qualified service person when the system is not operational or safe shutdown has occurred.

5.9 INTERLOCK – A mechanism designed to automatically open an electrical circuit in order to prevent a risk to a user by disabling the source posing a hazard (e.g.: the UV source of Contained UV Germicidal Equipment). The interlock may close the circuit once the user is no longer exposed to the risk. An interlock can consist of one or more switches, actuators, guards, and associated circuitry and hardware.

5.10 OCCUPANT – Individual(s) who may be present in the treated space where emitters are installed. It is assumed that occupants may not be aware of presence of the UV germicidal equipment or system and cannot be expected to take any precautions against UV exposure while the equipment or system is operating.

5.11 OCCUPIED SPACE – The volume in a treated space below the measurement plane.

NOTE: Examples of occupied space are illustrated in [Figure 8.1](#) of Part 1.

5.12 ORDINARY TOOLS — Tools that can normally be expected to be available to the user, such as screwdrivers, hammers, nut drivers, pliers. Any tools designed to adjust hardware with flat, hex, Philips, square or Robertson configurations are considered ordinary tools for the purpose of this standard.

5.13 PORTABLE EQUIPMENT – Cord-connected electrically operated equipment capable of being easily moved by hand from place to place. Portable equipment may be floor or counter supported in normal use. In this Standard, portable equipment is considered unattended and stationary while operating during normal use.

NOTE: In this standard, the term “portable equipment” represents a smaller set of products than those covered by CSA C22.2 No. 250.4 and UL 153. Hand-held luminaires are excluded from the scope of UL 8802.

5.14 QUALIFIED SERVICE PERSON – An individual charged to repair the UV germicidal equipment or system. They may also manage the routine maintenance of the equipment or system.

5.15 SAFE SHUTDOWN – A safe state where a device ceases to operate due to an abnormal operating condition (for example, a fault), and one that requires the intervention of an instructed operator or qualified service person in order to restore normal equipment operation. UV germicidal equipment and systems should not pose a risk of UV overexposure to occupants after a safe shutdown.

5.16 SAFEGUARD, EQUIPMENT – Safeguards that are part of the UV germicidal system. These can be integral to or remotely mounted from the device.

5.17 SAFEGUARD, SITE – Controls installed near or within the treated space that reduce the likelihood of occupancy immediately before or during emitter operation. Examples include interlocks on entry doors, as well as arming switches located within the treated space.

5.18 SAFEGUARDS – In the context of this standard, controls that function to prevent or reduce the likelihood of personal injury due to overexposure to UV energy.

5.19 TREATED SPACE – The area that is exposed to UV energy when an emitter is in operation.

5.20 ULTRAVIOLET (UV) EMITTER ASSEMBLY – Devices intended to emit UV energy into the treated space while the space is vacant (i.e.: not occupied by people). These are not considered stand-alone devices; these devices are intended for use as part of a UV germicidal system.

5.21 ULTRAVIOLET (UV) GERMICIDAL EQUIPMENT – Equipment intended to emit uncontained UV energy into the treated space while this space is occupied (or in use) by people.

NOTE: These devices may also be referred to as “upper-room luminaires”, “UV Germicidal Irradiators (UVGIs)”, or Germicidal Ultraviolet (GUV) luminaires.

5.22 ULTRAVIOLET (UV) GERMICIDAL RETROFIT KIT – A retrofit kit that replaces the light source of a General Lighting Service (GLS) luminaire with a UV emitter assembly. The UV emitter assembly shall be classified as ‘Risk Group 0 (Exempt)’ when evaluated for Photobiological Assessment. The UV emitter may also produce visible light. A UV retrofit kit includes all component parts required, including instructions, for conversion of a GLS luminaire to a UV emitter assembly.

5.23 ULTRAVIOLET (UV) GERMICIDAL SYSTEM – A system utilizing uncontained UV emitters that is intended to operate only when the treated space is vacant (i.e.: No occupants in the treated space during its operating cycle).

5.24 ULTRAVIOLET (UV) RADIATION – Electromagnetic energy with a wavelength of 200 – 400 nm.

5.25 ULTRAVIOLET (UV) SOURCE – The UV emitting optical element or surface. In particular, the outermost emitting surface of the final optic-altering entity such as the outer surface of an emitter or the outer surface of a protective, diffusing or beam shaping lens of a lamp or luminaire.

6 Organization and Application

6.1 This Standard is organized as follows:

- a) Part 1 – UV Germicidal Equipment;
- b) Part 2 – UV Emitter Assemblies;
- c) Part 3 – UV Germicidal Systems;
- d) Part 4 – UV Germicidal Retrofit Kits; and
- e) Part 5 – Contained UV Germicidal Equipment

PART 1 – UV GERMICIDAL EQUIPMENT

7 General

7.1 Germicidal equipment shall comply with one of the applicable safety standards in [1.7](#) in addition to the requirements in Part 1 of this Standard.

7.2 Devices that use low-pressure discharge lamps shall comply with the requirements applicable to fluorescent luminaires.

7.3 Devices shall be designed to be permanently mounted in a fixed location, such that it cannot be unmounted or relocated without the use of tools.

7.4 Devices not intended to be adjusted by the end-user shall be designed such that it is not possible to re-orient or refocus the UV source using ordinary tools.

8 Photobiological Assessment

8.1 Equipment shall not pose a risk of personal injury to persons due to UV overexposure when installed, tested and operated in accordance with the manufacturer's instructions and the requirements of this Standard.

8.2 In order to determine compliance with [8.1](#), the device shall be subjected to a photobiological assessment for actinic and near UV hazards from 200 nm through 400 nm in accordance with the requirements in CSA C22.2 No. 62471 (in Canada) or IEC 62471 (in the United States). This assessment shall be used to determine the risk group of the device for these hazards. The measurement distance from the UV source to the measuring instrument shall be as specified in [8.6](#) to [8.10](#).

8.3 At the manufacturer's request, the photobiological assessment in [8.2](#) may alternatively be conducted in accordance with IES RP-27.1 for actinic and near UV hazards from 200 nm through 400 nm, with the exception that the measurement distance from the UV source to the measuring instrument shall be as specified in [8.6](#) to [8.10](#). This assessment shall be used to determine the risk group of the device for these hazards.

8.4 When the equipment employs multiple UV sources, all sources must be simultaneously energized during the measurement in 8.2 unless an integral control regulates the selection or timing of the UV sources. Such an integral control shall be additionally evaluated as a safety-related electronic circuit (SREC) in accordance with Annex B, Safety-Related Electronic Circuit (SREC) Requirements.

8.5 The measurement instrument shall have a sensor with an aperture limiting the detector field of view cone in accordance with IEC 62471-6 or IES RP-27.1, as applicable. The centerline of the sensor aperture, normal to the surface area of the detector, shall be oriented to result in the highest reading at that point from the UV emission source.

8.6 The measurement distance shall be as follows:

- a) For equipment marked by the manufacturer with a minimum mounting height of at least 2.1 m (6 feet 11 inches), compliance shall be determined using the highest weighted actinic reading anywhere along the 2-dimensional test plane located 1.9 m (6 feet 3 inches) above the finished floor as defined in [Figure 8.1](#); and
- b) For equipment not marked by the manufacturer with a minimum mounting height, or marked with one that is less than 2.1 m (6 feet 11 inches), compliance shall be determined using a measurement distance from the UV source of 200 mm (8 inches) from the nearest emissive surface in the direction likely to produce the most severe weighted actinic test result.