Recommended Practice for Photobiological Safety for Lamps and Lamp Systems – General Requirements
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Publication of this Recommended Practice has been approved by IES. Suggestions for revisions should be directed to IES.

Prepared by:
The Photobiology Committee of the Illuminating Engineering Society of North America
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Approved by the IES Board of Directors, August 18, 2015 as a Transaction of the Illuminating Engineering Society of North America.

Approved as an American National Standard, November 6, 2015.

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Published by the Illuminating Engineering Society of North America, 120 Wall Street, New York, New York 10005.

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ISBN # 978-0-87995-321-8

Printed in the United States of America.

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1.0 INTRODUCTION

Lamps were developed and produced in large quantities and became commonplace in an era when industry-wide safety standards were not common. The evaluation and control of lamp hazards is a far more complicated subject than similar tasks for a single-wavelength laser system. The required radiometric measurements are quite involved, for they do not deal with the simple optics of a point source, but rather with an extended source which may or may not be altered by diffusers or projection optics. Also, the wavelength distribution of the lamp may be altered by ancillary optical elements, diffusers, lenses, and the like, as well as variations in operating voltage.

To evaluate a broad-band optical source, such as an arc lamp, an incandescent lamp, a fluorescent lamp, an array of lamps or a lamp system, it first is necessary to determine the spectral distribution of optical radiation emitted from the source at the point or points of nearest human access. This accessible emission spectral distribution of interest for a lighting system may differ from that actually being emitted by the lamp alone due to the filtration by any optical elements (e.g., projection optics) in the light path. Secondly, the size, or projected size, of the source should be characterized in the retinal hazard spectral region. Thirdly, it may be necessary to determine the variation of irradiance and projected radiance (see the Glossary) with distance.

The performance of the necessary measurements is not an easy task without sophisticated instruments. Users should normally rely upon the expertise of manufacturers for information on lamps and lamp systems. Safety requirements and reference measurement techniques for lamps and specific lamp systems are provided in later standards of this series (i.e., ANSI/IES RP-27.2-00/R2010 Recommended Practice for Photobiological Safety for Lamps & Lamp Systems – Measurement Techniques and ANSI/IES RP-27.3-07 Recommended Practice for Photobiological Safety for Lamps – Risk Group Classification Labeling).

Finally, there are well known optical radiation hazards associated with some lamps and lamp systems. The purpose of these standards is to inform the public and original equipment manufacturers (OEMs) about potential radiation hazards that may be associated with various lamps and lamp systems. It is also the purpose of these standards to provide guidance, advice, and standard methods for evaluating and informing the user, both the public and the OEM, about the potential optical radiation hazards that may be associated with these products.

2.0 SCOPE

This Recommended Practice covers the evaluation and control of optical radiation hazards from all electrically powered sources of optical radiation that emit in the wavelength range from 200 nm through 3,000 nm (3.0 μm [micrometers]) except for light emitting diodes (LEDs) used in optical fiber communication systems and for lasers which are covered in a separate series of ANSI (American National Standards Institute) standards (Series Z136). Federal mandatory requirements for lamps subject to specific Federal Regulations take precedence over requirements in subsequent standards included in this series.

Note 1: Units of wavelength in this document are exclusively in nanometers (nm).

Note 2: Subtended angles are denoted by the full included angle, not the half angle.

3.0 DEFINITIONS

For standard nomenclature and definitions, radiometric and photometric quantities, and illuminating engineering terminology, refer to ANSI/IES RP-16-2010, Nomenclature and Definitions for Illuminating Engineering. Certain frequently used terms are defined in the Glossary.

3.1 Assessment Distance

Distance for Risk Group classification is based upon reasonably foreseeable worst-case exposure. This is not generally the measurement distance, e.g., the distance to an illuminance of >500 lx (46.5 fc) for a GLS (general lighting source) lamp or luminaire.

3.2 Blue Light Hazard

There is potential for a photochemically induced retinal injury resulting from radiation exposure at wavelengths primarily between 400 nm and 500 nm. This damage mechanism dominates over thermal for times exceeding 10 s (see Annex Section A3.3 for Ham reference).

3.3 Continuous Wave (CW) Lamp

Defined as a lamp that is operated with a continuous output for a 0.25 s period of time or greater, i.e., a non-pulsed lamp (see Section 3.15). In this standard, GLS lamps are defined to be Continuous Wave lamps.