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AS/NZS IEC 62471:2011

Australian/New Zealand Standard™

Photobiological safety of lamps and lamp systems

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee SF-019, Personal Protection Against Laser Radiation. It was approved on behalf of the Council of Standards Australia on 20 October 2011 and on behalf of the Council of Standards New Zealand on 25 October 2011.
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The following are represented on Committee SF-019:

Australasian Faculty of Occupational & Environmental Medicine
Australian Dental Association
Defence Materiel Organisation (Australia)
Defence Science & Technology Organisation
Electronics Industry Association
National Radiation Laboratory New Zealand
Royal Australian and New Zealand College of Ophthalmologists
Safety Institute of Australia
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Australian/New Zealand Standard™

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee SF-019, Personal Protection Against Laser Radiation.

The objectives of this Standard are as follows:

(a) To protect people from optical radiation in the wavelength range 200 nm to 3000 nm by introducing a system of classification for all electrically powered incoherent broadband sources of optical radiation, including light emitting diodes (LEDs) but excluding lasers, according to their degree of optical radiation hazard.

(b) To provide a scheme for evaluation and control of photobiological hazards through specification of exposure limits and reference measurement technique.

(c) To ensure adequate warnings are provided to individuals of hazards associated with accessible incoherent broadband sources of optical radiation through the use of labels and instructions (refer to next paragraph).

This is the first Standard adopted by Australia/New Zealand relating specifically to the photobiological safety of lamps and lamp systems and is normative. However, additional informative guidance may be found in IEC/TR 62471-2, Edition 1.0 (2009)*, *Photobiological safety of lamps and lamp systems*—Part 2: *Guidance on manufacturing requirements relating to non-laser optical radiation safety*. The aforementioned IEC technical report provides in the context of classifications defined in AS/NZS IEC 62471, guidance on: requirements for optical radiation safety assessment; allocation of safety measures; and labelling of products.

This Standard is identical with, and has been reproduced from, IEC 62471, Ed.1.0 (2006), *Photobiological safety of lamps and lamp systems.*

As this Standard is reproduced from an International Standard, the following applies:

(a) Its number appears on the cover and title page while the International Standard number appears only on the cover.

(b) In the source text 'This International Standard' should read 'This Australian/New Zealand Standard'.

(c) A full point substitutes for a comma when referring to a decimal marker.

None of the normative references in the source document have been adopted as Australian or Australian/New Zealand Standards.

The term 'informative' has been used in this Standard to define the application of the annex to which it applies. An 'informative' annex is only for information and guidance.

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* To be published as AS/NZS IEC adoption.

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INTRODUCTION

Lamps were developed and produced in large quantities and became commonplace in an era when industry-wide safety standards were not the norm. The evaluation and control of optical radiation hazards from lamps and lamp systems 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 that 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 conditions.

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 is first necessary to determine the spectral distributions 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 must be characterized in the retinal hazard spectral region. Thirdly, it may be necessary to determine the variation of irradiance and effective radiance with distance. The performance of the necessary measurements is normally not an easy task without sophisticated instruments. Thus it was decided to include reference measurement techniques for lamps and lamp systems in this standard. The measurement techniques along with the described risk group classification scheme will provide common ground for both lamp manufacturers and users to define the specific photobiological hazards of any given lamp and/or lamp system.

Finally, there are well known optical radiation hazards associated with some lamps and lamp systems. The purpose of this standard is to provide a standardized technique for evaluation of potential radiation hazards that may be associated with various lamps and lamp systems.

AUSTRALIAN/NEW ZEALAND STANDARD

Photobiological safety of lamps and lamp systems

1. SCOPE

This International Standard gives guidance for evaluating the photobiological safety of lamps and lamp systems including luminaires. Specifically it specifies the exposure limits, reference measurement technique and classification scheme for the evaluation and control of photobiological hazards from all electrically powered incoherent broadband sources of optical radiation, including LEDs but excluding lasers, in the wavelength range from 200 nm through 3000 nm.

2. NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CIE 17.4-1987 *International lighting vocabulary* (ILV) – Joint publication IEC/CIE

CIE 53-1982 *Methods of characterizing the performance of radiometers and photometers*

CIE 63-1984 *The spectroradiometric measurement of light sources*

CIE 105-1993 *Spectroradiometry of pulsed optical radiation sources*

ISO *Guide to the expression of uncertainty in measurement*, ISO, Geneva, 1995.

3. DEFINITIONS, SYMBOLS AND ABBREVIATIONS

For the purposes of this standard, the following definitions, symbols and abbreviations apply.

3.1 actinic dose (see ILV 845-06-23)

Quantity obtained by weighting spectrally the dose according to the actinic action spectrum value at the corresponding wavelength.

Unit: $J \cdot m^{-2}$

Note: This definition implies that an action spectrum is adopted for the actinic effect considered, and that its maximum value is generally normalized to 1. When giving a quantitative amount, it is essential to specify which quantity dose or actinic dose is meant, as the unit is the same.

3.2 angular subtense (α)

Visual angle subtended by the apparent source at the eye of an observer or at the point of measurement. In this standard subtended angles are denoted by the full included angle, not the half angle.

Unit: radian

Note: The angular subtense α will generally be modified by incorporation of lenses and mirrors as projector optics, i.e. the angular subtense of the apparent source will differ from the angular subtense of the physical source.

3.3 aperture, aperture stop

Opening that defines the area over which average optical emission is measured. For spectral irradiance measurements this opening is usually the entrance of a small sphere placed in front of the radiometer/spectroradiometer entrance slit.