Designation: E2501 – 11

Standard Specification for Light Source Products for Inspection of Fluorescent Coatings[1]

This standard is issued under the fixed designation E2501; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification provides the requirements for light source products intended for excitation of fluorescent materials used as a system for detection of defects in industrial coatings. This includes the examination of both longer wavelength fluorescing primer coatings as well as non-fluorescent top coatings.

1.2 This specification establishes the radiometric requirements of the light source product in terms of required wavelength range and minimum irradiance.

1.3 This specification establishes safety requirements for the light source product necessary to ensure the product will not pose a threat to visual health.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E284 Terminology of Appearance

E1341 Practice for Obtaining Spectroradiometric Data from Radiant Sources for Colorimetry

G138 Test Method for Calibration of a Spectroradiometer Using a Standard Source of Irradiance

2.2 *IEC Standards:*[3]

IEC 62471-2:2006 Edition 1—Photobiological Safety of Lamps and Lamp Systems

2.3 *ANSI Standards:*[4]

ANSI/IESNA RP27.3-2005 Photobiological Safety for Lamps and Lamp Systems — General Requirements

ANSI/ISEA Z87.1 Occupational and Educational Personal Eye and Face Protection Devices

3. Terminology

3.1 *Definitions*—The definitions of terms in Terminology E284 are applicable to this standard.

4. Significance and Use

4.1 Light source products conforming to this specification are intended to be used in conjunction with coatings specially formulated with fluorescent colorants as a system for the visual detection of defects in industrial protective coatings.

4.2 Visible fluorescence from the coating enhances the contrast of coating irregularities and defects and is produced by excitation of visible-activated fluorescent colorants in the coating.

4.3 Light source products with defined wavelength and intensity properties are required to produce adequate visible fluorescence for easy visual location of defects.

4.4 A light source product is considered to consist of a light source component incorporated into an optical, electrical, mechanical, and power supply system that makes it suitable for use in an industrial environment. The entire light source product is subject to this standard. The light source component and any subassemblies of the light source product are not subject to this standard

4.5 This specification is limited to light source products providing excitation in the range from 400 to 420 nm.

5. Performance Requirements

5.1 *Irradiance:*

[1] This specification is under the jurisdiction of ASTM Committee E12 on Color and Appearance and is the direct responsibility of Subcommittee E12.05 on Fluorescence.

Current edition approved June 1, 2011. Published June 2011. Originally approved in 2006. Last previous edition approved in 2007 as E2501 - 07. DOI: 10.1520/E2501-11.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from International Electrotechnical Commission (IEC), 3, rue de Varembé, P.O. Box 131, CH-1211 Geneva 20, Switzerland, http://www.iec.ch.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

5.1.1 The light source shall provide a minimum irradiance of 5 W/m^2 at 20 cm distance from the point at which the light exits the product.

5.1.2 Ninety-five percent (95 %) of the output flux shall be of a wavelength in the range from 380 to 435 nm.

5.2 *Eye Safety*—The device shall conform to the requirements of a an Exempt or Risk Group 1 product as set out in IEC 62471 or ANSI/IESNA RP27.3.

6. Test Method

6.1 *Irradiance for Section 5.1:*

6.1.1 Measure the light source in an environment with ambient temperature between 20 and 25ºC. Store the light source and its batteries for a minimum of 4 hours in this environment before turning it on.

6.1.2 Turn on the light source and allow it to operate continuously for 30 min before measuring irradiance. This will allow the light source to approach a steady state operating temperature and for fresh batteries to discharge beyond higher voltage startup conditions.

6.1.3 Measure irradiance using a spectroradiometer calibrated, verified, and operated in accordance with Test Method G138 and Practice E1341.

6.1.4 Report irradiance results in accordance with Practice E1341.

6.1.5 Report the dimensions of the area that meet the requirements of Section 5.1.

7. Certification

7.1 When specified in the purchase order or contract, the purchaser shall be furnished certification stating samples representing the light source have been tested and inspected as indicated in this specification and the requirements have been met. When specified in the purchase order or contract, a report of the test results shall be furnished.

8. Keywords

8.1 coating inspection; fluorescent coatings; fluorescent inspection light

ANNEX

(Mandatory Information)

A1. VISUAL ERGONOMIC EYEWEAR SPECIFICATION

A1.1 Some coatings inspectors who use inspection lights complying with this specification report eye discomfort and headaches after using them for a few hours. These discomforts are not due to ultraviolet damage of the cornea or lens, but are due to not yet fully understood ergonomic issues associated with viewing intense violet light. The symptoms are mitigated with tinted eyewear, but some tints that block violet light also block the fluorescence emitted from the coating, thereby eliminating the defect contrast enhancement of the fluorescent coating inspection system. Yellow or amber-tinted glasses that meet the transmittance specification in Table A1.1 optimize the coating inspector's contrast sensitivity and eliminate the annoyance from viewing intense violet light sources. Compliance of a specific model of glasses with this specification can be evaluated, for example, by comparing a product's Transmittance Datasheet (ANSI Z87.1 Method 14.12) to this specification.

TABLE A1.1 Safety Eyewear Light Transmittance Specification

Light Wavelength (nm)	Percent Transmittance
From 315 to 400 (UV-A)	<1 % total UV-A transmittance
At 400	<1 %
At 415	≤2 %
At 500	≥65 %
From 520 to 750	Minimum 80 % at any wavelength