



Standard Practice for Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials¹

This standard is issued under the fixed designation G 53; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This practice covers the basic principles and operating procedures for using fluorescent ultraviolet (UV) and condensation apparatus to simulate the deterioration caused by sunlight and water as rain or dew.

1.2 This practice is limited to the method of obtaining, measuring, and controlling the conditions and procedures of exposure. It does not specify the exposure conditions best suited for the material to be tested. Specimen preparation and evaluation of the results are covered in ASTM test methods or specifications for specific materials.

1.3 The values stated in SI units are to be regarded as the standard.

1.4 *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:

E 220 Method for Calibration of Thermocouples by Comparison Techniques²

E 691 Practice for Conducting an Interlaboratory Study for Determining the Precision of a Test Method³

G 7 Practice for Atmospheric Environmental Exposure Testing of Nonmetallic Materials⁴

2.2 CIE Standard:

No. 20 Recommendations for the Integrated Irradiance and the Spectral Distribution of Simulated Solar Radiation for Testing Purposes⁵

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *irradiance*—the radiation incident on a surface expressed in W/m². Irradiance is the total of the incident radiation at all wavelengths. Forty watt fluorescent lamps of the UV-B and UV-A types generate similar amounts of irradiance. However, since this irradiance is distributed at different wavelengths, the photochemical effects caused by these different lamps vary greatly. Therefore, irradiance should not be used to compare UV light sources.

3.1.2 *spectral irradiance*—distribution of irradiance as a function of wavelength. It is expressed in W/m² per wavelength band. The spectral irradiance of sunlight is often shown as W/m² per 10 nm band. The spectral irradiance of fluorescent UV lamps should be shown in bands 1 or 2 nm wide. Spectral irradiance is the proper method for comparing sources with different energy distributions.

3.1.3 *spectral energy distribution (SED)*—general term for the characterization of the amount of radiation present at each wavelength. SEDs can be expressed by power in watts, irradiance in W/m², or energy in joules. The shape of the SED would be identical in all of these units. Fluorescent lamps are frequently described by relative SEDs which show the amount of radiation at each wavelength as a percentage of the amount of radiation at the peak wavelength. Fig. 1 is a relative SED.

3.1.4 *ultraviolet regions*—CIE Publication No. 20 (1972) divides the ultraviolet spectrum into three regions: UV-A, radiation in wavelengths between 315 nm and 400 nm; UV-B, radiation in wavelengths between 280 nm and 315 nm; and UV-C, radiation in wavelengths shorter than 280 nm.

3.1.5 *fluorescent UV lamp*—lamp in which radiation at 254 nm from a low-pressure mercury arc is transformed to longer wavelength UV by a phosphor. The spectral energy distribution of a fluorescent UV lamp is determined by the emission spectrum of the phosphor and the UV transmission of the glass tube.

4. Summary of Practice

4.1 Specimens are alternately exposed to ultraviolet light alone and to condensation alone in a repetitive cycle.

¹ This practice is under the jurisdiction of ASTM Committee G-3 on Durability of Nonmetallic Materials, and is the direct responsibility of Subcommittee G03.03 on Simulated and Controlled Environmental Tests.

Current edition approved Jan. 10, 1996. Published April 1996. Originally published as G 53 – 77. Last previous edition G 53 – 95.

² Annual Book of ASTM Standards, Vol 14.03.

³ Annual Book of ASTM Standards, Vol 14.02.

⁴ Annual Book of ASTM Standards, Vol 06.01.

⁵ Available from Secretary, U.S. National Committee, CIE, National Institute of Standards and Technology, Gaithersburg, MD 20899.