



STANDARD

ANSI/ASHRAE Standard 185.1-2015

Method of Testing UV-C Lights for Use in Air-Handling Units or Air Ducts to Inactivate Airborne Microorganisms

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CONTENTS

ANSI/ASHRAE Standard 185.1-2015, Method of Testing UV-C Lights for Use in Air-Handling Units or Air Ducts to Inactivate Airborne Microorganisms

SECTION	PAGE
Foreword	2
1 Purpose	2
2 Scope	2
3 Definitions	2
4 Test Apparatus and Procedures	3
5 Apparatus Qualification Testing	3
6 Bioaerosol Testing	3
7 Determination of Performance	6
8 Reporting Results	7
9 Normative References	7
Informative Annex A: Test Organism	8
Informative Annex B: Limitations	9
Informative Annex C: Safety	10
Informative Annex D: Environmental Considerations	11
Informative Annex E: Microorganism Susceptibility to UV-C Irradiation	12
Informative Annex F: Technical Issues Regarding Aerosol	13
Informative Annex G: Dosage Calculation	14
Informative Annex H: Poisson Distribution	15
Informative Annex I: Informative References	16

NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE Web site at www.ashrae.org/technology.

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FOREWORD

Test standards form the foundation for air-cleaner selection in the ventilation industry. Recent U.S. Environmental Protection Agency (EPA) literature states that the most important need in the area of ultraviolet germicidal irradiation (UVGI) is industry standards to rate installed devices. Standards for testing and reporting on products under controlled conditions are essential to users and specifiers so that they can compare products, predict levels of performance under specified operating conditions with reasonable certainty, and determine appropriate UVGI efficiencies for specific situations.

Historically, standards for testing air cleaners have been developed in response to the needs of the day. Protection of machinery and coils came first, then reduction of soiling. Recent concerns about indoor air quality and respirable particles, protection of products during manufacture, and protection of HVAC equipment prompted development of test standards based on particle size. Current interest in controlling airborne infectious contaminants or viable species that produce chemical contaminants as metabolic byproducts has created the need to provide a test standard for UVGI equipment.

Standards Project Committee (SPC) 185.1 was organized in 2005 to develop a method of test to determine inactivation rates of airborne microorganisms in air-handling units and air ducts.

This is a test-method standard, and its results are to be used to directly compare UVGI equipment on a standardized basis irrespective of their application. Results are also used to give the design engineer an easy-to-use basis for specifying UV devices or estimating the relative performance of UVGI for a given application. It is possible that an industry organization may use this test method as the basis for an application standard, in which they might require testing at conditions different than those required here.

Informative notes are used throughout this standard to provide nonmandatory guidance for the user in addition to the nonmandatory guidance found in informative appendices. Informative notes are not part of the standard.

1. PURPOSE

This standard establishes a test method for evaluating the efficacy of UV-C lights for their ability to inactivate airborne microorganisms.

2. SCOPE

2.1 This standard describes a method of laboratory testing to measure the performance of UV-C lights used in general ventilating systems.

2.2 The method of test measures the performance of UV-C lights to inactivate selected indicator microorganisms in the airstream. The standard defines procedures for generating the bioaerosols required for conducting the test. It also provides a method for counting the airborne bioaerosols upstream and downstream of the UV-C light in order to calculate inactivation efficiency for each microorganism.

2.3 This standard also establishes performance specifications for the equipment required to conduct the tests, defines methods of calculating and reporting results obtained from the test data, and establishes a reporting system to be applied to UV-C lights covered herein.

3. DEFINITIONS

3.1 Definitions. Terms specific to the use of this standard are defined below. Where definitions for a term are not provided, common usage shall apply.

burn-in time: a period of time that UV lamps are powered on prior to putting the lamps into service, typically 100 hours.

fluence: time integral of the fluence rate at a given point over a given duration, typically reported in microjoules per square centimetre ($\mu\text{J}/\text{cm}^2$).

fluence rate: quotient of the radiant flux incident on the outer surface of an infinitely small sphere centered at a given point, divided by the cross-sectional area of the sphere, typically reported in microwatts per square centimetre ($\mu\text{W}/\text{cm}^2$).

irradiance: the power of electromagnetic radiation incident on a surface per unit surface area, typically reported in microwatts per square centimetre ($\mu\text{W}/\text{cm}^2$).

radiant flux: power emitted, transmitted, or received in the radiant energy per unit time, or total power of ultraviolet light, typically reported in watts (W).

reflectivity: the fraction of incident UV-C radiation reflected by a surface.

ultraviolet germicidal irradiation (UVGI): the use of ultraviolet C (UV-C) energy, through a system designed to deliver UV-C, to kill or inactivate microorganisms.

ultraviolet (UV) light: ultraviolet electromagnetic radiation, which has a wavelength in the range 10 to 400 nm. It can be subdivided into ultraviolet A (400 to 320 nm); near (400 to 300 nm); ultraviolet B (320 to 280 nm); ultraviolet C, or germicidal (280 to 100 nm); far UV (200 to 122 nm); and extreme (121 to 10 nm).

ultraviolet C (UV-C): electromagnetic wavelength between 280 and 100 nm, also called *short wave* or *germicidal*. The germicidal UV wavelength (commonly 253.7 nm when generated using a mercury vapor lamp) falls into this UV band

UV dose: the product of UV irradiance and exposure time on a given microorganism or surface, typically reported in millijoules per square centimetre (mJ/cm^2).

UV-C device: a complete assembly consisting of lamps, ballasts, and supporting fixture. Also called *UV-C lights* in the configurations, as specified by the equipment provider.