

ADDENDA

**ANSI/ASHRAE/IES Addendum ar to
ANSI/ASHRAE/IES Standard 90.1-2019**

Energy Standard for Buildings Except Low-Rise Residential Buildings

Approved by the ASHRAE Standards Committee on July 20, 2022; by the ASHRAE Board of Directors on August 15, 2022; by the Illuminating Engineering Society on September 8, 2022; and by the American National Standards Institute on September 9, 2022.

This addendum was approved by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. Instructions for how to submit a change can be found on the ASHRAE® website (<https://www.ashrae.org/continuous-maintenance>).

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FOREWORD

Electric lighting is increasingly being used for horticulture growth and production. Indoor plant growth facility energy use intensities can exceed even those of data centers, with up to 80% of the electrical energy use attributed to horticultural grow lighting. As an example, indoor grow facilities for cannabis utilizing high-intensity discharge lighting can approach an energy use intensity of 1200 kBtu/ft² (Cannabis Energy Overview and Recommendations, Massachusetts Department of Energy Resources, February 23, 2018).

Addendum ar requires that horticultural lighting meet a photosynthetic photon efficacy (PPE) metric developed by the American Society of Agricultural and Biological Engineers (ASABE) for the ANSI/ASABE S640 standard. It also sets a threshold for compliance to avoid penalizing small horticultural growers.

There are two types of buildings and spaces with controlled environment horticulture (CEH): “greenhouse” buildings and spaces, where a significant amount of the light for plant growth is contributed by daylight, and the balance of the lighting is provided by electric lighting, and “indoor grow” buildings and spaces, where the majority or all horticulture growth lighting is provided by electric lighting. Due to the differing needs of each building and space type, two PPE values are provided based on the horticultural use of each of these spaces.

Standard 90.1-2019 includes a lighting power exemption for lighting designed for the support of nonhuman life forms (Table 9.2.3.1, Item #3), which applies to horticultural lighting. Addendum ar revises that lighting power exemption to no longer include horticultural lighting when used for horticulture production or cultivation purposes.

A cost-effectiveness analysis was completed, and this addendum meets the ASHRAE/IES Standard 90.1 scalar threshold for cost effectiveness.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~striking through~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum ar to Standard 90.1-2019

Modify Section 3.2 as shown (I-P and SI).

3.2 Definitions

[...]

greenhouse: a space with a skylight roof ratio of 50% or more above the growing area used exclusively for horticultural production, cultivation, or maintenance by utilizing a sunlit environment. Greenhouses are spaces erected for a period of 180 days or more.

[...]

lighting, horticultural: electric lighting used for horticultural production, cultivation, or maintenance with either plug-in or hard-wired connections for electric power.

[...]

indoor grow: a space, other than a greenhouse, used exclusively for horticultural production, cultivation, or maintenance.

[...]

photosynthetic photon efficacy (PPE): photosynthetic photon flux emitted by a light source between 400 and 700 nm divided by its electrical input power, expressed in units of micromoles per second per watt (micromoles per joule) as defined by ANSI/ASABE S640-2017.

[...]

3.3 Abbreviations and Acronyms

PPE photosynthetic photon efficacy

Modify Table 9.2.3.1 and Section 9.4.4 as shown (I-P and SI).

Table 9.2.3.1 Exceptions to Interior Lighting Power and Minimum Control Requirements

Item #	Equipment/Application	In Addition to and Controlled Separately From <i>General Lighting</i>	Required Controls
[...]			
3	Lighting specifically designed for <u>the research or life support of nonhuman life forms except for horticultural production or cultivation.</u>	YES	9.4.1.1(a)—Local control
[...]			

[...]

9.4.4 Horticultural Lighting. *Greenhouse horticultural lighting shall follow the requirements of Section 9.4.4.1. Indoor grow horticultural lighting shall follow the requirements of Section 9.4.4.2.*

9.4.4.1 *Luminaires in greenhouse buildings with at least 40 kW of connected load for horticultural lighting shall have a photosynthetic photon efficacy (PPE) of at least 1.7 μmol/J for integrated, nonserviceable luminaires, or a PPE of at least 1.7 μmol/J for lamps in luminaires with removable or serviceable lamps. Horticultural lighting in greenhouse spaces shall be controlled by a device that automatically turns off the horticultural lighting at specific programmed times.*

9.4.4.2 *Luminaires in indoor grow spaces used for horticultural lighting shall have a PPE of at least 1.9 μmol/J for integrated, nonserviceable luminaires, or a PPE of at least 1.9 μmol/J for lamps in luminaires with removable or serviceable lamps. Horticultural lighting in indoor grow spaces shall be controlled by a device that automatically turns off the horticultural lighting at specific programmed times.*

Exception: *Indoor grow buildings with less than 40 kW of connected load for horticultural lighting shall have a PPE of at least 1.7 μmol/J for integrated, nonserviceable luminaires, or a PPE of at least 1.7 μmol/J for lamps in luminaires with removable or serviceable lamps.*

Add the following reference to Informative Appendix E.

American Society of Agricultural and Biological Engineers (ASABE)
2950 Niles Road
St. Joseph, MI 49085

Table 9-3

Subsection No.	Reference	Title/Source
[...]		
9.4.4	<u>ANSI/ASABE S640-2017</u>	<u>Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms)</u>
[...]		

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

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ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

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