



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

Public Review Draft

Proposed Addendum ar to Standard 90.1-2019, Energy Standard for Buildings Except Low-Rise Residential Buildings

**First Public Review (August 2021)
(Draft Shows Proposed Changes to Current Standard)**

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ASHRAE, 180 Technology Parkway NW, Peachtree Corners, GA 30092

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(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

Electric lighting is increasingly being used for horticulture growth and production. Indoor plant growth facilities can have energy use intensities that exceed even 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 per square foot. (Cannabis Energy Overview and Recommendations, Massachusetts Department of Energy Resources, February 23, 2018)

This addendum 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. The balance of the lighting is provided by electric lighting. The second grow facility type is “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.

90.1-2019 includes a lighting power exemption for lighting designed for the support of non-human life forms (Table 9.2.3.1 item #3) which applies to horticultural lighting. This addendum 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 90.1 scalar threshold for cost effectiveness.

[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]

Addendum ar to 90.1-2019

Modify the standard as follows (IP and SI Units)

3.2 Definitions

Greenhouse: a space used exclusively for, and essential to horticultural production, cultivation or maintenance by utilizing a sunlit environment with a skylight roof ratio of 50% or more above the growing area.

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

Indoor grow: a space used exclusively for, and essential to horticultural production, cultivation or maintenance with a skylight roof ratio less than 50% above the growing area.

Photosynthetic photon efficacy (PPE): photosynthetic photon flux emitted by a light source divided by its electrical input power, expressed in units of micromoles per second per watt, or micromoles per joule ($\mu\text{mol}/\text{J}$) between 400-700nm as defined by ANSI/ASABE S640-2017.

3.3 Abbreviations and Acronyms

<u>PPE</u>	<u>Photosynthetic photon efficacy</u>
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Table 9.2.3.1 Exceptions to Interior Lighting Power and Minimum Control Requirements

Item #	Equipment/Application	In Addition to and Controlled Separately From General Lighting	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

Buildings with at least 40 kW of connected load for horticultural lighting shall conform to either the greenhouse horticultural lighting requirements of Section 9.4.4.1, or indoor grow horticultural lighting requirements of Section 9.4.4.2.

9.4.4.1 Luminaires in greenhouse spaces used for horticultural lighting shall have a PPE of at least 1.7 $\mu\text{mol}/\text{J}$. Greenhouse spaces shall be controlled by a device that automatically turns off the horticultural lighting when sufficient daylight is available and by scheduled shutoff control 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 $\mu\text{mol}/\text{J}$ and shall be controlled by a device that automatically turns off the horticultural lighting at specific programmed times.

Add the following reference to Informative Appendix E

American Society of Agricultural and Biological Engineers (ASABE)

2950 Niles Road
 St. Joseph, MI 49085

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>

For Reference Only - changes to section numbering that will occur if in-process addendum ac is approved for publication

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
4	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