

STANDARD

**ANSI/ASHRAE/IES Addendum t to
ANSI/ASHRAE/IES Standard 90.1-2022**

Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings

Approved by ASHRAE and the American National Standards Institute on May 31, 2024; and by the Illuminating Engineering Society on May 8, 2024.

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>).

The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 180 Technology Parkway, Peachtree Corners, GA 30092. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

© 2024 ASHRAE

ISSN 1041-2336



ASHRAE Standard Project Committee 90.1

Cognizant TC: 7.6 Systems Energy Utilization

SPLS Liaison: Jennifer Isenbeck · ASHRAE Staff Liaison: Emily Toto · IES Liaison: Mark Lien

Richard Lord*, <i>Chair</i>	Phillip Gentry	Vladimir Kochkin*	Steven Rosenstock*
Thomas Culp*, <i>Co-Vice-Chair</i>	Jason Glazer*	Michael Lane*	Loren Ross
Leonard Sciarra*, <i>Co-Vice-Chair</i>	Melissa Goren*	Toby Lau	Robert Ross*
Rahul Athalye	David Handwork*	Chonghui Liu	Armin Rudd
William Babbington	Armin Hauer	Emily Lorenz	Marty Salzberg*
John Bade*	Rick Heiden	Samuel Mason*	Christopher Schaffner
Sean Beilman*	Gary Heikkinen	Christopher Mathis*	Greg Schluterman
Michael Berrios	Mark Heizer*	Merle McBride*	Kelly Seeger*
Paula Cino*	David Herron*	James McClendon*	Wayne Stoppelmoor*
Glen Clapper	Emily Hoffman	Benjamin Meyer*	Matthew Swenka*
Ernest Conrad*	Mike Houston*	Julian Mills-Beale	Christian Taber*
Shannon Corcoran*	Michael Ivanovich	James C. Moore	Steven Taylor*
Jay Crandell*	Harold Jepsen	Frank Morrison*	Kevin Teakell
Brandon Damas*	Chad Johnson	Michael Myer	Douglas Tucker
Thomas Deary	Greg Johnson*	Frank Myers*	Jason Vandever
Darryl Dixon	Zac Johnson	Michael Patterson*	Martha VanGeem*
Julie Donovan*	Duane Jonlin*	Timothy Peglow*	Michael Waite*
Craig Drumheller*	Michael Jouaneh*	Christopher Perry	McHenry Wallace*
James Earley	Maria Karpman*	Laura Petrillo-Groh*	Jerry White*
Kurt Fester	Andrew Klein	Michael Rhodes	Jeremiah Williams*
D. Andrew Fouss	Ellery Klein	Michael Rosenberg*	

* Denotes members of voting status when the document was approved for publication

ASHRAE STANDARDS COMMITTEE 2023–2024

Douglas D. Fick, <i>Chair</i>	Gerald J. Kettler	Daniel H. Nall	Paolo M. Tronville
Kelley P. Cramm	Jay A. Kohler	Philip J. Naughton	Douglas Tucker
Abdel K. Darwich	Paul A. Lindahl, Jr.	Kathleen Owen	William F. Walter
Drake H. Erbe	James D. Lutz	Gwelen Paliaga	Susanna S. Hanson, <i>BOD ExO</i>
Patricia Graef	Julie Majurin	Karl L. Peterman	Ashish Rakheja, <i>CO</i>
Jaap Hogeling	Lawrence C. Markel	Justin M. Prosser	
Jennifer A. Isenbeck	Margaret M. Mathison	David Robin	
Phillip A. Johnson	Kenneth A. Monroe	Christopher J. Seeton	

Ryan Shanley, *Senior Manager of Standards*

SPECIAL NOTE

This American National Standard (ANS) is a national voluntary consensus Standard developed under the auspices of ASHRAE. *Consensus* is defined by the American National Standards Institute (ANSI), of which ASHRAE is a member and which has approved this Standard as an ANS, as “substantial agreement reached by directly and materially affected interest categories. This signifies the concurrence of more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that an effort be made toward their resolution.” Compliance with this Standard is voluntary until and unless a legal jurisdiction makes compliance mandatory through legislation.

ASHRAE obtains consensus through participation of its national and international members, associated societies, and public review.

ASHRAE Standards are prepared by a Project Committee appointed specifically for the purpose of writing the Standard. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Standard. Every effort is made to balance the concerned interests on all Project Committees.

The Senior Manager of Standards of ASHRAE should be contacted for

- interpretation of the contents of this Standard,
- participation in the next review of the Standard,
- offering constructive criticism for improving the Standard, or
- permission to reprint portions of the Standard.

DISCLAIMER

ASHRAE uses its best efforts to promulgate Standards and Guidelines for the benefit of the public in light of available information and accepted industry practices. However, ASHRAE does not guarantee, certify, or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with ASHRAE's Standards or Guidelines or that any tests conducted under its Standards or Guidelines will be nonhazardous or free from risk.

ASHRAE INDUSTRIAL ADVERTISING POLICY ON STANDARDS

ASHRAE Standards and Guidelines are established to assist industry and the public by offering a uniform method of testing for rating purposes, by suggesting safe practices in designing and installing equipment, by providing proper definitions of this equipment, and by providing other information that may serve to guide the industry. The creation of ASHRAE Standards and Guidelines is determined by the need for them, and conformance to them is completely voluntary.

In referring to this Standard or Guideline and in marking of equipment and in advertising, no claim shall be made, either stated or implied, that the product has been approved by ASHRAE.

(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

Addendum t removes Section 9.5.2.3, "Control Factors." Section 9.5.2.3 was added to ANSI/ASHRAE/IES Standard 90.1 in 2013 to allow for advanced lighting controls. Many of those advanced controls are now part of the standard. In 2013, inefficiencies with fluorescent dimming technology required more power than standard fluorescent ballasts to work with certain controls. The industry has shifted from fluorescent to LED technology. LED technology does not have the same electrical efficiencies. For these reasons, Section 9.5.2.3 is no longer necessary. This addendum removes an optional allowance, and a cost-effectiveness analysis is not required.

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

Addendum t to Standard 90.1-2022

~~Delete Section 9.5.2.3 and Table 9.5.2.3 (not shown) as follows.~~

~~9.5.2.3 Additional Interior Lighting Power Using Nonmandatory Controls.~~ An additional *interior lighting power allowance* shall be permitted for *space* types with nonmandatory controls installed as identified in Table 9.5.2.3 when all mandatory controls are used according to Section 9.4. This allowance is added to the *interior lighting power allowance* and is calculated as follows:

$$\text{Additional Interior Lighting Power Allowance} = \text{Lighting Power Under Control} \times \text{Control Factor}$$

where

Lighting Power Under Control = the total input watts of all *lamps* being controlled using the control method indicated

Control Factor = the value given in Table 9.5.2.3 for the corresponding *space* type and control method

Table 9.5.2.3 Control Factors Used in Calculating Additional Interior Lighting Power Allowance

Additional Control Method (in Addition to Mandatory Requirements)	Space Type				
	Open-Office	Private-Office	Conference-Room, Meeting-Room, Classroom (Lecture/Training)	Retail-Sales-Area	Lobby, Atrium, Dining-Area, Corridors/ Stairways, Gym/ Pool, Mall Concourse, Parking-Garage
Programmable multilevel dimming control using programmable-time scheduling	0.05	0.05	0.10	0.10	0.10
<i>Occupancy sensors</i> controlling the downlight component of workstation-specific <i>luminaires</i> with continuous dimming to off capabilities	0.25 ^a	0	0	0	0
<i>Occupancy sensors</i> controlling the downlight component of workstation-specific <i>luminaires</i> with continuous dimming to off operation, in combination with personal continuous dimming control of downlight illumination by workstation occupant	0.30 ^{a,b}	0	0	0	0

a. Control factor is limited to workstation-specific *luminaires* in partitioned single-occupant work *spaces* contained within an open office environment (i.e. direct-indirect *luminaires* with separately controlled downlight and uplight components, with the downward component providing illumination to a single occupant in an open-plan workstation). Within 30 minutes of the occupant leaving the *space*, the downward component shall continuously dim to off over a minimum of two minutes. Upon the occupant entering the *space*, the downward component shall turn on at the minimum level and continuously raise the illumination to a preset level over a minimum of 30 seconds. The uplight component of workstation-specific *luminaire* shall comply with Section 9.4.1.1(h) (*automatic full off*).

b. In addition to the requirements described in footnote (a), the control shall allow the occupant to select their preferred light level via a personal computer, handheld device, or similarly accessible device located within the workstation.

Modify Sections 11.5.2.5.2 and 11.5.2.5.3 as follows.

11.5.2.5.2 L02: Continuous Dimming and High-End Trim. To achieve this credit, *general lighting* in 75% or more of *gross lighted floor area* shall have *luminaires* configured for *continuous dimming* with the following:

- a. *High-end trim* shall be implemented, and *construction documents* shall state that maximum light output or power of controlled lighting shall be initially reduced by at least 15% from full output. The average maximum light output or power of the controlled lighting shall be documented without *high-end trim* and with *high-end trim* in accordance with Section 9.9.1 to verify reduction of light output or power by at least 15% when tuned.
- b. Where *lumen maintenance control* without lighting sensors is used, controls shall be configured to limit the initial maximum lumen output or maximum lighting power to 85% or less of full light output or full power draw.
- c. *High-end trim* and *lumen maintenance* controls shall be accessible only to authorized personnel.
- d. ~~Where this credit is taken, the additional interior lighting power allowance in Section 9.5.2.3 related to dimming control is not permitted to be used.~~ For hotel and multifamily *building* use types, the *gross lighted floor area* is for common areas not including *dwelling units* or guest rooms...

[. . .]

11.5.2.5.3 L03: Occupancy Sensor Control Areas. To achieve this credit, either *buildings* shall use Section 9.3, "Simplified Building Method Compliance Path," or in all *spaces* where *automatic* partial OFF (See Section 9.4.1.1[g]) or *automatic* full OFF (See Section 9.4.1.1[h]) is not required, it shall be installed as follows:

- a. *Automatic* shutoff or light reduction shall occur within 15 minutes of all occupants leaving each control zone.
- b. For *spaces* with multiple control zones or *automatic* partial OFF control, *automatic* full shutoff shall occur within 15 minutes of all occupants leaving the *space*.
- c. For *spaces* with one control zone, *automatic* full OFF control shall be used.
- d. All areas of the project with *automatic* partial OFF or *automatic* full OFF control shall have one *control device* for every 600 ft² of *gross lighted area*.

~~Where this credit is taken, additional interior lighting power allowance in Section 9.5.2.3 related to occupancy sensor control shall not be used.~~

[. . .]

Modify Table 12.5.1 as follows. (NOTE: This table includes changes made by previously published Addendum f to ANSI/ASHRAE/IES Standard 90.1-2022.)

Table 12.5.1 Modeling Requirements for Calculating Design Energy Cost and Energy Cost Budget

Proposed Design (Column A) Design Energy Cost (DEC)	Budget Building Design (Column B) Energy Cost Budget (ECB)
6. Lighting	
<p>Lighting power in the <i>proposed design</i> shall be determined as follows:</p> <ol style="list-style-type: none"> a. Where a complete <i>lighting system</i> exists, the actual lighting power for each <i>thermal block</i> shall be used in the model. b. Where a complete <i>lighting system</i> has been designed, lighting power for each <i>thermal block</i> shall be determined in accordance with Sections 9.1.3 and 9.1.4. c. Where no lighting exists or is specified, lighting power shall be determined in accordance with the <i>Building Area Method</i> for the appropriate <i>building area type</i>. d. <i>Lighting system</i> power shall include all <i>lighting system</i> components shown or provided for on plans (including <i>lamps</i>, <i>ballasts</i>, <i>task fixtures</i>, and <i>furniture-mounted fixtures</i>). For <i>dwelling units</i>, hotel/motel guest rooms, and other <i>spaces</i> in which <i>lighting systems</i> consist of plug-in light fixtures that are not shown or provided for on <i>design documents</i>, assume identical lighting power for the <i>proposed design</i> and <i>baseline building design</i> in the simulations. e. The lighting schedules in the <i>proposed design</i> shall reflect the mandatory <i>automatic</i> lighting control requirements in Section 9.4.1 (e.g., programmable controls or <i>occupancy sensors</i>). f. <i>Automatic</i> daylighting controls included in the <i>proposed design</i> may be modeled directly in the <i>building</i> simulation or be modeled in the <i>building</i> simulation through schedule adjustments determined by a separate analysis approved by the <i>authority having jurisdiction</i>. Modeling and schedule adjustments shall separately account for <i>primary sidelighted areas</i>, <i>secondary sidelighted areas</i>, and toplighted areas. g. <i>Automatic</i> lighting controls included in the <i>proposed design</i> but not required by Section 9.4.1 shall be modeled using the following methods for each luminaire under control: <ol style="list-style-type: none"> 1. <i>Manual-ON</i> or partial-auto-ON <i>occupancy sensors</i> shall be modeled by reducing the lighting schedule each hour by the <i>occupancy sensor</i> reduction factors in Table G3.7-1 and G3.7-2 for the applicable <i>space</i> type multiplied by 0.25. 2. <i>Automatic</i> lighting controls listed in Table 9.5.2.3 shall be modeled using the sum of the applicable control factors (CF). Apply control factors to only the portion of wattage of the fixtures in the space controlled by said lighting control. Divide each hour of the lighting schedule by (1 + ΣCF), where ΣCF indicates the sum of all applicable control factors for that space per Section 9.5.2.3 and Table 9.5.2.3. 2. For <i>luminaires</i> that meet requirements in Section 11.5.2.5.2 “L02 Continuous Dimming and High-End Trim,” the lighting schedule each hour shall be reduced by 7.5% compared to the <i>budget building design</i>. 3. For lighting in <i>dwelling units</i> with controls meeting requirements in Section 11.5.2.5.5 “L05 Lighting Control for Multifamily Buildings,” the lighting schedule each hour shall be reduced by 10%. 	<ol style="list-style-type: none"> a. Where a complete <i>lighting system</i> exists, lighting power in the <i>budget building</i> design shall be the same as in the <i>proposed design</i>. b. Where a <i>lighting system</i> has been designed, the <i>interior lighting power allowance</i> shall be determined using either the <i>Building Area Method</i> or <i>Space-by-Space Method</i>, and the <i>space</i> use classification shall be the same as the <i>proposed design</i> with lighting power set equal to the maximum allowed for the corresponding method and category in Section 9.2. Additional interior lighting power for nonmandatory controls allowed under Table 9.5.2.3 shall not be included in the <i>budget building design</i>. Lighting power density in <i>dwelling units</i> shall be 0.60 W/ft². c. Where lighting neither exists nor is submitted with design documents, the lighting power in the <i>budget building</i> design shall be the same as in the <i>proposed design</i>.

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.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

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.

ASHRAE · 180 Technology Parkway · Peachtree Corners, GA 30092 · www.ashrae.org

About ASHRAE

Founded in 1894, ASHRAE is a global professional society committed to serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration, and their allied fields.

As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

To stay current with this and other ASHRAE Standards and Guidelines, visit www.ashrae.org/standards, and connect on LinkedIn, Facebook, Twitter, and YouTube.

Visit the ASHRAE Bookstore

ASHRAE offers its Standards and Guidelines in print, as immediately downloadable PDFs, and via ASHRAE Digital Collections, which provides online access with automatic updates as well as historical versions of publications. Selected Standards and Guidelines are also offered in redline versions that indicate the changes made between the active Standard or Guideline and its previous edition. For more information, visit the Standards and Guidelines section of the ASHRAE Bookstore at www.ashrae.org/bookstore.

IMPORTANT NOTICES ABOUT THIS STANDARD

To ensure that you have all of the approved addenda, errata, and interpretations for this Standard, visit www.ashrae.org/standards to download them free of charge.

Addenda, errata, and interpretations for ASHRAE Standards and Guidelines are no longer distributed with copies of the Standards and Guidelines. ASHRAE provides these addenda, errata, and interpretations only in electronic form to promote more sustainable use of resources.