



**BSR/ASHRAE/IES Addendum b  
to ANSI/ASHRAE/IES Standard 90.1-2025**

**Advisory Public Review Draft**

# **Proposed Addendum b to Standard 90.1-2025, Energy Standard for Sites and Buildings Except Low- Rise Residential Buildings**

**First Advisory Public Review (March 2026)  
(Draft Shows Proposed Changes to Current Standard)**

This draft has been recommended for advisory public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website at <https://www.ashrae.org/technical-resources/standards-and-guidelines/public-review-drafts> and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. The current edition of any standard may be purchased from the ASHRAE Online Store at [www.ashrae.org/bookstore](http://www.ashrae.org/bookstore) or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

The appearance of any technical data or editorial material in this public review document does not constitute endorsement, warranty, or guaranty by ASHRAE of any product, service, process, procedure, or design, and ASHRAE expressly disclaims such.

© 2025 ASHRAE. This draft is covered under ASHRAE copyright. Permission to reproduce or redistribute all or any part of this document must be obtained from the ASHRAE Manager of Standards, 180 Technology Parkway NW, Peachtree Corners, GA 30092. Phone: 404-636-8400, Ext. 1125. Fax: 404-321-5478. E-mail: [standards.section@ashrae.org](mailto:standards.section@ashrae.org).

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

*This is an Advisory Public Review. The draft language shown below is not the final intended language. Throughout the document, users will find questions highlighted in yellow that request specific suggestions from reviewers. Of course, we welcome comments on any of the language or any suggested additions.*

*Locations for the spreadsheets and EnergyPlus models used to support this proposal are shared later in this document can be found here: TBD*

*If you want to have a discussion that goes beyond comment responses, please contact John Bade at [jbade@westmonroe.com](mailto:jbade@westmonroe.com).*

*The proponents of this measure do not intend to set requirements that will negatively impact product quality or yields. The intention is to ensure that indoor space growing conditions desired by the grower are maintained and under control.*

**(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**

*This proposed measure would establish mandatory sizing and control requirements for space conditioning systems that provide heating, cooling, and dehumidification in indoor grow spaces, along with prescriptive performance requirements for systems.*

*The requirements would apply to indoor grow spaces with lighting power density greater than 30 W per canopy square foot, skylight ratios below 50 percent, and a minimum of 5,000 ft<sup>2</sup> of plant canopy. Projects subject to these prescriptive requirements would also have the option to comply using a performance pathway supported by new indoor CEH prototypes and modeling capabilities.*

*The proposed requirements recognize the strong interaction between cooling and dehumidification functions in indoor grow spaces and require these functions to be addressed as an integrated space conditioning system. Applicants would be required to identify a primary space conditioning system providing cooling, dehumidification, and reheat. Prescriptive criteria would require this system to feature a variable sensible heat ratio (SHR), the ability to modulate recovered dehumidification process heat between 10 and 90 percent, and a capacity sufficient to meet a minimum percentage of the peak combined sensible and latent load. Acceptable system types include integrated DX systems, desiccant-based systems, and heat-recovery chiller systems. These prescriptive requirements would also establish the baseline energy budget for performance compliance, enabling modeling of alternative systems.*

*Mandatory requirements include submitting calculated sensible and latent loads, along with the corresponding equipment-sizing documentation. Supplemental equipment would be permitted to address loads exceeding the primary system's capacity, but would be required to be integrated through a central control system.*

*Control requirements for the primary system would include modulation of SHR in response to space conditions, control of reheat to manage recovered process heat, and limitations on supplemental heating when recovered heat is available. Supplemental dehumidification*

*equipment would be required to operate only as needed and in coordination with the primary system based on humidity measurements and load conditions.*

*The proposed requirements would apply uniformly across all climate zones and would cover new construction, additions, and major alterations, while excluding minor equipment replacements.*

***Existing definitions that may be useful for the discussion:***

***addition:*** an extension or increase in floor area or height of a building outside of the existing *building envelope* or the *equipment* or *systems* to a site.

***alteration:*** replacing or adding to *systems*, *equipment*, structures, or *building assemblies*; routine maintenance, repair, and service, or a change in the *building* or structure use classification or *space conditioning category* shall not constitute an alteration.

***air-circulating fan:*** a fan that has no provision for connection to ducting or separation of the fan inlet from its outlet using a pressure boundary, operated against zero external pressure loss, and is not a *jet fan* or a *ceiling fan*.

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

***lighting, horticultural:*** electric lighting used for horticultural production, cultivation, or maintenance with

either plug-in or hard-wired connections for electric power.

***[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 b to Standard 90.1-2025**

---

*Add or modify definitions in Section 3.2 (I-P and SI):*

***evapotranspiration load:*** the cooling load created by the conversion of sensible to latent heat through adiabatic cooling caused by transpiration from cultivated plants.

***HVAC system:*** the equipment, distribution systems, and terminals that provide, either collectively or individually, the processes of heating, ventilating, dehumidification, or air conditioning to a building or portion of a building.

***indoor grow integrated space conditioning system:*** is an HVAC system designed to serve indoor grow spaces. It provides a wide range of sensible heat ratios by using recaptured heat from the dehumidification process to reheat the dehumidified air or regenerate a desiccant. It rejects unneeded heat to the outdoors or for use elsewhere. It can be a packaged system or a field-erected system. Hydronic systems are included.

***plant canopy area:*** the area, in square feet [square meters], where plants are grown. Each part of the total canopy area is defined by clearly identifiable physical boundaries around all areas that will contain plants. Physical boundaries include, but are not limited to, interior and exterior walls, and shelves that delineate

the perimeter. Where plants will be grown in multiple tiers, the area of each tier is summed to determine the plant canopy area. Plant canopy area includes all actively used growing surfaces and excludes aisles, non-plant production zones, and equipment-only areas.

*Reviewers: The proposal contains both mandatory and prescriptive language. We intend that indoor grow spaces be able to comply using performance modeling. Our initial thoughts, reflected in this document, are that only the Section 12 Energy Cost Budget could be used. However, some members of the ECB subcommittee believe that we can find a way to do this in Appendix G, and we are looking into that.*

Modify Section 4.2 as follows:

#### 4. ADMINISTRATION AND ENFORCEMENT

...

##### 4.2 Compliance

###### 4.2.1 Compliance Paths

4.2.1.1 **New Buildings.** New *buildings* shall comply with Section 4.2.2 through 4.2.5 and either the provisions of

...

c. Normative Appendix G, “Performance Rating Method.”. Buildings with indoor grow spaces with greater than 5000 ft<sup>2</sup> [470 m<sup>2</sup>] of plant canopy area and horticulture lighting power density greater than 30 W/ft<sup>2</sup> [320 W/m<sup>2</sup>] shall not be permitted to comply using this method.

4.2.1.2 **Additions to Existing Buildings.** *Additions to existing buildings* shall comply with the provisions of Section 4.2.2 through 4.2.5 and one of the following:

...

b. Normative Appendix G, “Performance Rating Method,” in accordance with Section 4.2.1.1. Additions to existing buildings with indoor grow spaces with greater than 5000 ft<sup>2</sup> [470 m<sup>2</sup>] of plant canopy area and horticulture lighting power density greater than 30 W/ft<sup>2</sup> [320 W/m<sup>2</sup>] shall not be permitted to comply using this method.

4.2.1.2.1 When an *addition to an existing building* cannot comply by itself, trade-offs will be allowed by modification to one or more of the existing components of the *existing building*. Modeling of the modified components of the *existing building* and *addition* shall employ the procedures of Section 12 or Normative Appendix G; the *addition* shall not increase the *energy* consumption of the *existing building* plus the *addition* beyond the *energy* that would be consumed by the *existing building* plus the *addition* if the *addition* alone did comply.

4.2.1.3 **Alterations of Existing Building Assemblies, Systems, and Equipment.** *Alterations of existing building assemblies, systems, and equipment* shall comply with the provisions of Section 4.2.2 through 4.2.5 and one of the following:

a. Sections 5, “Building Envelope”; 6, “Heating, Ventilating, and Air Conditioning”; 7, “Service Water Heating”; 8, “Power”; 9, “Lighting”; 10, “Other Equipment”; and 11, “Additional Efficiency Requirements,” or

- b. Section 12, “Energy Cost Budget Method,” or
- c. Normative Appendix G, “Performance Rating Method,” in accordance with Section 4.2.1.1 with the following modifications:
  - 1. *Alterations* that meet the criteria in Section G3.1.4(a) shall use the BPF from Table 4.2.1.1 multiplied by 1.05.
  - 2. All other *alterations* modeled following Section G3.3 shall use BPF = 1.

**Exceptions to 4.2.1.3:**

- a. *A building* that has been specifically designated as historically significant by the *adopting authority* or is listed in The National Register of Historic Places or has been determined to be eligible for listing by the U.S. Secretary of the Interior need not comply with these requirements.
- b. Buildings with indoor grow spaces with greater than 5000 ft<sup>2</sup> [470 m<sup>2</sup>] of plant canopy area and horticulture lighting power density greater than 30 W/ft<sup>2</sup> [320 W/m<sup>2</sup>] of plant canopy area shall not be permitted to comply using Normative Appendix G.

*Modify section 6.1 as follows (I-P and SI):*

**6.1 General**

...

**6.1.4 Alterations to Heating, Ventilating, Air Conditioning, and Refrigeration in Existing Buildings.** All *alterations* shall comply with Section 6.2 and Sections 6.1.4.1 to 6.1.4.3. Other than where required for compliance with Sections 6.1.4.1 through 6.1.4.3, *equipment, controls, piping,* and ducts within the alteration area or served by the altered *system* that are not replaced or altered shall not be required to comply with Section 6.2.

*Alterations* to existing cooling systems shall not decrease economizer capability except where the altered *system* complies with Section 6.5.1.

**Exceptions to 6.1.4:**

...

8. HVAC systems and equipment serving indoor grow spaces that comply with Section 6.1.5

**6.1.5 Additions and alterations to indoor grow spaces.** Additions, alterations, and conversions to indoor grow spaces shall comply with the following:

**6.1.5.1 Conversion of existing buildings to indoor grow.** Where existing buildings are modified to include indoor grow spaces, HVAC systems serving those spaces shall comply with Section 6.2.

**6.1.5.2 Addition of plant canopy area.** Where the plant canopy area of an existing building is increased by the lesser of 100 percent or 5000 ft<sup>2</sup> [470 m<sup>2</sup>], new HVAC systems shall comply with Section 6.2.

**6.1.5.3 Alteration of HVAC Systems.** Where the equipment comprising more than 50% of the design airflow of an HVAC system, not including air-circulating fans and ceiling fans, that serves an indoor grow space is replaced, new HVAC systems shall comply with

## Section 6.2

*Add Section 6.4.8 (I-P and SI):*

**6.4.8 Indoor grow spaces.** Space conditioning systems for indoor grow spaces shall meet the following:

*Reviewers: The following language is in the mandatory section and has no minimum threshold of plant canopy size or lighting power to be applicable. It is modeled on California Title 24. However, we have received comments from stakeholders that there are other ways to save energy, such as using site-recovered energy for dehumidification reheating or water-side economizers. If you agree with adding other types of efficient systems, please comment.*

**6.4.8.1 Dehumidification equipment.** Dehumidification equipment serving indoor grow spaces shall be one or a combination of the following:

1. Dehumidifiers subject to regulation under federal appliance standards tested in accordance with 10 CFR 430.23(z) and Appendix X or X1 to Subpart B of 10 CFR Part 430 as applicable, and complying with 10 CFR 430.32(v)2.
2. An indoor grow integrated space conditioning system.

**6.4.8.2 Space conditioning systems for large indoor grow spaces with high intensity lighting.** In facilities with greater than 5000 ft<sup>2</sup> [470 m<sup>2</sup>] of plant canopy area, space conditioning systems serving indoor grow spaces with horticultural lighting power density greater than 30 W/ft<sup>2</sup> [320 W/m<sup>2</sup>] of plant canopy area shall comply with the following:

**6.4.8.2.1 Sizing.** Space conditioning systems shall be sized to meet not less than 100% for each of the following: the design heating load, the design sensible cooling loads, and the design evapotranspiration load for lights on and lights off at the following conditions:

1. Week 1 of the growing cycle
2. The week of peak irrigation
3. The last week of the growing cycle

Latent and sensible load calculations shall account for evapotranspiration loads, environmental setpoints, and horticultural lighting loads. The calculations shall account for variations in setpoints, internal loads, and climate throughout each grow cycle and the TMY weather year.

*Reviewers: The above sizing language is intended to ensure that equipment is sized properly, as many stakeholders have told us that often heating systems are undersized, which results in growers adding large amounts of electric resistance heating. If this proposal becomes part of the standard, we intend to ask PNNL to add a calculation section to COMcheck. A sample spreadsheet that would be the basis can be found here: **TBD**.*

**6.4.8.2.2 Supplemental heating.** Where used, electric resistance heating or combustion heating equipment shall comply with the following:

- a. The equipment shall be sized to meet heating loads that cannot be met using heat recovered from the dehumidification process.
- b. The equipment shall be controlled to only operate when the heating load exceeds 100% of the dehumidification process heat that the indoor grow space HVAC system is capable of recovering.

**6.4.8.2.3 Integrated temperature and humidity controls.** Controls for space conditioning equipment shall meet all the following requirements:

- a. One integrated control system shall control both humidity and temperature based on readings from humidity and temperature sensors co-located within the plant canopy.
- b. Controls shall automatically stage or modulate all space conditioning equipment to meet temperature and humidity setpoints.

**6.4.8.2.4 Dehumidification equipment that rejects all process heat to the space.**

Where used, dehumidification equipment that rejects 100% of process heat to the space shall:

- a. Be controlled by a central controller that sequences unitary dehumidifiers automatically based on dehumidification load.
- b. Only be activated during periods when all the heat rejected by such equipment waste heat can be used in the space or when other space conditioning equipment cannot satisfy 100% of cooling, heating, or dehumidification loads

**6.4.8.2.5 Field verification.** Field verification of specified equipment and functional performance tests shall demonstrate the correct installation and operation of components, systems, and system-to-system interfaces in accordance with the test requirements in [TBD].

*Add a new exception to Section 6.5.1 as shown (I-P and SI):*

[...]

**Exceptions to 6.5.1:** Economizers are not required for the following systems:

[...]

14. Where the use of an air economizer in indoor grow spaces or greenhouses will affect carbon dioxide enrichment systems.

*Add Section 6.5.12 as shown (I-P and SI):*

*Note to reviewers: Are there systems other than indoor grow integrated space conditioning systems that provide the same level of energy efficiency? Stakeholders have suggested that where all the heating can be provided by site-recovered energy, such as from cogeneration or engine-driven chillers provide equivalent energy savings to a system that uses heat recovered from the condenser. Stakeholders have also suggested that water-side or air-side economizing systems can provide equivalent savings. Comments on this would be appreciated.*

**6.5.12 Indoor grow space conditioning systems.** Space conditioning systems serving indoor grow spaces in buildings with more than 5000 ft<sup>2</sup> [470 m<sup>2</sup>] of plant canopy area and with horticultural lighting power density greater than 30 W/ft<sup>2</sup> [320 W/m<sup>2</sup>] shall comply with the following:

**6.5.12.1 Primary conditioning system.** The primary space conditioning systems shall be indoor grow HVAC systems. Construction documents shall identify the primary space conditioning systems.

**6.5.12.2 Sizing.** The indoor grow HVAC systems must be sized to meet at least 80% of peak latent and sensible load.

**6.5.12.3 Modulating dehumidification.** Indoor grow HVAC systems shall be capable of modulating heat recovery and heat rejection.:

**6.5.12.3 Control.** The primary indoor grow space conditioning system shall be controlled by a system that is configured to:

1. Modulate sensible heat ratio in response to measured room conditions and temperature and humidity setpoints; and
2. Modulate reheat to reject or recover dehumidification process heat, as needed to meet supply air setpoints; and
3. Modulate supply fan speed in response to measured space conditions and temperature and humidity setpoints.

*The following requirements shall be added to Section 12*

## **12. ENERGY COST BUDGET METHOD**

[...]

### **12.1 Simulation General Requirements**

### **12.2 Calculation of Design Energy Cost and Energy Cost Budget**

#### **12.2.1 [...]**

#### **12.2.2 HVAC Systems**

- a. Determining the HVAC System
- b. Kitchen Exhaust
- c. **Indoor Grow Rooms.** HVAC systems serving indoor grow spaces with plant canopy area greater than 5000 ft<sup>2</sup> [470 m<sup>2</sup>] and horticultural lighting power density greater than 30 W/ft<sup>2</sup> [320 W/m<sup>2</sup>] of plant canopy area shall be mapped to System 12, shall be modeled to meet the requirements specified in Section 6.5.12 and shall meet the following requirements:

The budget system shall be sized to meet at least (80%) of peak latent and sensible load.  
(TBD)

**12.2.3 ....**

Proposed Design (Column A) Design Energy Cost (DEC)	Budget Building Design (Column B) Energy Cost Budget (ECB)
<p><b>3. Space Use Classification</b></p> <p>The <i>building</i> area type or <i>space</i> type classifications shall be chosen in accordance with Section 9.5.1 or 9.5.2. The user or designer shall specify the <i>space</i> use classifications using either the <i>building</i> area type or <i>space</i> type categories but shall not combine the two types of categories within a single permit application. More than one <i>building</i> area type category may be used for a <i>building</i> if it is a mixed-use facility.</p> <p><b>Exceptions:</b></p> <ul style="list-style-type: none"> <li>a. Where <i>space</i> types neither exist nor are designated in design documents, use type shall be specified in accordance with Section 9.5.1.</li> <li>b. <u>Indoor grow spaces in buildings with more than 5000 ft<sup>2</sup> [470 m<sup>2</sup>] of plant canopy and horticulture lighting power density greater than 30W/ft<sup>2</sup>, shall be classified as indoor grow spaces.</u></li> </ul>	Same as Proposed Design
<p><b>6. Lighting</b></p> <p>Lighting power in the <i>proposed design</i> shall be determined as follows:</p> <p>[...]</p> <ul style="list-style-type: none"> <li>h. <u>Horticulture lighting in indoor grow spaces shall follow the requirements of Section 9.4.4.2</u></li> </ul>	
<p><b>10. HVAC System</b></p> <p>[...]</p>	The HVAC system type and related performance parameters for the budget building design shall be determined from Figure 12.5.2, the system descriptions in Table 12.5.2-1 and accompanying notes, and in accord with rules specified in Section 12.5.2(a) through 12.5.2(k).

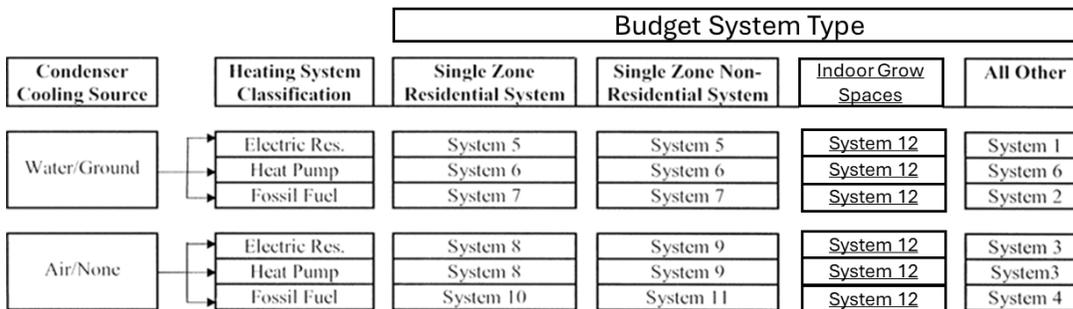


Figure 12.5.2 HVAC systems map.

Table 12.5.2-1 Budget System Descriptions

System No.	System Type	Fan Control	Cooling Type	Heating Type
<u>12</u>	<u>Indoor grow HVAC System</u>	VAV	Direct Expansion	<u>Hot gas reheat</u>

k. Modelling of hot gas reheat might not be explicitly supported in simulation programs and might require post-processing of simulation outputs.