

STANDARD

**ANSI/ASHRAE/IES Addendum f 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 June 30, 2023, and by the Illuminating Engineering Society on June 7, 2023.

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FOREWORD

Building Performance Factors (BPF) in Table 4.2.1.1 account for efficiency gains due to the introduction of energy credits. However, the existing modeling rules of the Performance Rating Method (Appendix G) do not allow capturing energy savings from some of the systems, component, and controls that are addressed by new energy credits in Section 11. As a result, projects that specify such technologies are not able to claim the associated credits. Addendum f addresses that gap. The new modeling requirements for the Performance Rating Method (Appendix G) and Energy Cost Budget Method (Section 12) reflect the methodologies used to assign weights to energy credits, as described in the PNNL Technical Support Document¹.

This addendum impacts an optional performance path in the standard designed to provide increased flexibility and therefore was not subjected to cost effectiveness analysis.

Informative 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 f to Standard 90.1-2022

1. www.energycodes.gov/sites/default/files/2021-11/TechBrief_Energy-Load-Credits_2021Oct20.pdf

Modify Table 12.5.1 as shown (I-P and SI).

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)
[...]	
4. Schedules	
<p>The schedule types listed in Section 12.4.1.1(b) shall be required input. The schedules shall be typical of the <i>proposed design</i> as determined by the designer and approved by the <i>authority having jurisdiction</i>. Required schedules shall be identical for the <i>proposed design</i> and <i>budget building design</i>.</p> <p>Temperature and Humidity Schedules. Temperature and humidity control <i>set points</i> and schedules, as well as <i>temperature control throttling range</i>, shall be the same for <i>proposed design</i> and <i>baseline building design</i>.</p> <p>HVAC Fan Schedules. Schedules for HVAC fans that provide <i>outdoor air</i> for <i>ventilation</i> shall run continuously whenever <i>spaces</i> are occupied and shall be cycled ON and OFF to meet heating and cooling loads during unoccupied hours.</p> <p>Exceptions:</p> <ol style="list-style-type: none"> Where no heating and/or cooling <i>system</i> is to be installed, and a heating or cooling <i>system</i> is being simulated only to meet the requirements described in this table, heating and/or cooling <i>system</i> fans shall not be simulated as running continuously during occupied hours but shall be cycled ON and OFF to meet heating and cooling loads during all hours. HVAC fans shall remain on during occupied and unoccupied hours in <i>spaces</i> that have health- and safety-mandated minimum <i>ventilation</i> requirements during unoccupied hours. Dedicated <i>outdoor air</i> supply fans shall stay off during unoccupied hours. HVAC fans shall remain on during occupied and unoccupied hours in <i>systems</i> primarily serving <i>computer rooms</i>. 	<p>Same as <i>proposed design</i>.</p> <p>Exception: When the <i>proposed building design</i> includes HVAC systems <i>serving dwelling units or sleeping units</i> that have controls meeting requirements of Section 11.5.2.2.4 “H04: Residential Space HVAC Control”:</p> <ol style="list-style-type: none"> The <i>budget building design</i> shall be modeled using heating temperature setback of 5°F (3°C) higher than in the <i>proposed design</i> but not higher than the occupied temperature for a maximum of 9 hours per day. The <i>budget building design</i> shall be modeled using cooling temperature setback of 5°F (3°C) lower than the <i>proposed design</i> but not lower than the occupied temperature for not more than 9 hours per day.
[...]	
6. Lighting	
<p>Lighting power in the <i>proposed design</i> shall be determined as follows:</p> <ol style="list-style-type: none"> Where a complete <i>lighting system</i> exists, the actual lighting power for each <i>thermal block</i> shall be used in the model. 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. 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>. <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 furniture-mounted <i>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 <i>fixtures</i> 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. 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>). <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. <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"> <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 type</i> multiplied by 0.25. 	<ol style="list-style-type: none"> Where a complete <i>lighting system</i> exists, lighting power in the <i>budget building design</i> shall be the same as in the <i>proposed design</i>. 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>. <i>Lighting power density</i> in <i>dwelling units</i> shall be 0.60 W/ft². Where lighting neither exists nor is submitted with design documents, the lighting power in the <i>budget building design</i> shall be the same as in the <i>proposed design</i>. Power for <i>fixtures</i> not included in the lighting power calculation shall be modeled identically in the <i>proposed design</i> and <i>budget building design</i>. Mandatory <i>automatic</i> lighting controls required by Section 9.4.1 shall be modeled the same as the <i>proposed design</i>.

Table 12.5.1 Modeling Requirements for Calculating Design Energy Cost and Energy Cost Budget (Continued)

Proposed Design (Column A) Design Energy Cost (DEC)	Budget Building Design (Column B) Energy Cost Budget (ECB)
<p>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 <i>fixtures</i> in the <i>space</i> controlled by said lighting control. Divide each hour of the lighting schedule by $(1 + \sum CF)$, where $\sum CF$ indicates the sum of all applicable control factors for that <i>space</i> per Section 9.5.2.3 and Table 9.5.2.3.</p> <p>3. <u>For luminaires 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 budget building design.</u></p> <p>4. <u>For lighting in dwelling units 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%.</u></p>	
[...]	

Modify Table G3.1 as shown (I-P and SI).

Table G3.1 Modeling Requirements for Calculating Proposed Building Performance and Baseline Building Performance

Proposed Building Performance	Baseline Building Performance
<p>4. Schedule</p> <p>Schedules capable of modeling hourly variations in occupancy, lighting power, miscellaneous <i>equipment</i> power, <i>thermostat set points</i>, and <i>HVAC system</i> operation shall be used. The schedules shall be typical of the proposed <i>building type</i> as determined by the designer and approved by the <i>rating authority</i>.</p> <p>Temperature and Humidity Schedules. Temperature and humidity control <i>set points</i> and schedules as well as <i>temperature control throttling range</i> shall be the same for <i>proposed design</i> and <i>baseline building design</i>.</p> <p>HVAC System Fan Schedules. Schedules for <i>HVAC system</i> fans that provide <i>outdoor air</i> for <i>ventilation</i> shall run continuously whenever <i>spaces</i> are occupied and shall be cycled ON and OFF to meet heating and cooling loads during unoccupied hours.</p> <p>Exceptions:</p> <ol style="list-style-type: none"> Where no heating and/or cooling <i>system</i> is to be installed, and a heating or cooling <i>system</i> is being simulated only to meet the requirements described in this table, heating and/or cooling <i>system</i> fans shall not be simulated as running continuously during occupied hours but shall be cycled ON and OFF to meet heating and cooling loads during all hours. <i>HVAC system</i> fans shall remain on during occupied and unoccupied hours in <i>spaces</i> that have health- and safety-mandated minimum <i>ventilation</i> requirements during unoccupied hours. <i>HVAC system</i> fans shall remain on during occupied and unoccupied hours in <i>systems</i> primarily serving <i>computer rooms</i>. Dedicated <i>outdoor air</i> supply fans shall stay off during unoccupied hours. 	<p>Same as <i>proposed design</i>.</p> <p>Exceptions:</p> <ol style="list-style-type: none"> <i>Set points</i> and schedules for <i>HVAC systems</i> that <i>automatically</i> provide occupant thermal comfort via means other than directly controlling the air dry-bulb and wet-bulb temperature may be allowed to differ, provided that equivalent levels of occupant thermal comfort are demonstrated via the methodology in ASHRAE Standard 55, Section 5.3.3, "Elevated Air Speed," or Standard 55, Appendix B, "Computer Program for Calculation of PMV-PPD." <u>When the proposed building design includes HVAC systems serving dwelling units or sleeping units that have controls meeting requirements of Section 11.5.2.2.4 "H04: Residential Space HVAC Control":</u> <ol style="list-style-type: none"> <u>The baseline building design shall be modeled using heating temperature setback of 5°F (3°C) higher than in the proposed design but not higher than the occupied temperature for a maximum of 9 hours per day.</u> <u>The baseline building design shall be modeled using cooling temperature setback of 5°F (3°C) lower than the proposed design but not lower than the occupied temperature for not more than 9 hours per day.</u> Schedules may be allowed to differ between <i>proposed design</i> and <i>baseline building design</i> when necessary to model nonstandard <i>efficiency</i> measures, provided that the revised schedules have been approved by the <i>rating authority</i>. Measures that may warrant use of different schedules include but are not limited to <i>automatic</i> lighting controls, <i>automatic</i> natural <i>ventilation</i> controls, <i>automatic demand control</i> <i>ventilation</i> controls, and <i>automatic</i> controls that reduce <i>service water-heating</i> loads. In no case shall schedules differ where the controls are <i>manual</i> (e.g., <i>manual</i> operation of light switches or <i>manual</i> operation of windows). <i>HVAC system</i> fan schedules may be allowed to differ when Section G3.2.1.2(a) applies. For <i>Systems</i> 6 and 8, only the <i>terminal-unit</i> fan and <i>reheat</i> coil shall be energized to meet heating <i>set point</i> during unoccupied hours <u>Lighting schedules may be allowed to differ based on occupancy sensor reduction factor in Tables G3.7-1 and G3.7-2</u>

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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.

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