

STANDARD

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

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

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FOREWORD

Addendum a modifies Normative Appendix G to address a known issue with how purchased heating and cooling is handled. Prior to adoption of a stable baseline in Appendix G, purchased heating and cooling were treated as energy neutral. With the adoption of a stable baseline and BPF factors, a proposed design using purchased heating and cooling has more difficulty meeting the PCI target. Addendum a addresses this issue by requiring purchased heating and cooling to be modeled in the proposed design as being supplied by a minimally code-compliant hot- and chilled-water plant.

Addendum a also proposes a change to the wording of Sections G3.1.3.2 through G3.1.3.11 to clarify baseline building requirements.

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 a to Standard 90.1-2022

Modify Normative Appendix G as shown (I-P and SI).

G2.4.2 Annual Energy Costs:

- a. The *design energy cost* and *baseline energy cost* shall be determined using either actual rates for *purchased energy* or state average *energy prices* published by DOE's Energy Information Administration (EIA) for commercial *building* customers, but rates from different sources ~~may~~shall not be mixed in the same project.

Exceptions to (a):

1. Where the proposed design utilizes purchased hot water, steam, or chilled water, such projects shall be modeled as using purchased electricity or gas in accordance with the "Proposed Building Performance" column of Table G3.1(10)(e), G3.1(10)(f), G3.1(11)(g).
 2. Where natural gas must be modeled in the baseline following Tables G3.1.1-2 or G3.1.1-3 but is not available at the building site, the state average energy prices published by EIA shall be used for natural gas, and either the actual rates published by the utility serving the building or state average energy prices published by EIA shall be used for electricity.
- b. Where *on-site renewable energy* or *site-recovered energy* is used, the *baseline building design* shall be based on the *energy source* used as the *backup energy source*, or the *baseline system energy source* in that category if no *backup energy source* has been specified, except where the *baseline energy source* is prescribed in Tables G3.1.1-2 and G3.1.1-3
- c. Where the proposed design includes *on-site electricity generation systems* other than *on-site renewable energy systems*, the *baseline design* shall include the same generation systems excluding its *site-recovered energy*.

Informative Note: The above provision allows users to gain credit for features that yield load management benefits. Where such features are not present, users can simply use state average unit prices from EIA, which are updated annually and readily available on EIA's web site (<http://www.eia.gov>).

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

Proposed Building Performance	Baseline Building Performance
[...]	
10. HVAC Systems	
<p>The <i>HVAC system</i> type and all related performance parameters in the <i>proposed design</i>, such as <i>equipment</i> capacities and efficiencies, shall be determined as follows:</p> <ol style="list-style-type: none"> Where a complete <i>HVAC system</i> exists, the model shall reflect the actual <i>system</i> type using actual component capacities and efficiencies. Where an <i>HVAC system</i> has been designed and submitted with design documents, the HVAC model shall be consistent with design documents. Mechanical <i>equipment</i> efficiencies shall be adjusted from actual <i>design conditions</i> to the standard rating conditions specified in Section 6.4.1 if required by the simulation model. Where <i>efficiency</i> ratings include supply fan <i>energy</i>, the <i>efficiency</i> rating shall be adjusted to remove the supply fan <i>energy</i> from the <i>efficiency</i> rating in the <i>baseline building design</i>. The <i>proposed design HVAC system</i> shall be modeled using <i>manufacturers'</i> full- and part-load data for the <i>HVAC system</i> without fan power. Exception to (a) and (b): Where part-load performance of chillers in the <i>proposed design</i> is not available, and design temperature across the condenser is 10°F (5.56°C), the performance curves in Normative Appendix L, as referenced in Table J-1, shall be modeled for the specified chiller. When using performance curves from Normative Appendix L, chiller minimum part-load ratio (ratio of load to available capacity at a given simulation time step) and minimum compressor unloading ratio (part-load ratio below which the chiller capacity cannot be reduced by unloading and chiller is false loaded) shall be equal to 0.25. <i>Simulation programs</i> that do not use performance curves are permitted to use an alternative simulation method that results in the same performance as the curves described in Normative Appendix L. Where no heating <i>system</i> exists or no heating <i>system</i> has been submitted with design documents, the <i>system</i> type shall be the same <i>system</i> as modeled in the <i>baseline building design</i> and shall comply with but not exceed the <u>mandatory and prescriptive</u> requirements of Section 6. Where no cooling <i>system</i> exists or no cooling <i>system</i> has been submitted with design documents, the cooling <i>system</i> type shall be the same as modeled in the <i>baseline building design</i> and shall comply with the requirements of Section 6. Exception: <i>Spaces</i> using baseline <i>HVAC system</i> types 9 and 10. <u>Systems in the <i>proposed design</i> that use purchased hot water or purchased steam for space heating shall be modeled with forced draft boiler(s) that comply with but do not exceed the mandatory and prescriptive requirements of Section 6. The number of boilers and boiler controls shall meet the requirements of Sections G3.2.3.2 through G3.2.3.6</u> <u>Systems in the <i>proposed design</i> that use purchased chilled water shall be modeled with the type and number of chillers determined by following Sections G3.2.3.7 through G3.2.3.11 using equipment efficiency and controls that comply with but not exceed the mandatory and prescriptive requirements of Section 6.</u> 	<p>The <i>HVAC systems</i> in the <i>baseline building design</i> shall be of the type and description specified in Section G3.2.1, shall meet the general <i>HVAC system</i> requirements specified in Section G3.2.2, and shall meet any <i>system-specific</i> requirements in Section G3.2.3 that are applicable to the baseline <i>HVAC system</i> types.</p> <p>If the <i>proposed design</i> includes humidification then the <i>baseline building design</i> shall use adiabatic humidification. Exception: If the proposed <i>building</i> humidification <i>system</i> complies with Section 6.5.2.4 then the <i>baseline building design</i> shall use non-adiabatic humidification.</p> <p>For <i>systems</i> serving <i>computer rooms</i>, the <i>baseline building design</i> shall not have <i>reheat</i> for the purpose of dehumidification.</p> <p><i>Fossil fuel systems</i> shall be modeled using natural gas as their <i>fuel</i> source. Exception: For <i>fossil fuel systems</i> where natural gas is not available for the proposed <i>site</i> as determined by the <i>rating authority</i>, the <i>baseline HVAC systems</i> shall be modeled using propane as their <i>fuel</i>.</p>
11. Service Water-Heating Systems	
<p>The <i>service water-heating system</i> type and all related performance parameters, such as <i>equipment</i> capacities and efficiencies, in the <i>proposed design</i> shall be determined as follows:</p> <p>[...]</p> <ol style="list-style-type: none"> <u>Systems in the <i>proposed design</i> that use purchased hot water or purchased steam for service water heating shall be modeled with the same service water heating system type as in the baseline design and shall comply with but not exceed the mandatory and prescriptive requirements of Section 7.</u> 	<p>[...]</p> <ol style="list-style-type: none"> Gas storage <i>water heaters</i> shall be modeled using natural gas as their <i>fuel</i>. Exception: Where natural gas is not available for the proposed <i>site</i>, as determined by the <i>rating authority</i>, gas storage <i>water heaters</i> shall be modeled using propane as their <i>fuel</i>. Piping losses shall not be modeled.
[...]	

[...]

G3.2.1.4 Purchased Heat. For *systems* using purchased hot water or steam, the heating source shall be modeled as purchased hot water or steam in both the *proposed design* and *baseline building design*. Hot water or steam costs shall be based on actual utility rates, and *on-site boilers*, electric heat, and furnaces shall not be modeled in the *baseline building design*.

G3.2.1.5 Purchased Chilled Water. For *systems* using purchased chilled water, the cooling source shall be modeled as purchased chilled water in both the *proposed design* and *baseline building design*. Purchased chilled water costs shall be based on actual utility rates, and *on-site chillers* and *direct expansion equipment* shall not be modeled in the *baseline building design*.

G3.2.1.6 Baseline HVAC System Requirements for Systems Utilizing Purchased Chilled Water and/or Purchased Heat. If the *proposed design* uses purchased chilled water and/or purchased heat, the following modifications to the baseline *HVAC system* types in Table G3.1.1-4 shall be used:

G3.2.1.6.1 Purchased Heat Only. If the *proposed design* uses purchased heat, but does not use purchased chilled water, then Tables G3.1.1-3 and G3.1.1-4 shall be used to select the baseline *HVAC system* type, and purchased heat shall be substituted for the heating type in Table G3.1.1-4. The same heating source shall be used in the *proposed design* and *baseline building design*.

G3.2.1.6.2 Purchased Chilled Water Only. If the *proposed design* uses purchased chilled water but does not use purchased heat, then Tables G3.1.1-3 and G3.1.1-4 shall be used to select the baseline *HVAC system* type, with the modifications listed below:

- a. Purchased chilled water shall be substituted for the cooling types in Table G3.1.1-4.
- b. *System 1* and *2* shall be constant volume fan-coil units with *fossil fuel boilers*.
- c. *System 3* and *4* shall be constant volume single-zone air handlers with *fossil fuel* furnaces.
- d. *System 7* shall be used in place of *System 5*.
- e. *System 8* shall be used in place of *System 6*.

G3.2.1.6.3 Purchased Chilled Water and Purchased Heat. If the *proposed design* uses purchased chilled water and purchased heat, then Tables G3.1.1-3 and G3.1.1-4 shall be used to select the baseline *HVAC system* type, with the following modifications:

- a. Purchased heat and purchased chilled water shall be substituted for the heating types and cooling types in Table G3.1.1-4.
- b. *System 1* shall be constant volume fan-coil units.
- c. *System 3* shall be constant volume single zone air handlers.
- d. *System 7* shall be used in place of *System 5*.

G3.2.1.6.4 On-Site Distribution Pumps. All *on-site* distribution *pumps* shall be modeled in both the *proposed design* and *base building design*.

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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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