ADDENDA

ANSI/ASHRAE/IES Addendum as 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 April 30, 2025, and by the Illuminating Engineering Society on March 31, 2025.

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).

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FOREWORD

ANSI/ASHRAE Standard 205, Representation of Performance Data for HVAC&R and Other Facility Equipment, defines the formats for describing detailed performance data for chillers, unitary equipment, fan assemblies, direct expansion systems, motors, motor drives, and mechanical drives. This performance data is expected to be published by manufacturers of the equipment and primarily used by building energy modeling software. Standing Standard Project Committee (SSPC) 205 is continuing to work on expanding this list of data formats for other types of equipment primarily focused on HVAC. To represent performance data as accurately as possible, the formats described in Standard 205 are all in the form of data tables and keyword-value pairs. The tables and keywords vary by the type of equipment. In no case are traditional performance curves used in Standard 205. To ensure that data and software that support the Standard 205 formats can be used as part of one of the Standard 90.1 performance paths, Addendum as substitutes a newly defined term, "expanded performance data," for most locations in Standard 90.1 that previously referenced "performance curves." This addendum impacts the optional performance paths 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 ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum as to Standard 90.1-2022

Revise Section 3.2 as follows (IP and SI).

expanded performance data: detailed performance characteristics, provided by the manufacturer or by a nationally recognized third party, for the *equipment* accounting for the variation of capacity and energy consumption of that *equipment* at varying part-load conditions, operating temperatures, and other conditions, expressed as one or more matrices of data, performance curves, or mathematical equations along with the properties needed to describe the expected operating range of the *equipment*. [***Informative Note*:** Example formats for *expanded performance data* are described in ASHRAE Standard 205.]

Modify Section 12 as follows (IP and SI).

12.4.1.1 The *simulation program* shall be approved by the *adopting authority* and shall, at a minimum, have the ability to explicitly model all of the following:

a. 8760 hours per year
b. Hourly variations in occupancy, lighting power, miscellaneous *equipment* power, *thermostat set points*, humidity *set points*, and *HVAC system* operation, defined separately for each day of the week and holidays
c. Thermal mass effects
d. Ten or more thermal zones
~~e. Part-load performance curves for mechanical *equipment*~~
e. Mechanical equipment, including heating and cooling equipment, using *expanded performance data*
~~f. Capacity and *efficiency* correction curves for *mechanical heating* and *mechanical cooling equipment*~~
~~g.~~ f. *Air-side economizer* and *fluid economizer* with integrated control
~~h.~~ g. The *budget building design* characteristics unless otherwise specified in Section 12.5

[. . .]

12.5.2 HVAC Systems. 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 the following rules:

[. . .]

b. **Minimum Equipment Efficiency.** All HVAC and service water-heating equipment in the budget building design shall be modeled at the minimum efficiency levels, both part load and full load, in accordance with Sections 6.4, 6.5.4.8, 7.4, and 7.5 based on the budget system type determined following Section 12.5.2(j) and capacity determined following Section 12.5.2(i). Chillers shall use Path A efficiencies as

shown in Table 6.8.1-3 and be modeled using the *expanded performance data* ~~performance curves~~ specified in Table J-1 and included in Normative Appendix J. When using *expanded performance data* ~~performance curves~~ from Normative Appendix J, 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. Simulation programs that do not use *expanded performance data* ~~performance curves~~ are permitted to use an alternative simulation method that results in the same performance as the *expanded performance data* ~~curves~~ described in Normative Appendix J.

[. . .]

Modify Table 12.5.1(10), HVAC Systems (Proposed Design), as follows. The remainder of the table is unchanged.

The *HVAC system* type and all related performance parameters, such as *equipment* capacities and efficiencies, in the *proposed design* shall be determined as follows:

a. Where a complete *HVAC system* exists, the model shall reflect the actual *system* type using actual component capacities and efficiencies.
b. Where an *HVAC system* has been designed, the HVAC model shall be consistent with design documents. Mechanical *equipment* efficiencies shall be adjusted from actual *design conditions* to the standard rating conditions specified in Section 6.4.1 if required by the simulation model. Where *efficiency* ratings include supply fan *energy*, the *efficiency* rating shall be adjusted to remove the supply fan *energy* from the *efficiency* rating in the *budget building design*. The equations in Section 12.5.2 shall not be used in the *proposed design*. The *proposed design HVAC system* shall be modeled using *manufacturers*' full- and part-load data for the *HVAC system* without fan power.

Exception to (a) and (b): Where part-load performance of chillers in the *proposed design* is not available, and design temperature across the condenser is 10°F, the ~~performance curves~~ *expanded performance data* in Normative Appendix J for the appropriate chiller type and capacity, as referenced in Table J-1 shall be modeled for the specified chiller. When using ~~performance curves~~ *expanded performance data* from Normative Appendix J, 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. *Simulation programs* that do not use ~~performance curves~~ *expanded performance data* are permitted to use an alternative simulation method that results in the same performance as the ~~curves~~ *expanded performance data* described in Normative Appendix J.

[. . .]

Modify Informative Appendix E, "Informative References," as follows.

Reference		Section
ASHRAE Standard 205-2023	Representation of Performance Data for HVAC&R and Other Facility Equipment	3.2, J1.1

Modify Section G2.2.1 as follows (IP and SI).

G2.2.1 The *simulation program* shall be approved by the *adopting authority* and shall, at a minimum, have the ability to explicitly model all of the following:

a. 8760 hours per year
b. Hourly variations in occupancy, lighting power, miscellaneous *equipment* power, *thermostat set points*, humidity *set points*, and *HVAC system* operation, defined separately for each day of the week and holidays
c. Thermal mass effects
d. Ten or more thermal zones
~~e. Part-load performance curves for mechanical *equipment*~~
e. Mechanical equipment, including heating and cooling equipment, using *expanded performance data*
~~f. Capacity and *efficiency* correction curves for *mechanical heating* and *mechanical cooling equipment*~~
~~g.~~ f. *Air-side economizer* and *fluid economizer* with integrated control
~~h.~~ g. The *budget building design* characteristics unless otherwise specified in Section 12.5

[. . .]

Modify Table G3.1(10), HVAC Systems (Proposed Building Performance), as follows.

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

The *HVAC system* type and all related performance parameters in the *proposed design*, such as *equipment* capacities and efficiencies, shall be determined as follows:

a. Where a complete *HVAC system* exists, the model shall reflect the actual *system* type using actual component capacities and efficiencies.
b. Where an *HVAC system* has been designed and submitted with design documents, the HVAC model shall be consistent with design documents. Mechanical *equipment* efficiencies shall be adjusted from actual *design conditions* to the standard rating conditions specified in Section 6.4.1 if required by the simulation model. Where *efficiency* ratings include supply fan *energy*, the *efficiency* rating shall be adjusted to remove the supply fan *energy* from the *efficiency* rating in the *baseline building design*. The *proposed design HVAC system* shall be modeled using *manufacturers*' full- and part-load data for the *HVAC system* without fan power.

   Exception to (a) and (b): Where part-load performance of chillers in the *proposed design* is not available, and design temperature across the condenser is 10°F, the ~~performance curves~~ *expanded performance data* in Normative Appendix L, as referenced in Table J-1, shall be modeled for the specified chiller. When using ~~performance curves~~ *expanded performance data* 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. *Simulation programs* that do not use ~~performance curves~~ *expanded performance data* are permitted to use an alternative simulation method that results in the same performance as the ~~curves~~ *expanded performance data* described in Normative Appendix L.
c. Where no heating *system* exists or no heating *system* has been submitted with design documents, the *system* type shall be the same *system* as modeled in the *baseline building design* and shall comply with but not exceed the requirements of Section 6.

[. . .]

Modify Section G3.2.2.1 as follows (IP and SI).

G3.2.2.1 Equipment Efficiencies. All HVAC *equipment* in the *baseline building design* shall be modeled at the minimum *efficiency* levels, both part load and full load, in accordance with Tables G3.5.1 through G3.5.6. Where multiple *HVAC zones* are combined into a single *thermal block* in accordance with Table G3.1, the efficiencies (for baseline HVAC System Types 3, 4, 9, and 10) taken from Tables G3.5.1, G3.5.2, and G3.5.5 shall be based on the *equipment* capacity of the *thermal block* divided by the number of *HVAC zones*. HVAC System Types 5 or 6 efficiencies taken from Table G3.5.1 shall be based on the cooling *equipment* capacity of a single *story* when grouping identical *stories* in accordance with Section G3.2.1.1(a)(4). Fan *energy* shall be modeled separately according to Section G3.2.1.7.

$COP_{nfcooling}$ and $COP_{nfheating}$ are the packaged HVAC *equipment* cooling and heating *energy efficiency*, respectively, to be used in the *baseline building design*, which excludes supply fan power.

The sets of ~~performance curves~~ *expanded performance data* specified in Table J-2 should be used to represent part-load performance of chillers in the *baseline building design.* When using ~~performance curves~~ *expanded performance data* from Normative Appendix J, 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. *Simulation programs* that do not use ~~performance curves~~ *expanded performance data* are permitted to use an alternative simulation method that results in the same performance as the ~~curves~~ *expanded performance data* described in Normative Appendix J.

Modify Appendix J as follows (IP and SI).

NORMATIVE APPENDIX J
SETS OF ~~PERFORMANCE CURVES~~ EXPANDED PERFORMANCE DATA

J1. GENERAL

J1.1 Description. This appendix provides sets of ~~performance curves~~ *expanded performance data* that shall be used to represent the part-load performance of chillers in the *budget building design* when using Section 12

and in the *baseline building design* when using Normative Appendix G. They are also permitted to be used for the *proposed building design* when specific chiller performance is not known.

Each set of *expanded performance data* includes three curves: an energy-input-ratio modifier as a function of temperatures (EIR-f-T) and as a function of a chiller's part-load ratio (EIR-f-PLR), and a capacity modifier as a function of temperatures (CAP-f-T). These curves are intended to describe the part-load performance of a chiller when its operating capacity and power (not including cycling degradation) are calculated by the *simulation program* as follows:

Operating Capacity = Rated Capacity × CAP-f-T
Operating Power = Operating Capacity × EIR-f-T × EIR-f-PLR ×
Chiller Input Power at Rated Conditions/Chiller Capacity at Rated Conditions

Table J-3 provides the reference values for the ~~curves~~ *expanded performance data*. Tables J-4 and J-6 are to be used when the *simulation program* uses I-P units to evaluate the ~~performance curves~~ *expanded performance data*, and Tables J-5 and J-7 are to be used when the *simulation program* uses SI units to evaluate the ~~performance curves~~ *expanded performance data*.

Informative Note: Compatible sets of *expanded performance data* are available for liquid-cooled chillers in ASHRAE Standard 205 format at https://data.ashrae.org/standard205/examples.html.

Table J-1 Sets of Chiller ~~Performance Curves~~ Expanded Performance Data for Section 12

<table not included>

Table J-2 Sets of Chiller ~~Performance Curves~~ Expanded Performance Data for Normative Appendix G

<table not included>

Modify Appendix L as follows (IP and SI).

[. . .]

L2.2.3 HVAC System Components. The *HVAC system* parameters shall be provided for the *proposed design* at *design conditions* unless otherwise stated with clarifications and simplifications as described in Table L2.2.3 and as follows:

a. All *HVAC zones* within a block shall be served by the same *HVAC system* type as listed in Table L.1.1.1.
b. Where multiple *system* components serve a block, average values weighted by the appropriate metric as described in Section L2.2.3.1 shall be used.
c. The Table L2.2.3 parameter requirements are based on input of full-load~~.~~ *equipment efficiencies* with adjustment using ~~part-load curves~~ *expanded performance data* integrated in the *simulation program*. Where other approaches to part-load adjustment are used, it is permitted for specific input parameters to vary.

[. . .]

L3.2 TSPR Simulation Program. All components of the *proposed design* for blocks served by *HVAC systems* using this method shall be explicitly modeled by the *simulation program*. The *code official* shall be permitted to approve a *simulation program* for a specified application or limited scope.

L3.2.1 Minimum Capability. The *simulation program* shall be approved by the *code official* and shall, at a minimum, have the ability to explicitly model all of the following:

a. 8760 hours per year
b. Hourly variations in occupancy, lighting power, miscellaneous *equipment* power, *thermostat set points*, and *HVAC system* operation, defined separately for each day of the week and holidays
c. Thermal mass effects
d. Ten or more *thermal blocks*
~~e. Part-load performance curves or other part-load adjustment methods for mechanical *equipment*~~
e. Mechanical equipment, including heating and cooling equipment, using *expanded performance data*
~~f. Capacity and *efficiency* correction curves or other part-load adjustment methods for *mechanical heating* and *mechanical cooling equipment*~~
~~g.~~ f. *Air economizers* with integrated controls
~~h.~~ g. The *energy* use of all *HVAC system* types included in the analysis and *energy* impact from all related fixed and user inputs in Table L2.2.3
~~i.~~ h. Ability to automatically generate the *TSPR reference building design* as specified in Section L4.3

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

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