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ANSI/ASHRAE/IES Standard 90.1-2019
Energy Standard for Buildings Except Low-Rise Residential Buildings (I-P Edition)

NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE website at www.ashrae.org/technology.

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

The 2019 edition of Standard 90.1 incorporates over 100 addenda to the 2016 edition and includes numerous energy-saving measures. Notable changes include the following:

a. ***Administration and Enforcement.*** *Commissioning requirements were added to the standard for the first time. Section 4.2.5, "Verification, Testing, and Commissioning" was greatly expanded and requirements were outlined for commissioning in accordance with ASHRAE/IES Standard 202. A new Informative Appendix H provides additional information and guidance.*

b. ***Building Envelope***
   1. *For vertical fenestration, the categories of "nonmetal framed" and "metal framed" products were combined.*
   2. *Minimum criteria for SHGC and U-factor were upgraded across all climate zones.*
   3. *The air leakage section was revised to clarify compliance.*
   4. *Changes to the vestibule section refined the exceptions and added a new option and associated criteria for using air curtains.*

c. ***Lighting***
   1. *Lighting power allowances for the Space-by-Space Method and the Building Area Method were modified to reflect the outcomes of the fully reconstructed Standard 90.1 lighting model, which included many updates and improvements. The model is more representative of real-world conditions with the inclusion of updated IES recommendations, room cavity ratios, additional surface reflectance categories, light loss factors, and a 100% LED technology baseline with updated efficacy values.*
   2. *A new simplified method for lighting (new Section 9.2) was added to provide a simple approach for contractors and designers who design or renovate office buildings and retail buildings up to 25,000 ft^2.*
   3. *Lighting control requirements for parking garages were updated to account for the use of LEDs in this application by increasing the stringency of the setback requirement to 50% and reducing the control timeout from 20 minutes to 10 minutes.*
   4. *Daylight responsive requirements were updated from continuous dimming or stepped control to continuous dimming required for all spaces, and a definition was added for continuous dimming based on NEMA LSD-64-2014.*
   5. *Side-lighting requirements were updated to clarify that the setback distance is a horizontal measurement, and the exception was amended to include natural objects as an obstruction.*

d. ***Mechanical***
   1. *New requirements were defined to allow designers the option to use ASHRAE Standard 90.4 instead of ASHRAE Standard 90.1 requirements in computer rooms that have an IT equipment load larger than 10 kW.*
   2. *Pump definitions, requirements, and efficiency tables are included in the standard for the first time, as they are now covered by the U.S. Department of Energy.*
   3. *Equipment efficiency requirements*
      - *New tables were added, and some existing tables were combined, renumbered, or deleted.*
      - *Where required, tables were updated to align with USDOE requirements.*

- *New Tables F-4 and F-5 were created for U.S. federally covered furnace products and to specify USDOE-covered residential water boiler efficiency requirements.*
- *The efficiency table for liquid-to-liquid heat exchangers was removed.*
- *New requirements and a new table were added for ceiling-mounted computer room units.*
- *New efficiency metrics and minimum efficiency requirements and a new Table 6.8.1-16 were added for heat pump and heat reclaim chillers.*
- *New requirements for vacuum insulating glazing were added to the list of options for reach-in doors in walk-in coolers and freezers in Section 6.4.5.*

4. *Fans and fan systems changes*
   - *The fan efficiency grade (FEG) efficiency metric was replaced with the fan energy index (FEI).*
   - *New requirements were added in Section 6.4.1.3. for reporting fan power for ceiling fans.*
   - *Requirements were updated in Section 6.5.3.1.2 for fan motor selections to increase the design options for load-matching variable-speed fan applications.*
5. *Energy recovery and heat reclaim*
   - *Energy recovery requirements were included for high-rise residential buildings.*
   - *A new requirement was added for condenser heat recovery for acute care inpatient hospitals.*

e. ***Energy Cost Budget (ECB) Method (Section 11)***
   1. *Numerous changes were made to ensure continuity.*
   2. *The baseline was set for on-site electricity generation systems.*

f. ***Performance Rating Method (Appendix G)***
   1. *Appendix G rules and the corresponding baseline efficiency requirement were clarified for when combining multiple thermal zones into a single thermal block.*
   2. *Explicit heating and cooling COPs were provided without fan for the baseline packaged cooling equipment.*
   3. *Rules were added for modeling the impact of automatic receptacle controls.*
   4. *More specific baseline rules were set for infiltration modeling.*
   5. *Clarification was added for how plant and coil sizing should be performed.*
   6. *Building performance factors in Section 4 were updated.*

g. ***Both Compliance Paths***
   1. *Clearer and more specific rules were added related to how renewables are treated.*
   2. *Extensive updates were added to the rules for lighting modeling.*

In addition, the 2019 edition includes various changes and clarifications to improve internal consistency and to standardize the structure and language of the document. Affected items include submittal documentation requirements, compliance paths, and terminology.

Standard 90.1 is a fluid document. To remain viable it must evolve strategically and technically. The project committee welcomes suggestions for improvement, and users are encouraged to use the continuous maintenance proposal (CMP) form located on the ASHRAE website (www.ashrae.org/continuous-maintenance) to propose changes. The committee takes formal action on every CMP received. As addenda are approved, notices are published on the ASHRAE and IES websites. Users are encouraged to sign up for the free ASHRAE and IES Internet listserv for Standard 90.1 to receive notice of all public reviews and approved and published addenda and errata.

1 Purpose

1.1

To establish the minimum *energy efficiency* requirements of *buildings* other than *low-ris residential buildings* for

a. design, *construction*, and a plan for operation and maintenance; and
b. utilization of on-site, renewable *energy* resources.

2 Scope

2.1

This standard provides

a. minimum *energy*-efficient requirements for the design and *construction*, and a plan for operation and maintenance of
   1. new *buildings* and their *systems*,
   2. new portions of *buildings* and their *systems*,
   3. new *systems* and *equipment* in *existing buildings*, and
   4. new *equipment* or *building systems* specifically identified in the standard that are part of industrial or manufacturing processes

   and
b. criteria for determining compliance with these requirements.

2.2

The provisions of this standard do not apply to

a. single-family houses, multifamily structures of three stories or fewer above *grade*, manufactured houses (mobile homes), and manufactured houses (modular) or
b. *buildings* that use neither electricity nor *fossil fuel*.

2.3

Where specifically noted in this standard, certain other *buildings* or elements of *buildings* shall be exempt.

2.4

This standard shall not be used to circumvent any safety, health, or environmental requirements.