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ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2020
Standard for the Design of High-Performance Green Buildings
Except Low-Rise Residential Buildings

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NOTE

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

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(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

Standard 189.1 was originally published in 2009 through collaboration between ASHRAE, the Illuminating Engineering Society (IES), and the U.S. Green Building Council (USGBC). In 2015, the International Code Council (ICC) was added as an additional cosponsor of the standard, which reflected a Memorandum of Understanding signed in 2014 by ASHRAE, the American Institute of Architects (AIA), ICC, IES, and USGBC to better align green building goals through Standard 189.1, the International Green Construction Code (IgCC), and the LEED certification system. As part of that agreement, the 2020 edition of Standard 189.1 serves as the technical content of the 2021 IgCC. Prior to this agreement, the 2012 and the 2015 versions of the IgCC included Standard 189.1 as a project compliance option. This agreement only applies in the U.S. and Canada; Standard 189.1-2020 stands alone and is available as a separate document in other countries.

Like its predecessors, the 2020 edition of the standard is written in code-intended (mandatory and enforceable) language so that it may be referenced or adopted by enforcement authorities as the minimum acceptable design criteria within their jurisdiction. States and local jurisdictions within the United States that wish to adopt Standard 189.1 into law may wish to review applicable federal laws regarding preemption and related waivers available from the U.S. Department of Energy (<https://energy.gov/eere/state-petitions-exemption-jurisdictional-preemption>).

Building projects, which are defined in the standard to include both the building and the site, result in significant energy and environmental impacts through their design, construction, and operation. USGBC reports that buildings in the United States produce 40% of U.S. carbon dioxide emissions, are responsible for 41% of U.S. energy consumption, account for 14% of U.S. potable water consumption, and use 40% of raw materials in their construction and operation. In addition, building development frequently converts land from biologically diverse natural habitat that helps manage rainwater to impervious hardscape with reduced biodiversity. While buildings consume energy and have other environmental impacts, they exist primarily to serve occupants who live, work, and otherwise use buildings, providing significant contributions to national economies. Based on a combination of research and practical experience, it is clear that buildings can provide these services with reduced energy use, greenhouse gas emissions, water use, construction waste, local air and light pollution effects, and impacts on the atmosphere and other resources. A 2015 Economic Impact Study by USGBC finds that the U.S. green building industry supports over two million jobs annually and results in a median state average economic contribution of \$934 million.

The far-reaching influence of buildings, and the benefits provided by high-performance green buildings, has led many organizations to pursue efforts to reduce their energy and environmental impacts. Based on ASHRAE's and the other cosponsors' ongoing responsibilities to support such actions, Standing Standard Project Committee (SSPC) 189.1 has contributed to building sustainability goals by updating this standard in response to input from the building community, the public at large, and project committee members. Compliance with the updated standard will further reduce energy and environmental impacts through high-performance building design, construction, and operation, while providing indoor environments that support the activities, health, and comfort of building occupants and contribute positively to local economies by providing high-quality jobs and conserving natural resources.

The project committee considers a variety of factors in developing the provisions of this standard, including published research, justification for proposals received from outside the committee, and ultimately the committee members' professional judgment. Cost-benefit assessment, while an important consideration, is not a necessary criterion for inclusion of any given requirement in the standard. However, the practicality and existing application of any new requirements are considered before they are included.

Standard 189.1 addresses site sustainability, water use efficiency, energy use efficiency, indoor environmental quality, materials and resources, and construction and plans for operation. The 2020 edition incorporates changes made by 70 separate addenda to the 2017 edition. Highlights among these changes are as follows:

- a. **Compliance.** Buildings that are within the scope of, and that comply with, ASHRAE/ASHE Standard 189.3, Design, Construction, and Operation of Sustainable High-Performance Health Care Facilities, are now in compliance with Standard 189.1.
- b. **General.** A new table of jurisdictional options has been added to indicate sections of the standard that may warrant particular attention as jurisdictions consider adoption of the IgCC. In general, the provisions listed in the table (and marked with [JO] in the body of the standard) are provisions that result in higher-performing buildings, while the other requirements are considered essential for a high-performing green building. Different criteria were used in assigning JO status, but in all cases the jurisdictional options have been identified for the benefit of jurisdictions adopting the IgCC. A new informative Appendix L also provides a list of requirements that align with LEED prerequisites or are aligned with LEED credits that are attained by a large percentage of projects.
- c. **Site.** Requirements for outdoor lighting were updated. Requirements for electric vehicle charging infrastructure were revised and clarified. Cool-roof requirements were extended to buildings in Climate Zones 4A and 4B.
- d. **Water.** Requirements were added to ensure proper pipe sizing in hot-water distribution systems. Requirements for cooling towers were updated and relocated to the mandatory portion of Section 6.
- e. **Energy**
 1. Lighting tables were updated with improved efficiencies, equipment efficiency tables were updated, and envelope requirements were revised. These changes represent similar updates in ANSI/ASHRAE/IES Standard 90.1-2019.
 2. SHGC multiplier and duct insulation requirements were reverted to those in Standard 90.1.
 3. Dwelling-unit lighting efficacy requirements were increased, and new requirements were added for dwelling-unit lighting controls.
 4. Fan efficiency and pump efficiency requirements were updated to use the Fan Efficiency Index (FEI) and Pump Efficiency Index (PEI), respectively.
 5. Renewable energy requirements were upgraded such that the combination of on-site and off-site renewable energy must meet approximately half of expected building energy use. A new mandatory on-site PV system requirement was created for qualifying portions of the building roof area.
 6. The Alternate Renewables Approach was limited to buildings with less than 25,000 ft² (2300 m²).
 7. Requirements for fault detection and diagnostics were added, as were efficiency requirements for traction elevators with a rise height of 75 ft (23 m) or more.
 8. Requirements were updated for occupancy-sensor-based controls in hotel/motel guestrooms.
 9. Clarifications were made to better specify where requirements of Sections 7 and 7.5 supersede related requirements in Standard 90.1.
 10. A new section adds requirements for high-capacity service water heating systems. A new section on low-power ventilating systems aligns requirements for exhaust fans used in multi-family and small commercial buildings with those in the IECC.
 11. New criteria were added for compliance with the performance energy path, including a Zero Energy Performance Index (zEPI) requirement, additional renewable energy requirements, and updated values for determining energy performance: BPF, source energy, and CO_{2e} emissions factors, the latter two of which are based on eGRID subregion location.
 12. A new requirement to perform modeling in compliance with ASHRAE Standard 209 was also added to the performance path.
 13. A new informative appendix was included to guide performance path users through the process used to develop source energy and CO_{2e} emission factors so that local jurisdictions can calculate energy performance factors based on their local data.
- f. **IEQ.** Requirements related to composite wood materials and the use of paints and coatings were further developed to limit VOC and formaldehyde emissions into the space. Preoccupancy ventilation control requirements were clarified, and new requirements were added to prevent ozone emissions from air cleaning devices. The lighting quality section was updated to include requirements for dimming controls, color rendition, and flicker. A requirement was also added that views to the outside be provided from certain space types.

- g. **Materials and resources.** *It was made clear that the total waste provisions apply to new construction, and the threshold value was increased. Refrigerant requirements were removed in light of regulations developed by others.*
- h. **Construction and plans for operation.** *Section 10 was reorganized to better group related topics and to clarify that this section does not distinguish between prescriptive and performance path requirements. Section 10 also received updates to align operating requirements with ASHRAE Standard 62.1-2019.*

SSPC 189.1 considers and administers changes to this continuous maintenance standard and provides interpretations as requested. Proposed changes to the standard may originate within or outside of the committee. The committee welcomes proposals for improving the standard using the ANSI-approved ASHRAE continuous maintenance procedure. A continuous maintenance proposal (CMP) form can be found online at <https://www.ashrae.org/standards-research--technology/standards--guidelines/continuous-maintenance> and may be completed and submitted at any time. The committee takes formal action on every proposal received, which may lead to changes to the published standard. ASHRAE posts approved addenda in publication notices on the ASHRAE website. To receive notice of all public reviews, approved and published addenda, errata, interpretations, and meeting notices, ASHRAE encourages interested parties to sign up for the free ASHRAE Internet Listserv for this standard (<https://www.ashrae.org/resources--publications/periodicals/listserves>).

1. PURPOSE

1.1 The purpose of this standard is to provide minimum requirements for the siting, design, construction, and plans for operation of *high-performance green buildings*.

- a. reduce emissions from buildings and building systems, enhance building occupant health and comfort, conserve water resources, protect local biodiversity and ecosystem services, promote sustainable and regenerative materials cycles, enhance building quality, and enhance resilience to natural, technological, and human-caused hazards; and
- b. support the goal of development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

1.2 This standard is intended to provide the technical basis of mandatory building codes and regulations for *high-performance green buildings* that are broadly adoptable by national and local jurisdictions.

2. SCOPE

2.1 This standard contains requirements that

- a. apply to the following *building projects*:
 - 1. New buildings and their systems
 - 2. New portions of buildings and their systems
 - 3. New systems and equipment in existing buildings
 - 4. Relocated existing buildings and temporary structures where specified in this standard
- b. address site sustainability, water use efficiency, energy efficiency, indoor environmental quality (IEQ), materials and resources, and construction and plans for operation.

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); and
- b. *building projects* that use none of the following: electricity, fossil fuel, or water.

2.3 The requirements in this standard shall not be used to circumvent any applicable safety, health, or environmental requirements.

3. DEFINITIONS, ABBREVIATIONS, AND ACRONYMS

3.1 General. Certain terms, abbreviations, and acronyms are defined in this section for the purposes of this standard. These definitions are applicable to all sections of this standard.