Shaping Tomorrow's Built Environment Today

ASHRAE Position Document on

Energy Efficiency in Buildings

Approved by the ASHRAE Board of Directors November 6, 2024

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ASHRAE is a global professional society of over 55,000 members, committed to serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration and their allied fields (HVAC&R). ASHRAE position documents are approved by the Board of Directors and express the views of the Society on specific issues. These documents provide objective, authoritative background information to persons interested in issues within ASHRAE's expertise, particularly in areas where such information will be helpful in drafting sound public policy. The documents also clarify ASHRAE's position for its members and building professionals.

Energy Efficiency is a Public Interest Issue

It has never been more necessary or urgent to improve the energy efficiency of buildings. ASHRAE has long advocated for energy efficiency as the central means for reducing the environmental impact of buildings through lowering their energy use. Energy efficiency, when implemented strategically, uniquely reduces greenhouse gas (GHG) emissions associated with the built environment while simultaneously reducing life-cycle costs and maintaining or improving occupant health, comfort, and safety.

Why ASHRAE Takes Positions on Energy Efficiency in Buildings

ASHRAE consensus standards and design guides provide the technical foundation for international building practices and energy codes. Energy-efficient design, construction, operation, and considerations for end of life can dramatically reduce and sometimes eliminate building net energy use and associated GHG emissions.

ASHRAE resources span the entire life cycle of buildings. Because buildings account for 34%[1] of global energy use, our work in this sector is crucial. *ASHRAE Position Document on Building Decarbonization*[2] states that decarbonization of buildings and their systems must be based on a holistic analysis including healthy, safe, and comfortable environments. Energy efficiency is the first priority in reducing building GHG emissions.

[1] UN Environment Programme's Global Alliance for Buildings and Construction, *2021 Global Status Report for Buildings and Construction* (2021), www.unep.org/resources/report/2021-global-status-report-buildings-and-construction.
[2] www.ashrae.org/file%20library/about/position%20documents/pd-on-building-decarbonization---2024.pdf

Positions

ASHRAE takes the positions that:

- **Improving Building Energy Efficiency is Paramount.** Energy efficiency of existing buildings is essential because the average lifespan of a building is more than 70 years. While new buildings may reach net zero, most of the building population will consist of older buildings. Energy efficiency reduces building GHG emissions in these buildings, an immediate and crucial policy goal to reducing the impacts of climate change. Furthermore, energy efficiency is necessary to allow older buildings to compete economically by reducing operating costs while maintaining occupant health and safety.
- **Energy Efficiency is the Leading Cost-Effective Solution for Decarbonization and Climate Change Mitigation.** Efficiency is the lowest-cost energy resource we have;[3] it results in the reduction of building operational GHG emissions while saving life-cycle costs and increasing property values. Reducing loads through efficiency is the most cost-effective approach to whole-building decarbonization and is a critical first step before consideration of renewable energy systems. ASHRAE's guidance and resources for improving the energy efficiency of buildings, developed and honed over the past decades, provide a strong foundation for strategic decarbonization efforts. The impact of carbon emissions is an essential consideration when evaluating energy efficiency measures.
- **Energy Efficiency Contributes to Resilience and Assurance.[4]** Efficiency lowers or eliminates the energy demands of buildings. Doing this improves resilience by minimizing or eliminating the loads that must be met by supply grids and emergency systems. This approach minimizes the need for backup, storage, and redundant systems and reduces the necessary capacities and costs of those systems. Electrification without building efficiency will delay the transition to green electricity significantly.
- **Energy Efficiency Provides Quality Local Jobs and is an Economic Catalyst.** Energy efficiency contributes to local economies, including through the creation of jobs that cannot be exported. According to the United Nations Development Programme, transitions in energy infrastructure are predicted to increase job demand by 1% annually.[5] Investments in new building technologies must be accompanied by similar investments in a technically trained workforce.
- **Operational Efficiency is a Continuous Improvement Process.** Building operating systems often deviate significantly from optimal performance, leading to significant and frequent loss in energy efficiency. Ongoing commissioning is essential to keep buildings operating efficiently.

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[3] Per the International Energy Agency's report *7th Annual Global Conference on Energy Efficiency: The value of urgent action on energy efficiency* (June 2022, p. 4): "The cleanest, cheapest, most reliable source of energy is what countries can avoid using, while still providing full energy services for citizens. That is why the IEA refers to energy efficiency as the 'first fuel.'" https://iea.blob.core.windows.net/assets/6ed712b4-32a3-4934-9050-d97a83a45a80/Thevalueofurgentaction-7thAnnualGlobalConferenceonEnergyEfficiency.pdf.

[4] *Energy assurance* refers to the reliability of energy transmission from one site to another. Energy efficiency and resilience should look not only at facility-level use but also at transmission and other grid factors that can benefit from energy efficiency measures.

[5] Liisa Õunmaa, "What are the socio-economic impacts of an energy transition?," United Nations Development Programme, Europe and Central Asia (August 23, 2021), www.undp.org/eurasia/blog/what-are-socio-economic-impacts-energy-transition.

- **ASHRAE Standards Should Provide Guidance for Energy Efficiency while Maintaining Healthy Buildings.** Energy efficiency strategies must consider impacts on indoor environmental quality, including thermal comfort, indoor air quality, lighting, and acoustics. ASHRAE standards and guidelines can continue to protect public health by maintaining healthy indoor environmental quality while reducing energy consumption.
- **Energy Efficiency Must be Maintained Throughout the Building Life Cycle.** Bridging the gap between design and construction and continued efficient operation of buildings is critical. In current practice there is a frequent disconnect between the teams responsible for the development, design, and construction of efficient new buildings; the commissioning of those buildings; and subsequent postoccupancy operation. This gap results in buildings that do not or cannot meet performance expectations when new and then deteriorate significantly in only a few years. We need to continue to promote practices that improve the transition from design and construction to operational teams so that buildings may better achieve their high-performance objectives.
- **Energy Efficiency Must be Considered Using Holistic Approaches.** Improving energy efficiency often involves the replacement of existing equipment with higher-efficiency equipment. Thus, there can be significant energy embodied in the manufacture and installation of this new equipment that also carries with it consumption of natural resources and associated GHG emissions. The life-cycle environmental impacts including this embodied energy, continuing throughout the building's life (and including its end of life), should be considered in the decisions to design or redesign a building. The building's entire life cycle and associated emissions should be considered in the evaluation of overall GHG emissions. Energy efficiency and water efficiency are linked and should be evaluated in parallel, as there can be positive or negative interactions depending on building types and needs.

Recommendations

ASHRAE recommends that **policymakers, government agencies and regulators** adopt the following:

- ASHRAE energy-related standards, particularly those listed in Annex 1 (and regularly update references to the most current editions of these standards).
- Policies that encourage transparency of building performance, including regular publicly reported energy and water benchmarking, and policies that enforce consistent means for expressing and labeling the performance of buildings.
- Policies that support quality standards for building performance assessments, such as energy audits, to identify energy efficiency opportunities and provide analytical foundations for decarbonization.
- Building performance standards as described in *Building Performance Standards: A Technical Resource Guide*.[6]
- Funding programs for research, development, and demonstration of energy-efficient technologies and practices.
- Policies and regulations that provide financial resources for implementation of energy efficiency measures and energy equity through tax incentives, utility-sponsored incentives,

[6] https://forms.ashrae.org/forms/PDFdownload_BuildingPerformanceStandards

and other mechanisms to improve a building's energy consumption while not impacting indoor environmental quality.

- Programs to provide publicly available databases and tools for energy performance benchmarking, such as the U.S. Energy Information Administration's Commercial Buildings Energy Consumption Survey (CBECS)[7] and the U.S. Environmental Protection Agency's ENERGY STAR® Portfolio Manager®[8].
- Regulations that require professionals with appropriate credentials and experience such as those cited in ASHRAE/ACCA Standard 211[9] to ensure the desired energy-savings outcomes.

ASHRAE recommends that **owners and design professionals of new buildings** do the following:

- Maximize energy efficiency in new building design to support the goal that all new buildings achieve net zero GHG emissions in operation by 2030.[10]
- Ensure that energy efficiency design practices also enhance indoor environmental quality.
- Review and apply appropriate energy efficiency measures from Advanced Energy Design Guides,[11] stretch codes, and other forward-thinking guidance for energy-efficient buildings, including those listed in Annex 3.
- Evaluate investment in energy efficiency alternatives based on life-cycle GHG emissions and costs.
- Employ designs that:
    - Optimize building envelope, orientation, and geometry to reduce energy use.
    - Implement passive and active energy efficiency measures.
    - Apply energy-efficient decarbonization of space and water heating.
    - Select energy-efficient equipment and use low-GWP[12] refrigerants as an integrated design choice.
    - Provide for effective long-term operations and maintenance, including ongoing tracking of building energy performance postoccupancy.
    - Apply water-efficient design to reduce energy and water use.
    - Select equipment to maximize expected service life and minimize life-cycle GHG emissions.
- Commission buildings so that they operate optimally.

ASHRAE recommends that **owners and operators of existing buildings** do the following:

- Maximize implementation of energy efficiency measures in existing buildings to support the goals that
    - by 2030, existing buildings halve their emissions and have widespread energy efficiency retrofits of existing assets well underway, and
    - by 2050, all existing assets achieve net zero GHG emissions in operation.

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[7] www.eia.gov/consumption/commercial

[8] www.energystar.gov/buildings/benchmark

[9] ASHRAE, ANSI/ASHRAE/ACCA Standard 211-2018 (RA2023), *Standard for Commercial Building Energy Audits* (2023).

[10] www.ashrae.org/file%20library/about/position%20documents/pd-on-building-decarbonization---2024.pdf

[11] www.ashrae.org/aedgs

[12] GWP = global warming potential. Per the U.S. Environmental Protection agency, GWP is "a measure of how much energy the emission of 1 ton of a gas will absorb over a given period of time, relative to the emission of 1 ton of carbon dioxide (CO2)." Understanding Global Warming Potentials (August 2024), www.epa.gov/ghgemissions/understanding-global-warming-potentials.

- Ensure that energy efficiency practices enhance or maintain indoor environmental quality.
- Establish comprehensive energy management programs including setting energy goals, monitoring ongoing performance, engaging all stakeholders, and recognizing success.
- Conduct energy audits performed by qualified professionals using the approaches in ASHRAE/ACCA Standard 211[13] as a proven analytical foundation for decarbonization plans.
- Evaluate implementation of energy efficiency measures based on life-cycle costs and GHG emission impacts.
- Prioritize energy efficiency measures that reduce loads prior to meeting those loads with supply-side approaches.
- Conduct periodic ongoing commissioning practices to ensure efficient operation over time.
- Support operations and maintenance staff with appropriate training and resources to operate buildings in the most energy-efficient manner, while maintaining occupant comfort, health, and safety.
- Use water-efficient technologies and operational practices to reduce energy and water consumption.
- When equipment is replaced, select new equipment to maximize expected service life and minimize life-cycle GHG emissions.

Additional Recommendations

We also recommend that ASHRAE continue its important work in energy efficiency codes and standards development and:

- Build tools and infrastructure so that decarbonization plans rely on strong analytical foundations.
- Consider the timing of energy savings and associated GHG emission impacts. Further develop energy efficiency tools and reporting to reflect the value of those savings in supporting the transition to grid-interactive efficient buildings.
- Continue to support policymakers through timely updates to standards and guidelines such as those shown in Annexes 1 and 2.
- Fund and conduct research to support these energy efficiency policy objectives.

Annex 1: ASHRAE Standards Related to Energy Efficiency in Buildings

We recommend that policymakers, government agencies, and regulators adopt and regularly update to reference the most current editions of ASHRAE standards, including the following:

- ANSI/ASHRAE/IES Standard 90.1, *Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings*
- ANSI/ASHRAE/IES Standard 90.2, *High-Performance Energy Design of Residential Buildings*
- ANSI/ASHRAE Standard 90.4, *Energy Standard for Data Centers*
- ANSI/ASHRAE/IES Standard 100, *Energy and Emissions Building Performance Standard for Existing Buildings*

[13] ASHRAE, ANSI/ASHRAE/ACCA Standard 211-2018 (RA2023), *Standard for Commercial Building Energy Audits* (2023).

- ANSI/ASHRAE Standard 105, *Standard Methods of Determining, Expressing, and Comparing Building Energy Performance and Greenhouse Gas Emissions*
- *International Green Construction Code®* and ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*
- ANSI/ASHRAE/ASHE Standard 189.3, *Design, Construction, and Operation of Sustainable High-Performance Health Care Facilities*
- ANSI/ASHRAE/IES Standard 202, *The Commissioning Process Requirements for New Buildings and New Systems*
- ANSI/ASHRAE/ACCA Standard 211, *Standard for Commercial Building Energy Audits*
- ANSI/ASHRAE Standard 228, *Standard Method of Evaluating Net Zero Energy and Net Zero Carbon Building Performance*

Annex 2: ASHRAE Guidelines Related to Energy Efficiency in Buildings

- ASHRAE Guideline 14, *Measurement of Energy, Demand, and Water Savings*
- ASHRAE Guideline 36, *High-Performance Sequences of Operation for HVAC Systems*

Annex 3: ASHRAE Guides

- Advanced Energy Design Guides (free guides developed by ASHRAE and its partners on how to achieve net zero buildings in specific building constructions such as K-12 buildings, office buildings, multifamily buildings, and others)
- Center of Excellence for Building Decarbonization technical resources (guides developed by ASHRAE and at times in collaboration with other partners that are tools for decarbonizing the building stock)

DOCUMENT REVISION COMMITTEE ROSTER

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DOCUMENT HISTORY

Publication and Revision History

ASHRAE's Technology Council and the cognizant committee recommend revision, reaffirmation, or withdrawal every 30 months. The history of this position document is described below:

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