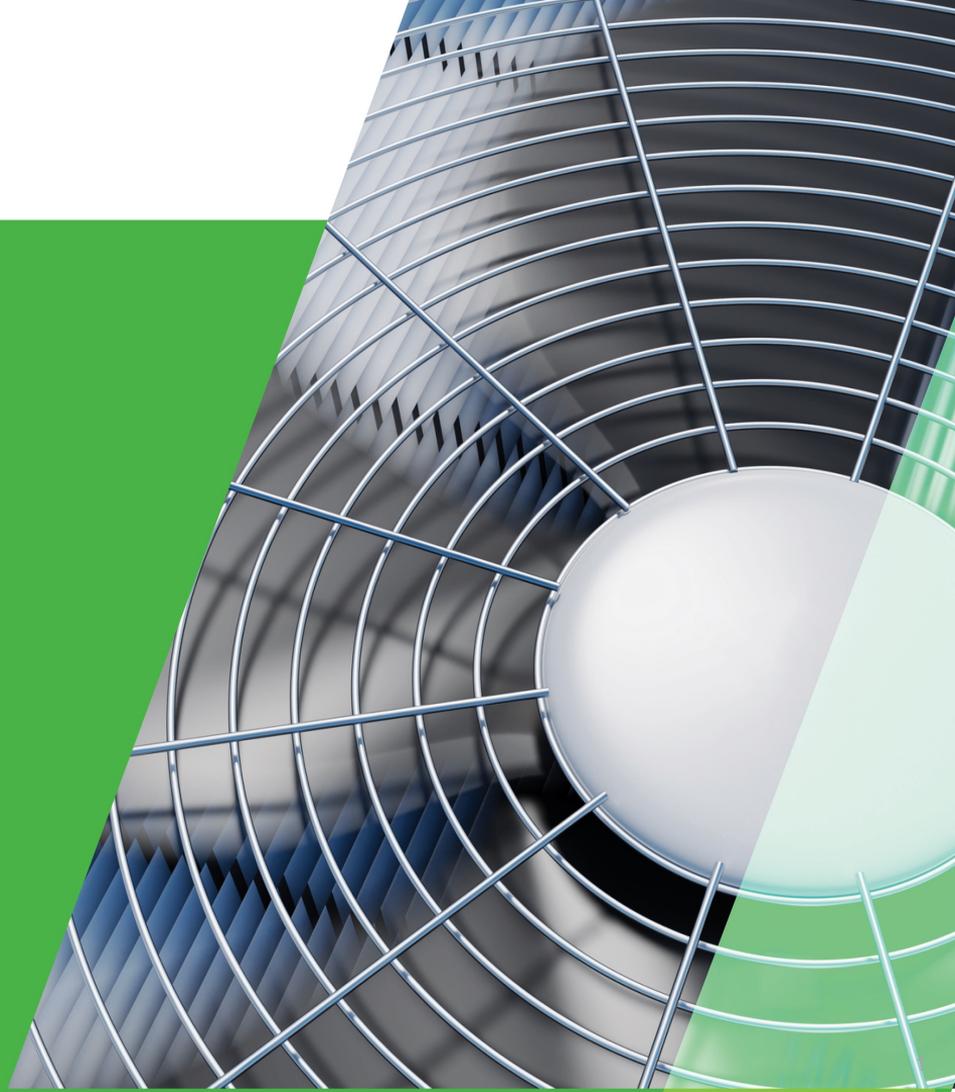


Fan Efficiencies and Energy Regulation 101

November 2023

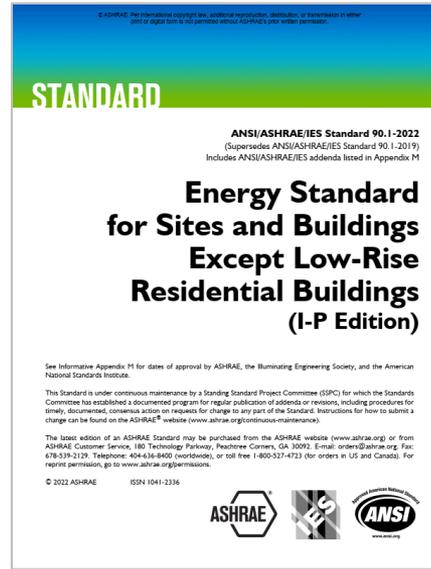


U.S. Commercial Energy Codes

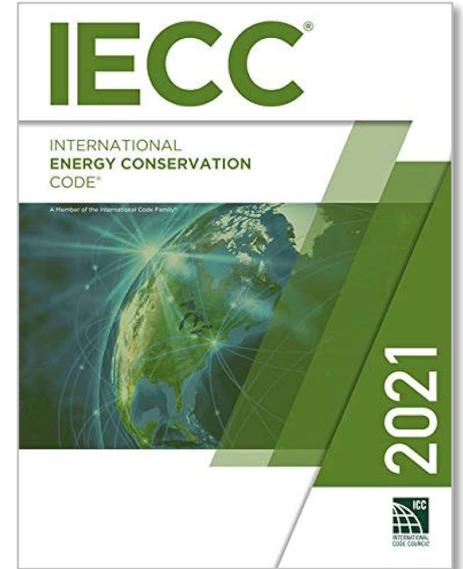
ASHRAE 90.1 and the International Energy Conservation Code (IECC) are documents that establish model energy codes for commercial buildings.

Standard 90.1-2022 is the most current version of the ASHRAE standard, and 2021 is the most recent version of the IECC.

Both ASHRAE 90.1 and the IECC include similar requirements for the efficiency of fans installed in commercial buildings, specified in terms of a **fan energy index, or FEI**.



ASHRAE Standard 90.1 (2022)



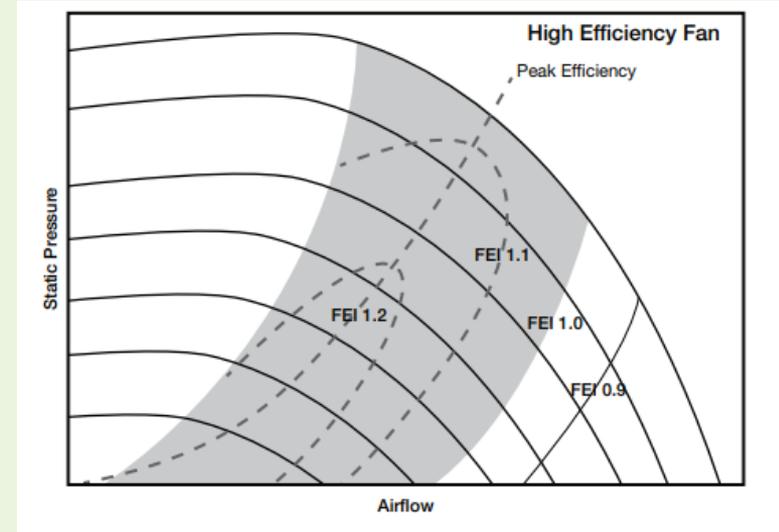
IECC (2021)

Fan Energy Index (FEI)

In the past five years, manufacturers and regulators have adopted the new FEI metric to characterize fan efficiency.

FEI is a design point metric: While a fan model will have ranges of FEIs associated with its available operating ranges, you must know the design point of a specific fan installation to determine that fan's FEI. This characterizes both the fan model's efficiency, as well as how a specific fan will perform (from an efficiency perspective) under its design conditions.

FEI is also a “wire-to-air metric,” accounting for the efficiencies associated with all aspects of the motor driven system—including the efficiency of the motor, transmission, fan, and any controls. **As a fan's FEI increases, the relative efficiency of that fan also increases.**



Source: content.greenheck.com/public/DAMProd/Original/10014/FA_03_21_FanEnergyIndex.pdf

ASHRAE 90.1-2022

Section 6.5.3.1.3 states that each fan and fan array shall have a FEI of 1.00 or higher.

Starting in 2019, FEI replaced the Fan Efficiency Grade (FEG) metric in both ASHRAE 90.1 and the IECC, along with applicable definitions and references. This is based on the manufacturer's certified data, as defined by AMCA 208-18.

FEI is rated using static or total efficiency, depending on the type of fan, offering a simpler and more versatile approach to fan selection and compliance verification.

Replacing FEG with FEI metric enables better fan selection, inclusive of the effects of motors, drives, and design-point performance. Enforcement also becomes more straightforward because the “sizing and selection window” based on peak total efficiency is removed.

ASHRAE 90.1-2022

Exceptions to 6.5.3.1.3:

- Fans that are not embedded fans with a motor nameplate horsepower of less than 1.0 hp or with a fan nameplate electrical input power of less than 0.89 kW.
- Embedded fans and fan arrays with a combined motor nameplate horsepower of 5 hp or less or with a fan system electrical input power of 4.1 kW or less.
- Embedded fans that are part of equipment listed under Section 6.4.1.1.
- Embedded fans included in equipment bearing a third-party-certified seal for air or energy performance of the equipment package.
- Fans used for moving gases at temperatures above 482°F.
- Fans used for operation in explosive atmospheres.
- Reversible fans used for tunnel ventilation.
- Fans that are intended to only operate during emergency conditions.

Ceiling Fan Efficiency Requirements

Included in ASHRAE 90.1-2022 is a version of FEI for ceiling fans, CFEI, which was not included in the older 2019 version.

Equipment Type	Size Category	Minimum Efficiency	Test Procedure
<i>Large-diameter ceiling fan for applications outside the U.S.</i>	Blade span \geq 84.5 in.	1. CFEI \geq 1.00 at high (maximum) speed; <i>and</i> 2. CFEI \geq 1.31 at 40% of high speed or the nearest speed that is not less than 40% of high speed	10 CFR 430 Appendix U or AMCA Standard 230 and AMCA Standard 208

Department of Energy

According to the U.S. Department of Energy (DOE), all states must comply with ASHRAE 90.1-2019 by July 2023.

As the 2022 version was only recently published, DOE has not updated their requirements to reference the latest version. However, the fan requirements between ASHRAE 90.1-2019 and 2022 are identical, except for the addition of CFEI in the 2022 version.

[Source: federalregister.gov/documents/2021/07/28/2021-15971/final-determination-regarding-energy-efficiency-improvements-in-ansiashraeies-standard-901-2019](https://www.federalregister.gov/documents/2021/07/28/2021-15971/final-determination-regarding-energy-efficiency-improvements-in-ansiashraeies-standard-901-2019)

ASHRAE 90.1-2022 Adoption

Not all states have met the requirement to update their energy codes to meet the 2019 edition of ASHRAE 90.1, however most are working towards adopting these code levels. As of June 3, 2023, jurisdictions that have adopted energy codes meeting or exceeding the requirements of the 2019 version of ASHRAE 90.1, include Montana, Oregon, Montana, and Washington.

State Energy Index Data:

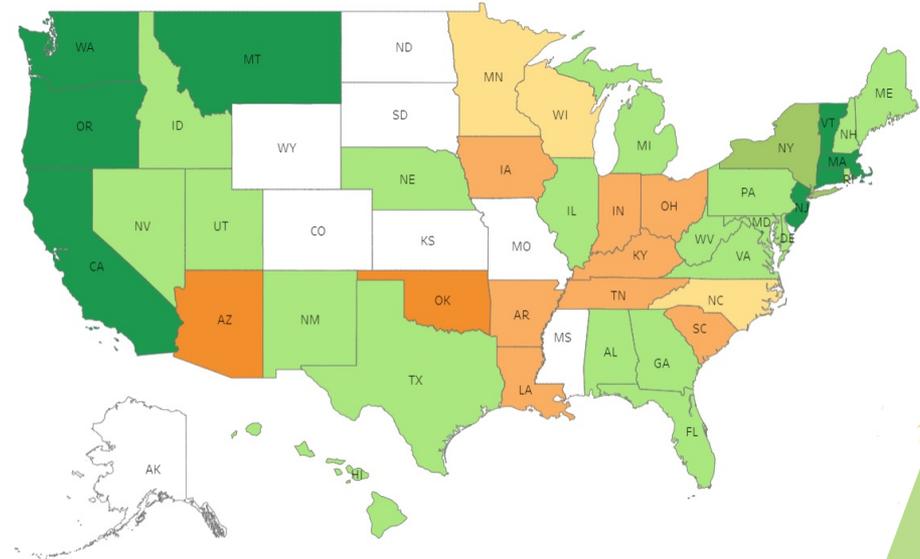
<https://public.tableau.com/app/profile/doebecp/viz/BECPSStateofStateEnergyCodeAdoption/ResidentialDashboard>

City Energy Code Data:

https://public.tableau.com/app/profile/doebecp/viz/Top100MetroDatabase-PrimaryCityCode-V4/MetroCityCommercialGrayHR_1

State Commercial Code Efficiency

June 2023



Code Efficiency Category

- 90.1-2019
- 90.1-2016
- 90.1-2013
- 90.1-2010
- 90.1-2007
- <90.1-2007
- No statewide code

To learn more about efficient fans, visit
betterbricks.com/solutions/efficient-fans