

Healthier Buildings, Healthier Planet: Climate Legislation and Our Indoor Environment in 2023

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Pop quiz! How much time do you spend each day inside a building? From the home and office you live and work in to the stores and restaurants you frequent, you likely spend a high percentage of your day enclosed in a space.

We eat, sleep, work, and learn in buildings, but are these indoor environments performing at their best for the health of our families and our planet?

Buildings account for 75% of U.S. electricity consumption and 40% of energy overall, which contributes to 35% of greenhouse gas emissions.

Considering the millions of buildings throughout the U.S. and the energy it takes to keep them ready for occupancy, it's easy to see why buildings are the focus of legislation aimed at improving their efficiency.

This blog examines emerging energy consumption trends and provides information on how safety and energy considerations affect buildings and building owners. By applying legislation to improve building envelope components, reduce energy and carbon footprints, and other safety considerations to support operational efficiency, buildings can be transformed from climate liabilities to climate solutions.

BUILDING ENERGY LEGISLATION KEY TERMS

First, let's define some standard terms that play a role in building energy legislation.



- » **Benchmarking:** Measuring a building's performance against its past performance and other structures of similar size or use.
- » **Energy Auditing:** An inspection survey and analysis of energy flows for energy conservation in a building.
- » **Retro-Commissioning:** A process to evaluate and test the performance of an existing building's equipment and systems to optimize its operation.
- » **Envelope:** The physical barrier between the conditioned and unconditioned environment of a building.
- » **Sustainability:** The capacity to improve the quality of human life while living within the carrying capacity of the Earth's supporting ecosystems.

- » **Passive House:** A voluntary standard for energy efficiency in a building, which reduces the building's ecological footprint by tightening building envelopes and reducing outside air infiltration.
- » **Blue Roof:** Designed to provide temporary water storage and gradual release of stored water, typically rainfall.
- » **Green Roof:** Partially or entirely covered with vegetation and a growing medium planted over a waterproofing membrane.

COMMON LEGISLATIVE DENOMINATORS

Cities and states require benchmarking, energy auditing, and retro-commissioning to reduce energy demand and the resultant costs. California created Title 24 in 1978 to reduce wasteful and unnecessary energy consumption in new and existing buildings, kicking off the trend of environmentally conscious building regulations and laws.

Since then, there has been a steady increase in cities across the country adopting benchmarking and energy laws. New York City first enacted Local Law 84 to establish building benchmarks to compare the performance of similar structures, followed by Local Law 87, which requires commercial and residential buildings to conduct energy audits and retro-commissioning every 10 years. New Jersey adopted its Rehabilitation Subcode, a comprehensive set of code requirements for existing buildings.

What do these policies have in common? Common denominators include assessing buildings based on building envelope, mechanical/electrical/plumbing (MEP) systems, and life safety.

BUILDING ENVELOPE INEFFICIENCIES

Infiltration is responsible for 20% of the total energy used to heat and cool a commercial building.

For example, Hartford, Connecticut's Building Code has air leakage requirements to encourage the implementation of passive house design standards. Although passive house design standards, or the tightening of building envelopes, is not new, the practice is gaining momentum because of its effectiveness in energy reduction. Another national trend is the installation of blue, green, or solar roofs. In Washington, D.C.,

the construction code requires buildings to reserve 25% of roof area for future installation of sustainable energy systems.

Building owners can ensure compliance with climate laws and carbon footprint regulations by addressing building envelope inefficiencies. Proper insulation around fenestration aids significantly in reducing infiltration of outside air and effectively tightens a building envelope. Rigid insulation below roof decks and spray foam along the interior side of mass walls reduce energy lost to infiltration compensation.

MEP SYSTEMS

Mechanical systems primarily relate to heating, ventilating, and air conditioning (HVAC) systems providing human comfort and ventilation within facilities. These systems are significant contributors to building energy usage and carbon footprint.

As of 2022, 42 U.S. cities, counties, and states have adopted mandatory building energy benchmarking and transparency policies for existing buildings. Cities appear to be following a similar playbook in understanding the health and performance of their facilities and then implementing measures for improvement.

Along with benchmarking, numerous cities require energy audits every five to 10 years and retro-commissioning with evidence of MEP improvements. Such initiatives require modifications that reduce energy consumption and promote sustainable design. New York City's Climate Mobilization Act (Local Law 97) has a greenhouse gas emissions reduction goal of 80% by 2050.

Incremental steps and local laws are implemented to meet these aggressive goals. For example, swapping out No. 4 or No. 6 grades of boiler oil for No. 2, natural gas, or electricity puts New York City buildings in compliance with Local Law 43 and helps building owners meet greenhouse gas emissions limits in cities across the country.

HVAC systems can be upgraded by:

- » Installing building management systems to modify sequence of operations and improve economizer control.
- » Replacing constant volume systems with variable volume systems linked to a central control station.
- » Installing seven-day programmable thermostats with time-of-day/occupancy-based reset schedules.

LIFE SAFETY

Climate legislation also may require life safety upgrades. National Fire Protection Association (NFPA) 13 sets the industry standard for designing and installing automatic fire sprinkler systems. With tightened building envelopes decreasing infiltration, carbon monoxide poisoning is a concern in buildings with fossil fuel-burning equipment.

Carbon monoxide sensors must be installed in compliance with NFPA 720 and other local municipalities' fire code amendments. Boston, Philadelphia, and seven other cities require façade inspections and reports every five years to keep the public safe from falling exterior components and debris. Furthermore, building owners must install automatic fire sprinkler systems in compliance with the NFPA and locally adopted fire code amendments.

ENERGY AND SAFETY IMPROVEMENTS IN ACTION: AUDIT ON BROADWAY

What does the path toward legislation compliance look like?

1. Assess the current building envelope, MEP, and life safety system conditions to document out-of-compliance components.
2. Implement feasible corrective measures or planning for deferred improvements requiring significant capital investment.
3. Track and maintain the improvements annually to verify a return on investment.
4. Implement the improvements that had been deferred.

Gannett Fleming's architects and engineers conducted an envelope, MEP, and life safety system audit at a 152,000-square-foot mixed-use building on Broadway built in 1900. The audit revealed multiple issues that, if not brought into local law compliance by the building owner, could result in approximately \$1 million in annual fines:

- » **Exceeding emissions limits:** \$736,000.
- » **Failure to report benchmarking data:** \$2,000.
- » **Failure to submit energy audit:** \$3,675.
- » **Failure to display Energy Star score:** \$1,250.
- » **Façade safety violations:** \$124,425.
- » **Failure to install automatic sprinkler system:** \$30,500.

- » **Missing carbon monoxide sensors:** \$95,000.

In addition to avoiding fines by complying with local laws, the building owner can reduce energy costs by 10 to 20% by implementing energy improvements. Recommended energy improvements include:

- » Converting from No. 4 fuel oil to natural gas.
- » Using LED bulbs.
- » Installing seven-day programmable thermostats.
- » Updating controls for rooftop exhaust fans.
- » Installing economizers on the existing units.
- » Improving the insulation and windows.
- » Replacing constant volume systems with variable volume systems with a central control station.


With the first step of the process complete, the building owner will implement the recommended corrective measures and track the results.

BE THE CHANGE: INITIATE COMPLIANCE

Implementing climate legislation can be intimidating and overwhelming, especially considering the fines and penalties for non-compliance. The first step is for building owners to take property improvement measures that require minimal capital investment and plan for future improvement measures.

Compliance benefits include:

- » Increased property value.
- » Reduced operating costs with payback in the form of energy savings.
- » Reduced carbon footprint and emission of greenhouse gases.
- » Enhanced sustainability with the use of green energy.
- » Improved indoor air quality and occupant comfort.
- » Increased life safety.
- » Avoiding non-compliance fines.
- » **Multiple benefactors:** occupants, developers, building property managers, and the environment.

There is no time like the present to bring a building into compliance to reduce building energy consumption and improve safety. 



About the Article

This article was written by William Curran, PE, Mechanical Technical Manager, Gannett Fleming, and Huzefa Irfani, AIA, Director of Architecture, Gannett Fleming for the online [Gannett Fleming INSIGHTS Blog](#).

Founded in 1915, [Gannett Fleming](#) has been a driving force in shaping infrastructure and improving communities in more than 65 countries, specializing in natural resources, transportation, water, power, and facility-related projects. The company embraces sustainability and innovation in projects and internal activities and achieves results while being responsible stewards of the environment. A results-driven firm, Gannett Fleming is consistently ranked in the top one percent of engineering firms worldwide.

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