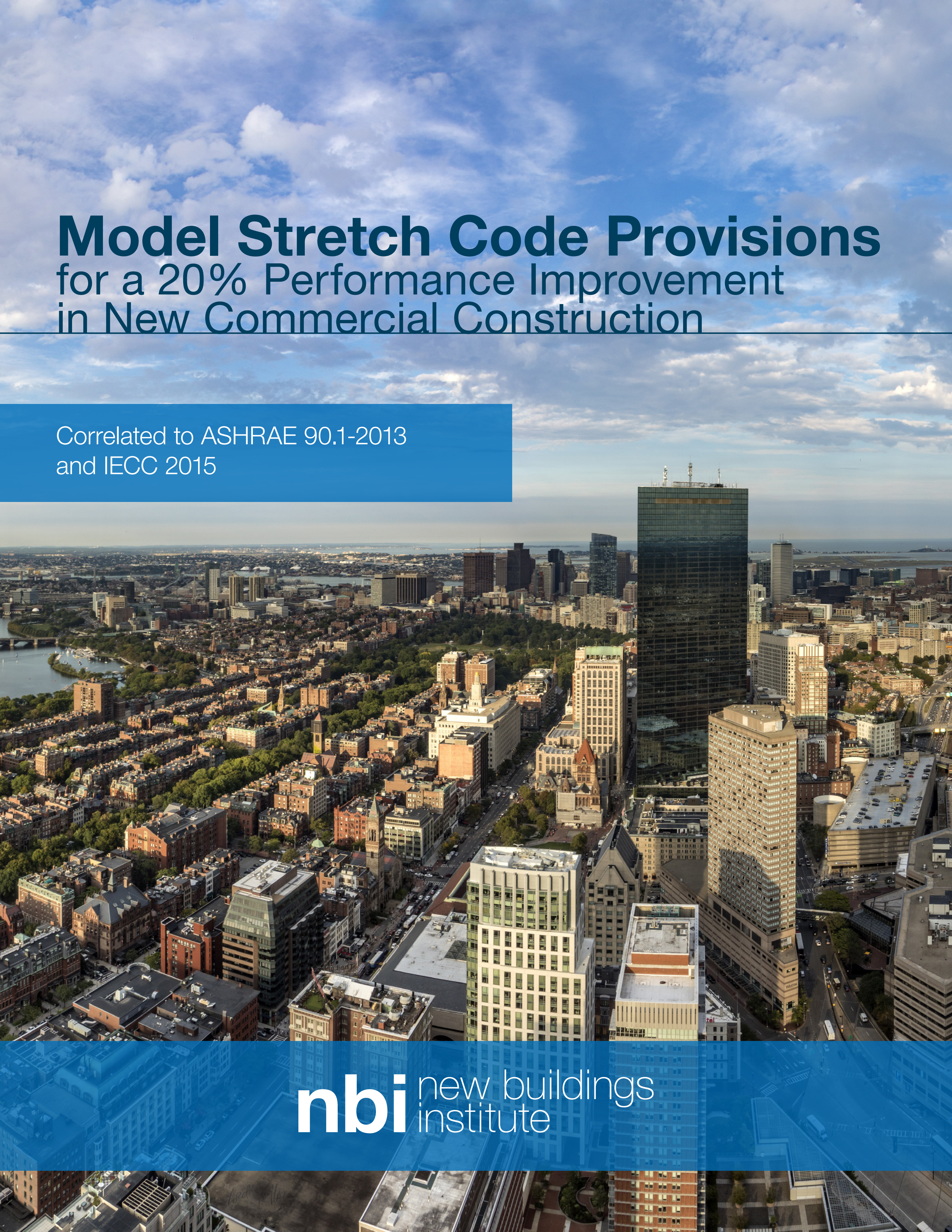
Model Stretch Code Provisions

for a 20% Performance Improvement in New Commercial Construction

Correlated to ASHRAE 90.1-2013 and IECC 2015



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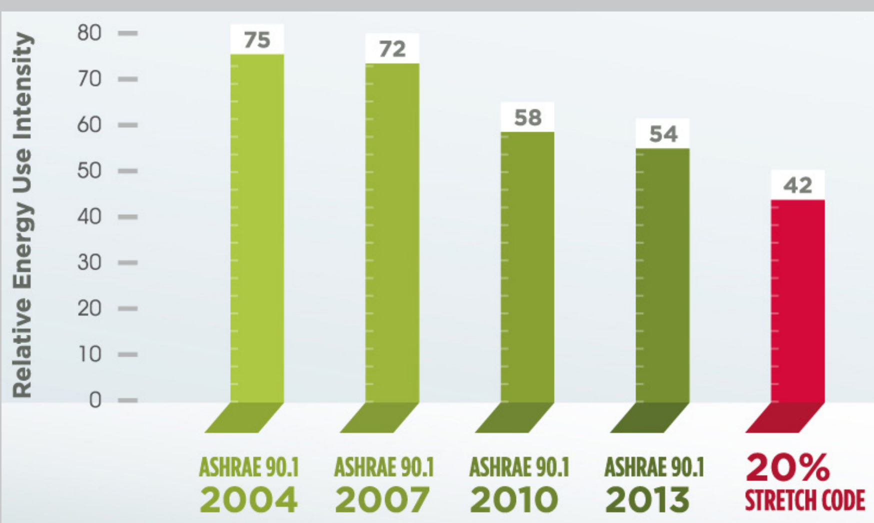
SUMMARY

Many U.S. cities and states have adopted meaningful goals to reduce carbon impacts and energy use, often aligned with the recent Paris Climate Accord. To achieve these goals, local governments are looking for tools and strategies to guide improvements in the energy performance of the building stock. Although energy codes have been a critical tool to drive efficiency improvements in the building sector, jurisdictions have realized that current energy codes are not delivering the level of building energy performance needed to meet energy and climate action goals. Stretch codes, or sometimes called "reach codes," are meant to provide a series of additional building performance strategies that can be adopted by cities as more aggressive or incentivized stretch standards to drive improvements in the building sector.

The 20% Stretch Code Provisions measures are the first outcome of a larger project that is focused directly on the technical development of stretch codes and standards, and on support for jurisdictions in adopting and implementing these policies. The goal of this effort is to develop a series of stretch codes/provisions for both commercial and residential construction of increasing stringency that can be adopted by cities as policy or incentive programs to support progress toward energy or climate goals. As jurisdictions move forward with the adoption of codes and policies that support building stock performance improvement, a set of increasingly stringent performance metrics are anticipated, ranging from a 20% improvement over baseline code performance to a policy that delivers zero energy performance in buildings.

Benefits of Adopting a Stretch Code



- Adopting stretch codes offers a winning solution for cities, the building industry, and utilities.
- Adopting stretch codes puts cities and states on the path to achieving zero carbon emissions from the building sector.
- Adopting stretch codes reduces building energy use and costs, reduces overall load on the power system and helps cities meet carbon reduction goals.
- Cities and states can exercise flexibility and creativity in the way they adopt codes—via policy, voluntary programs, incentives and other methods.

A key characteristic of the 20% Stretch Code Provisions is that it is designed to be 'adoptable' as an energy code strategy. This means that the measures will align with current code scope and limitations, and primarily impact building components that are currently regulated by city building departments. It is also focused on prescriptive strategies, which is what most building departments and design projects are familiar with.

This documentation describes a set of code strategies that represent a 20% performance improvement for commercial buildings over the ASHRAE 90.1-2013 code baseline (and approximately similar savings over the IECC 2015 baseline). The 20% Stretch Code Provisions a set of individual building performance measures which can serve as an overlay on current code requirements to achieve improved energy performance. The savings of these strategies have been analyzed by the Pacific Northwest National Lab (PNNL) to demonstrate achievement of the 20% threshold on average across the building stock. Cities which control their own code destiny (meaning they can adopt energy codes at the city level) can use part or all of the measures in this set of stretch code provisions to increase code stringency or adopt a stretch code strategy with incentives. They can also be aligned with local utility incentive programs to drive higher compliance rates. For jurisdictions that are not able to adopt codes outside of a state process, the stretch code strategies could be used as part of a zoning policy or in conjunction with utility or other incentives.

Residential

For residential building performance, a 20% improvement is based on the Home Energy Rating System (HERS), under which discrete performance improvements can be targeted using lower HERS scores as the basis of improvement. Residential characteristics are described in a separate document that is being developed by New Building Institute (NBI).

Commercial

In collaboration with the PNNL, NBI has developed technical content and requirements in the form of adoptable stretch energy measures for commercial buildings that can deliver 20% energy savings beyond the most recently implemented model energy codes (IECC 2016 and ASHRAE Standard 90.1 2013).

The 20% Stretch Code Provisions development process included reviewing content from variety of other advanced code sources (ASHRAE Standard 189.1, International Green Construction Code and NYStretch-Energy) and current best building practices. This research was used to inform the measures selection process and content development.

Subsequent work will focus on strategies which achieve 40% improvement over base code, and policies to deliver zero energy building energy performance.

The 20% Stretch Code Provisions

To achieve savings of approximately 20% over the 90.1-2013 baseline, the following strategies are described that should be adopted into stretch code language.

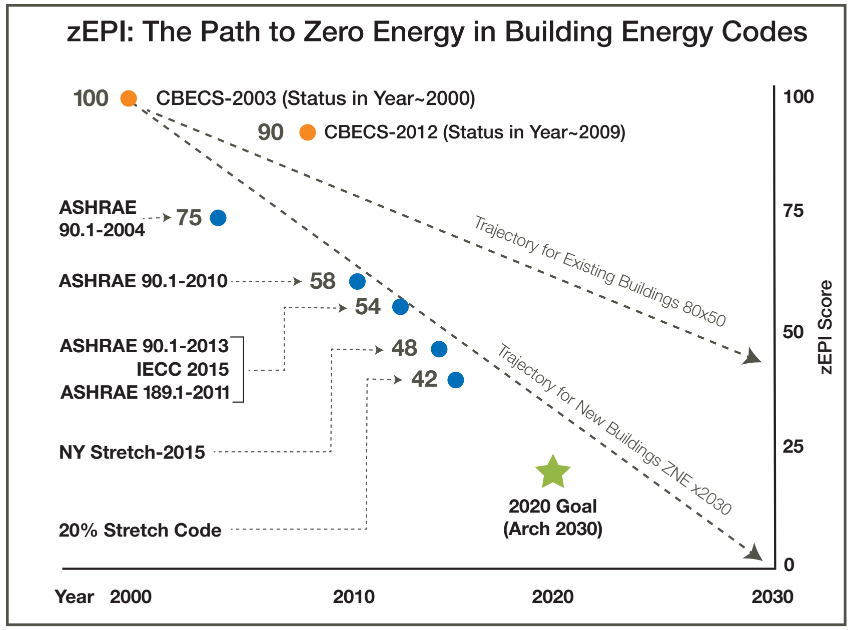
Envelope Performance Improvements

Improvements in building envelope thermal performance reduce heating and cooling loads and improve occupant comfort. Envelope components tend to be among the longest lasting building elements, so it is important to invest in good building envelope performance. The required strategies include:

- Reduce energy losses through fenestration by increasing window assembly thermal performance (U-factor), reducing solar gain (SHGC), and managing overall window area. These performance improvements should not significantly reduce visible light transmittance through the glazing, to maintain daylighting performance and occupant views.
- Increase insulation levels in all opaque building envelope components. These improvements represent a slight increase in stringency over current code and can be achieved through standard building practices.
- Reduce heat transmission losses through uninsulated building elements. Thermal bridging occurs at uninsulated structural elements, like slab edges, window frames, and framing elements. When these components are uninsulated, the thermal performance of the overall building envelope is significantly degraded.
- Improve air barrier performance to reduce energy loss and moisture transmission through the building's thermal envelopes. This strategy also requires testing and commissioning of the building air barrier at a time when improvements can be incorporated.

Lighting System Performance

- Reduce connected lighting load by deploying state-of-the-art solid state (LED) lamp technologies, and control systems that respond directly to the presence of occupants to insure that lights are only in use when needed by occupants.
- Increase the use of daylighting to offset electric lighting energy use.
- Reduce the lighting power for exterior spaces by requiring more efficient lamp and fixture technologies, and incorporate advanced controls which can reduce exterior lighting use when not needed.



The Zero Energy Performance Index (zEPI) is a relative scale that allows various levels of building energy performance to be compared against each other. zEPI sets an energy use intensity (EUI) target for building type and is adjusted for climate. This graph charts zEPI scores for the current national model energy codes and standards.

Heating, Cooling, and Ventilation Systems

Continued efficiency improvements are possible in conventional mechanical systems, while significant efficiency gains are possible through better system configurations.

Adopt requirements for increased equipment efficiency, or select alternative mechanical systems with more efficient distribution strategies, particularly those that reduce or eliminate fan energy use.

- Separate ventilation systems from heating and cooling systems, and incorporate heat recovery into ventilation systems.
- Improve the responsiveness of these systems to occupancy and vacancy characteristics for both ventilation and temperature control.

Domestic Hot Water

Domestic hot water use is a particularly large component of building energy use in residential and hospitality project types.

- Reduce fixture flows to reduce overall hot water demand.
- Reduce supply run length and volume to reduce standby heat loss.
- Incorporate waste heat recovery or solar thermal systems to serve hot water needs.

Plug and Equipment Loads

As HVAC and lighting demand decrease, plug and equipment loads to serve occupant needs are becoming one of the most significant loads in building energy use. Strategies to insure that equipment is off when not in use, and to deploy the most energy efficient appliances can significantly reduce overall building energy use .

While the measures described here go a long way to defining a 20% Stretch Code, NBI has developed additional information and support to offer jurisdictions considering a stretch code. To learn more, contact Webly Bowles at webly@newbuildings.org.

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New Buildings Institute (NBI) is a nonprofit organization driving better energy performance in commercial buildings. We work collaboratively with industry market players—governments, utilities, energy efficiency advocates and building professionals—to promote advanced design practices, innovative technologies, public policies and programs that improve energy efficiency. We also develop and offer guidance and tools to support the design and construction of energy efficient buildings.