ISSUE 2/2026 ▪ VOLUME 42 ▪ NUMBER 2

Hoffmann

Journal of building technology published by Hoffmann Architects + Engineers, specialists in the rehabilitation of building exteriors.

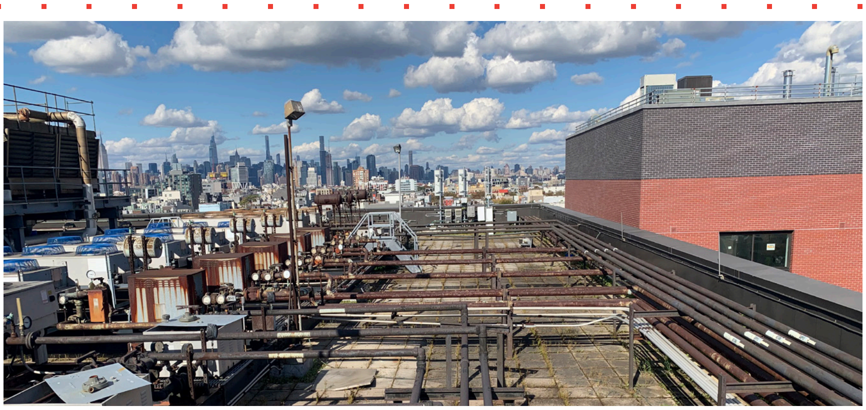
Journal

What Tougher Energy Codes Mean for Building Enclosure Projects

Melissa R. Melone, AIA and Inderpal Singh

Residential and commercial buildings account for nearly 40% of energy consumption in the United States. That's roughly 10% more than the transportation sector, and, while data centers are rapidly increasing energy demand from the tech sector, computing – including data centers – still only clocks in at under 10% of U.S. energy use. Despite growing demand from other areas, buildings remain the nation's largest energy consumers. Since many of these buildings were constructed before energy efficiency became a design priority, their rehabilitation and modernization will play an important role in meeting goals for mitigating climate change.

Energy codes are the regulatory answer to this upward spiral of consumption and energy loss. In 1975, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) released the first model energy code, ASHRAE Standard 90-75. However, it was not until 23 years later, in 1998, that the International Code Council (ICC) published the International Energy Conservation Code (IECC), which serves as the model for most residential construction. It was another three years before the modern iteration of ASHRAE Standard 90.1 was released, in 2001, which became the model code for commercial buildings.



As energy codes evolve, so, too, must strategies adapt to achieve performance gains.

Since then, states and municipalities have adopted, with widely varying degrees of speed and agility, newer and more stringent energy codes. Nationwide, California leads as an early adopter of tighter regulations, with New York standing out as a leader on the East Coast. New York City codes are even more rigorous than those mandated at state level. With Manhattan's population density and an older building stock in the outer boroughs, the city is compelled to enact strict energy regulations to address rising energy costs and the impact on climate and quality of life in the city. Moreover, to meet the ambitious objective of carbon neutrality set by the "Net Zero by 2050" plan, New York needs to take bold steps toward curtailing energy use.

Melissa R. Melone, AIA, Senior Staff Architect in New York and an owner of the firm, delivers rehabilitation solutions that balance performance, cost-effectiveness, and aesthetics. Inderpal Singh, Senior Project Coordinator, applies energy modeling and thermal calculations to achieve elegant, efficient enclosure upgrades.

What Happens in New York (Doesn't) Stay in New York

In response to the OPEC oil crisis of 1973, the federal government issued the Energy Policy and Conservation Act (EPCA), which, among other things, established minimum energy standards at the federal level that would supersede any more lenient state guidelines. Following California in 1978, New York enacted its first Energy Conservation Code in 1979, four years after the release of ASHRAE Standard 90.1, and thereby established a precedent of exceeding the requirements of national regulations. In 2010, the first New York City Energy Conservation Code (NYCECC) took the state code as its model but tightened requirements for existing buildings, including eliminating exemptions for smaller alterations. Since then, New York City continued releasing updated codes about every three years, but the 2020 NYCECC remained in force for more than five years. This year, all that changed.

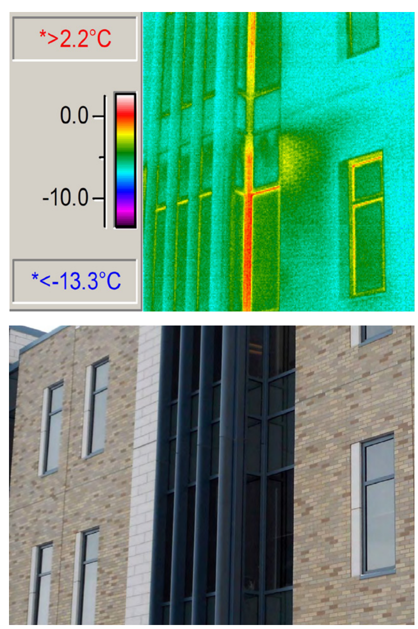
Where New York City leads, other jurisdictions tend to follow. What's ahead: mandatory air-leakage testing, stricter thermal resistance requirements for opaque enclosure assemblies like walls and roofs, and more rigorous window and curtain wall performance requirements, among other things. The latest NYCECC uses the 2022 and 2024 editions of the IECC and ASHRAE model codes, respectively, while other jurisdictions still use earlier iterations; some, such as Washington DC, use model codes from as early as 2015. Even compared with the latest and most stringent versions of the model codes, the 2025 NYCECC, effective 30 March 2026, goes further, with a total ban on fossil fuel-powered mechanical systems in new construction for most occupancy groups, additional efficiency and demand-response requirements for water heating and lighting, and dramatically expanded requirements for existing buildings – including historic ones. For New York City property owners and managers, this likely means substantive new requirements for both rehabilitation and new construction that demand additional cost and considerations. For those in other locations, New York City serves as a proving ground for new, stricter requirements, whereby legislators can observe the impact of the new regulations and determine which to enact in their own jurisdiction.

> "Modern energy codes tend to rely less on prescriptive value-based compliance and more on design detail-driven conceptions of energy performance."

The Toughest Energy Code Yet

By state law, all local energy codes must be at least as stringent as their respective statewide codes. New York City intentionally goes beyond these minimum standards to advance its own climate and sustainability objectives. In addition to aligning with the new Energy Conservation Construction Code of New York State (ECCCNYS), which went into effect on 31 December 2025, the NYCECC takes into consideration a series of underlying codes, standards, and local laws, including not only the IECC and ASHRAE 90.1, but also standards set by technical organizations such as the American National Standards Institute (ANSI), the American Society for Testing and Materials (ASTM), and more. New York City's monumental Local Law 97 of 2019, which went into effect in 2024, forms the cornerstone of the city's Climate Mobilization Act, which sets ambitious carbon emissions limits and therefore also underpins the NYCECC. Local Law 154 of 2021 phases out fossil fuel systems, including gas stoves and oil boilers, in new construction or comprehensive renovations by the end of 2027, and these prohibitions are now enshrined in the city's energy code.

Adopted December 2025 and effective three months later, the 2025 NYCECC introduces key changes from the 2020 edition that will directly affect building owners, facility managers, and design and construction professionals. As New York City continues to set the pace, other jurisdictions will likely follow suit, making these changes relevant to the industry at large.



Infrared thermography reveals heat loss at this curtain wall assembly.

Where existing flashing and threshold conditions limit insulation thickness, vacuum insulation offers superior insulating value with minimal depth. *Top:* original assembly; *Bottom:* replacement.

Historic Buildings Not Exempt

One big change: historic buildings are no longer automatically exempt from the New York City energy code. Previously, buildings listed on or eligible for national or state historic registers, or those designated as historic under state or local law, need not comply with the city's energy regulations. Now, obtaining that exemption requires submission and approval of a Historic Building Report explaining how compliance with the code would threaten or destroy the historic form, fabric, or function of the building.

A Move Toward Performance-Driven Compliance

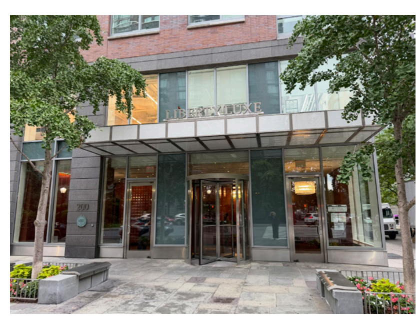
As with most state and local energy codes, there are two approaches to demonstrating compliance with the NYCECC: a *prescriptive path* and a *performance path*. The first of these requires documenting that the project meets or exceeds baseline metrics for insulating properties of walls, roofs, and windows, as well as solar heat gain coefficient (SHGC) for glazing, enclosure air leakage, and mechanical and lighting efficiency. Since this pathway demands meeting values for individual components without the ability to offset lower performance in one element with superior performance in another, it's usually best for smaller, less complex projects.

A more holistic approach is the performance path, which permits the use of energy modeling software to demonstrate overall building thermal metrics. Here, tradeoffs allow designers to compensate for, say, a lower-efficiency HVAC system with a high-performance building enclosure, provided the total energy consumption remains within range. Historically, the NYCECC has offered a combination of these two pathways to allow for flexibility in compliance. However, much stricter prescriptive requirements effectively mean that the 2025 NYCECC directs all but small projects towards the performance method.

Updated Credit System

Previous versions of the NYCECC already had an optional point-based system to allow projects to earn credits for a range of efficiency and renewable energy initiatives, but the new version of the code greatly expands this point-based structure – and makes it mandatory when using the prescriptive path for compliance. Now, every project must achieve a minimum score based on building occupancy and climate zone, earned by surpassing baseline measures in categories ranging from additional roof and wall insulation to reduced air leakage. Beyond the building enclosure, projects also earn credits for efficient HVAC performance, energy monitoring, increased daylighting areas, and a range of options across more than 30 categories.

This type of flexible, point-based approach will feel familiar to owners and designers experienced in the United States Green Building Council (USGBC) LEED rating system for green building certification, which has been using credits since it launched in the early 2000s. Unlike LEED, however, the NYCECC uses these points as "additional energy efficiency credits," rather than as the basis for compliance. Baseline performance metrics, whether through the performance path or the prescriptive path, still form the core of the energy code mandate, with greater efficiencies above and beyond those minimums required in some capacity; the credit system just allows building owners and project teams to choose how to achieve those additional performance gains.



Projection factor measures shading effect of window canopies, which dictates required SHGC.

Now that New York City is, essentially, piloting this type of combined credit-based and standards-based approach to cutting energy use, other cities and states will likely be watching to see how the mandate succeeds. If it helps move the city closer to its climate goals without strangling development, it may become the standard on which other regions base their building energy requirements.

What Changed in the Latest Commercial Energy Code

As with the prior energy code and the model codes followed by most states, the 2025 NYCECC lists distinct targets for residential and commercial properties. The residential code is limited to single-family homes, duplexes, and low-rise multi-family dwellings, leaving everything else – commercial, industrial, institutional – subject to the "commercial" regulations, including multi-family units over three stories.

While the energy code also includes requirements for heating, electrical, mechanical, lighting, and other building systems, our focus here is to highlight the major changes related to the building envelope, which encompasses elements that, together, enclose conditioned space: exterior walls, floors, slabs, ceilings, roofs, windows, curtain walls, skylights, and exterior doors.

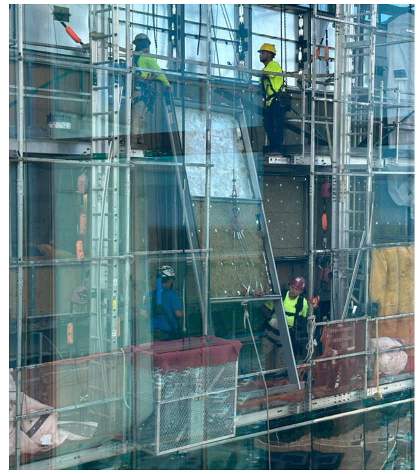
Increased Minimum Insulating Values

A material's ability to resist heat transfer, and therefore provide insulating properties, is typically expressed as *R-value,* the inverse of the rate of heat flow across a material per unit area and unit temperature difference. Higher R-value means better insulation, so each successive edition of the energy code has increased minimum R-values for opaque wall assemblies, roofs, floors, and structural slabs. For mass walls above grade, the minimum R-value jumped from 11.2 for continuous insulation in non-residential buildings to 13.3, a nearly 20% increase.

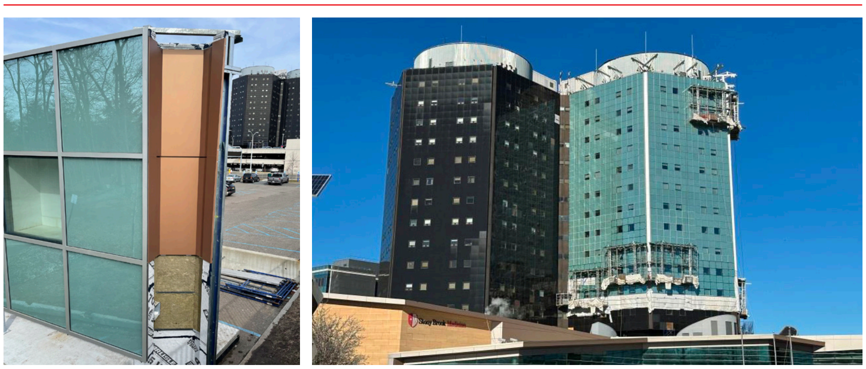
More Rigorous Performance Standards for Windows

In the U.S., the energy performance of fenestration, which includes windows, doors, curtain walls, and other openings, is typically expressed as *U-factor.* The rate of heat flow per unit area and unit temperature differential, U-factor is the inverse of R-value, such that lower numbers mean better performance.

For commercial building fenestration, the NYCECC was already tough in 2020, but for fixed-pane metal-framed windows on higher floors (above 95 feet), U-factor now must be below 0.34, a seemingly minor change from the prior value of 0.36, but one that could substantively impact product selection and rehabilitation of existing windows.



For curtain wall, mandated insulating values continue to rise, while max SHGC drops.



Mockups *(left)* reveal how components such as air barriers, insulation, metal panels, vision and spandrel glass, and framing come together, identifying potential issues prior to construction *(right).*

Window energy performance is measured not only by insulating value, but also by how much of the sun's thermal energy it admits. Untreated older windows can drastically increase the temperature in a room by trapping solar heat inside. To cut down on overreliance on mechanical systems to compensate for this excessive heat in the summer months, energy codes mandate maximum values for a glazing assembly's *Solar Heat Gain Coefficient (SHGC),* a measure of the proportion of solar energy transmitted into a space. Depending on the geometry of the shading overhang on a window assembly, expressed as projection factor, the new NYCECC slashes the maximum allowable SHGC by between seven and nine percent, a significant change when the originally mandated SHGC values were already quite low.

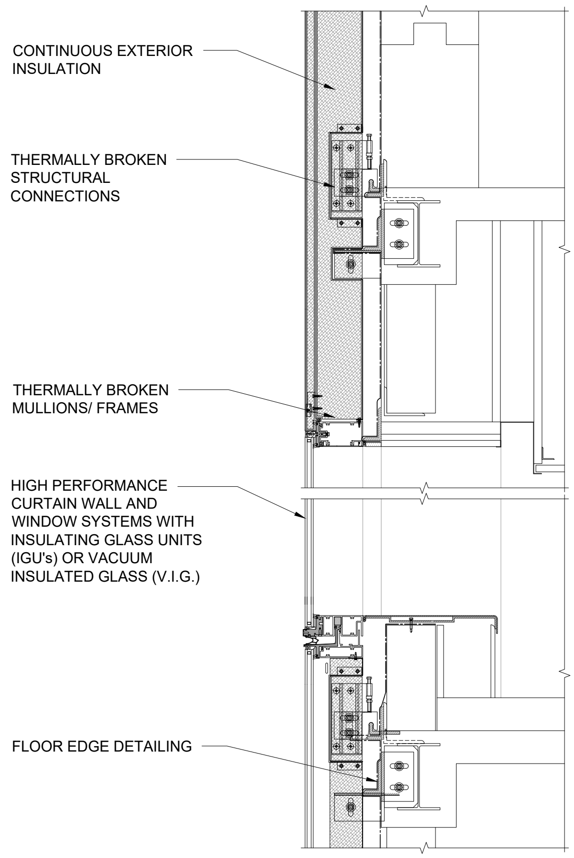
Stricter Thermal Bridging Requirements

What building owners and designers are likely to see in the years ahead, not just in New York City but across Northeast, Mid-Atlantic, and West

Coast jurisdictions, is a move away from optional guidelines and best practices for managing *thermal bridging* – areas of relatively high conductivity that draw heat energy across the building enclosure. Instead, newer energy codes are likely to follow New York City in mandating these measures, with explicit requirements for detailing and calculations.

Junctions between building elements, such as walls to floors, or at openings for windows and doors, often incorporate conductive materials that circumvent surrounding insulation to offer a low-resistance pathway for heat energy to traverse the building enclosure: a *thermal bridge*. Not only do unaddressed thermal bridges lead to overestimated energy performance, but they can also cause moisture problems as the temperature differential leads to condensation.

Preventing Thermal Bridging *in Curtain Wall Assemblies*



EXTERIOR WALL SECTION – METAL PANEL SYSTEM WITH VISION GLASS

Earlier editions of the NYCECC covered thermal bridging only cursorily and focused exclusively on *linear thermal bridges,* which, since they occur along the length of building elements like balconies and floor slabs, contribute to a significant area of heat transfer. However, in recent years, the industry has begun to pay more attention to the collective impact of *point thermal bridges*, localized elements that penetrate building insulation. Beams, anchors, mounting brackets, cladding supports, and other discrete penetrations in the building enclosure are now subject to scrutiny by the latest code.

Previously, the code accounted for thermal bridging only by requiring reduced overall assembly values. The updated code goes a step further by introducing mandatory detailing requirements designed to minimize the formation of thermal bridges. For example, cladding supports, including shelf angles and clips, are no longer lumped together with the wall assembly and assigned an overall minimum insulation value; instead, the code enforces detailing that offsets these supports to accommodate continuous insulation. The size of brackets used to achieve this design detail now also is restricted by code to further limit the potential for point thermal bridging. Rather than focusing on numerical insulating value alone, this new approach to energy code guidance directly addresses sources of thermal bridging, with explicit guidelines for both size and position to manage performance.

Structural beams and columns that penetrate the building envelope also receive unique consideration as point thermal bridges in the new code. Unless the design includes a thermal break, these structural members now must incorporate insulation that extends well past the beam or column end, and they are limited, like cladding supports, in their dimensions to minimize the area of possible heat transfer.

For linear thermal bridges, including fenestration and parapets, newer requirements are more granular than in the past, with stipulations for thermal breaks in metal window frames, minimum thermal resistance R-values for coverings of rough openings, and alignment of frame thermal breaks with the continuous insulation layer.

At parapets, the code now explicitly prescribes continuous insulation that passes over or through the parapet wall, or, alternatively, a highly insulating thermal break, whereas the earlier NYCECC considered only the continuity of insulation but stopped short of offering construction detailing guidance.

In all these scenarios, the code admits compliance via thermal modeling, provided the model presents insulation value analysis that includes any thermal bridges. Compliance via calculations using prescriptive values for *psi-factor (ψ-factor),* a heat loss coefficient per unit length for linear thermal bridges,

Once automatically exempt from the New York City Energy Conservation Code, historic buildings now must comply unless they can prove that doing so would threaten historic qualities.

and *chi-factor (χ-factor)*, for point thermal bridges, is also admissible but generally less accurate than a performance modeling approach. Such directives point to a tendency in modern energy codes, both in New York City and beyond, to rely less on prescriptive value-based compliance and more on design detail-driven conceptions of energy performance.

Mandatory Building Envelope Testing

Uncontrolled air leakage, whether as air enters the building (*infiltration*) or exits (*exfiltration*), leads to heat loss, moisture penetration, drafts, and premature component deterioration. To measure the building enclosure's resistance to air leakage, energy codes typically provide guidelines for air leakage testing; however, aside from buildings pursuing net-zero or passive house certifications, most non-residential projects were not required to undergo this type of airtightness assessment. For those in New York City, those days are over.

Now, most new buildings, as well as existing buildings undergoing major renovation or additions, must undergo mandatory whole-building air leakage testing. Furthermore, the latest NYCECC drops the allowable air leakage limit by nearly 15% over the previous version of the code. While some building owners already elected to meet this type of rigorous standard to earn green building credentials, this change portends compulsory enclosure testing across the board, should other states and municipalities follow New York City's lead.

Not only does the NYCECC increase demands with a blanket mandate on air leakage testing, but it also introduces staged verification protocols throughout the construction process, rather than waiting until after the project is complete to assess performance. Through preliminary and mid-construction air leakage testing, the project team can identify and correct air gaps before they are covered by the cladding assembly. Then, the final, post-construction air leakage testing serves to verify continuity after these breaches have been addressed. This change recognizes the reality that if testing doesn't begin until construction ends, remediating these late-identified air leaks will likely result in costly corrective measures.

To further support the goal of identifying deficiencies during construction, the 2025 NYCECC requires periodic inspection of the air barrier system throughout the project by a qualified design professional with expertise in building enclosure assemblies. The architect or engineer is charged with setting an inspection schedule, creating a list of critical inspection items, and establishing documentation requirements. Where gaps in the air barrier are discovered, the design professional offers timely recommendations for corrective action. This combination of expert evaluation and functional performance testing is more likely to yield a system that meets the code's stricter airtightness metrics than would be possible through end-of-construction testing alone. New York City's proactive construction management approach will likely encourage other jurisdictions to adopt similar inspection and testing protocols to meet increasingly stringent performance benchmarks.

Looking Ahead

The 2025 NYCECC represents a significant evolution in how we approach energy efficiency within the built environment. For architects, engineers, contractors, and owners, the code introduces both challenges and opportunities. The heightened requirements for thermal resistance, solar heat gain, insulation continuity, performance testing, and envelope detailing will inherently require more rigorous design and coordination. The consideration of these design challenges has the potential to significantly improve occupant comfort, reduce operational energy costs, mitigate moisture-related issues, and support durable building control

The latest NYCECC not only considers insulation continuity but also prescribes parapet details to limit thermal bridging.

(continued on page 8)

representative projects

Energy Code Compliance

Staying up-to-date on energy codes demands more than knowing prescribed insulating values or solar heat gain coefficients. More than ever, meeting increasingly tough energy standards means not only grasping the metrics but also applying new means of quantifying performance. Code compliance now demands facility with sophisticated calculations, thermal modeling, and complex design details as part of a comprehensive, whole-building energy use strategy.

At Hoffmann, we have spent 50 years honing unmatched expertise in building enclosure science. Our design professionals guide clients in realizing performance gains through design, testing, and detailing that is as rigorous as it is efficient. Recent work includes:

Countee Cullin Library
New York, New York
Exterior Rehabilitation, Energy Upgrades

Park City Plaza / 10 Middle Street
Bridgeport, Connecticut
Facade Replacement

The Homer Building, Washington, DC, *Roof Replacement, Penthouse Energy Upgrades.*

Stony Brook University Hospital, Patient Towers
Stony Brook, New York
Curtain Wall and Soffit Replacement, Energy Modeling

Montgomery College, Macklin Tower
Rockville, Maryland
Facade Retrofit

SUNY Farmingdale State College, Roosevelt Hall
Farmingdale, New York
Exterior Design Energy Analysis

Osborn Correctional Institution, Physical Plant
Somers, Connecticut
Curtain Wall Replacement

Lexington Avenue Armory
New York, New York
Historic Window Replacement

Smithsonian Institution, Freer Gallery of Art
Washington, District of Columbia
Plaza Rehabilitation with Energy Upgrade

Pratt Institute, Stabile Hall
Brooklyn, New York
Roof Replacement

Niagara University, Academic Complex, Niagara University, NY, *Facade Replacement.*

489 Fifth Avenue, New York, NY, *Facade Replacement.*

East River Professional Building
521-523 East 72nd Street
New York, New York
Roof Replacement

Herman T. Schneebeli Federal Building and U.S. Courthouse
Williamsport, Pennsylvania
Window Replacement

Firefighter Dan Defranco Building
New York, New York
Facade/Roof Replacement to 2025 NYCECC

Electchester Towers
Queens, New York
Window Replacement to 2025 NYCECC

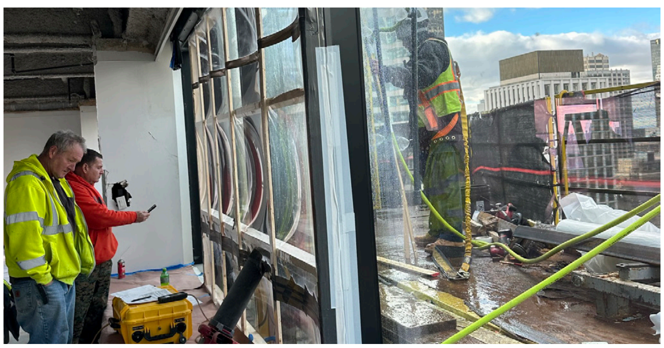
Verizon Communications Center
55 Meserole Street
Brooklyn, New York
Building Enclosure Rehabilitation, Door and Roof Replacement to 2025 NYCECC

Woodrow Wilson Houses
New York, New York
Roof Replacements to 2025 NYCECC

Hoffmann Architects + Engineers
265 Church Street, 16th Floor
New Haven, CT 06510

ADDRESS SERVICE REQUESTED

(continued from page 6)



Other cities may follow NYC's lead in requiring whole-building air leakage testing, a major change from the earlier code.

layers. As New York City continues its path toward carbon neutrality by 2050, the energy code will remain a critical regulatory tool and will continue to evolve to support these climate goals.

While those outside New York may see the NYCECC changes as incremental and, moreover, irrelevant, New York has historically served as a bellwether for other locales. This holds particularly true in cities like Boston, Chicago, Philadelphia, and Washington DC with similar commitments to ambitious carbon-reduction and energy performance goals. Already states such as Connecticut, Rhode Island, Massachusetts, and New Jersey have set in motion legislation enacting new energy code mandates moving toward performance-based compliance in line with that of the NYCECC. State-specific additions, from zero-carbon ready construction to on-site solar for affordable housing, demand attention to how local regulations may impact individual projects. Whether for rehabilitation of an existing building or for new construction, the project team needs to be fluent in the nuances of the applicable code, as well as any newly minted stipulations that may come into effect during the construction timeline. ■

Discussion provided in this article is for general informational purposes. Before taking action, consult a design professional.

AIA Continuing Education Provider

JOURNAL offers AIA Learning Units
Earn Health, Safety, and Welfare (HSW) continuing education credit for reading the JOURNAL.
To learn more, visit www.hoffarch.com/the-journal.

JOURNAL is a publication of Hoffmann Architects + Engineers, specialists in the rehabilitation of building exteriors. The firm's work focuses on existing structures, diagnosing and resolving problems within roofs, facades, windows, waterproofing materials, structural systems, plazas/terraces, parking garages, and historic and landmark structures. We also provide consulting services for new building construction, as well as litigation and claim support.

For address changes, free subscriptions, or information on the topics discussed in this issue, contact our Marketing Department at news@hoffarch.com, or:

265 Church Street, 16th Floor
New Haven, CT 06510
203-239-6660

462 Seventh Avenue, 20th Floor
New York, NY 10018
212-789-9915

277 S Washington Street, Suite 210
Alexandria, VA 22314
703-253-9800

www.hoffarch.com

Editor/Production: Alison Hoffmann