

LEADING GREEN PUBLIC PROJECTS 2025

MAYOR'S OFFICE OF
ENVIRONMENTAL COORDINATION
NYC CAPITAL GREEN BUILDING
PROGRAM



NYC

New York City Capital Green Building Program

FIRST ANNUAL LEADING GREEN PUBLIC PROJECTS AWARDS

Photo: Jeff Goldberg

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Mayor's Office of Environmental Coordination

Established by Section 192(e) of the New York City Charter, the Mayor's Office of Environmental Coordination (MOEC) is an interdisciplinary team of attorneys, planners, scientists and tech professionals who lead the City's environmental impact review process – City Environmental Quality Review or "CEQR" – to ensure that the delivery of critical infrastructure, planning, and policy projects is transparent and protective of the environment and health of our communities. MOEC assists City agencies in carrying out their environmental review responsibilities. In addition to being the repository for all City Environmental Quality Review (CEQR) documents, the Office serves as the City's liaison to state and federal agencies on environmental matters and advises the Mayor on matters of environmental policy.

Executive Order 149 of 2011 further defines MOEC's responsibilities to include implementation of the City's capital green building standards as defined in Charter Section 224.1, including authorizing the Director to exercise the powers and duties of the Mayor granted by the law.

MOEC's mission is to be a resource for city agencies and private applicants by providing information and assistance in completing the environmental review process and to help the City lead by example in applying state-of-the-art green building requirements. MOEC's focus is to improve the health and quality of life for NYC communities while preparing for climate challenges.

Capital Green Building Program

The Capital Green Building Program (CGBP) is an effort by the City of New York to carry out the provisions of Charter Section 224.1: "Green Building Standards" to ensure that most capital projects owned or funded by the City are designed and constructed to achieve significantly higher environmental performance than the private building industry average.

In 2023, the New York City Council adopted Local Law 51, which is codified in Charter Section 224.1. This law amended Local Laws 31 and 32 of 2016, which amended Local Law 86 of 2005. Local Law 86 of 2005 was one of the nation's first green building laws.

This effort is in support of the City of New York's OneNYC Plan 2050 goal to achieve carbon neutrality and position New York City to advance climate change mitigation and adaptation strategies and local and regional resilience.

LETTER FROM THE DIRECTOR



Brooklyn Public Library - Library for Arts & Culture |
Photo: Andrea Steele Architecture

Fellow New Yorkers,

The Mayor's Office of Environmental Coordination (OEC) is proud to present this report inaugurating the Leading Green Public Projects Program to recognize projects completed in the last fiscal year that have exceeded the City's minimum green building standards, demonstrating design excellence and innovation. For twenty years, New York City has been a leader in its deep commitment to achieving design excellence, innovation, and environmental performance across its capital portfolio through the [Capital Green Building Program \(CGBP\)](#), introduced with the passage of Local Law 86 in 2005. Since that time, the City's capital building projects have been leading the way in the ever-evolving field of green building, repeatedly demonstrating that ambitious environmental design standards can be achieved efficiently and cost-effectively with the combination of excellent project management, an integrative and collaborative design approach, and smart, strategic innovation.

Year after year the City's newly completed capital green buildings serve as a beacon and call to action for the private building sector to continue in its progress toward helping create a truly sustainable, resilient and regenerative New York City.

The projects featured here are prime examples of how the City's capital agencies continuously work together to meet our needs for quality housing, schools, workplaces, cultural and recreational spaces, and critical public service facilities, all while maintaining a clear focus on doing what it takes to Get Sustainability Done. Each project achieving the requirements of the CGBP contributes significantly toward meeting the City's PlaNYC goals as the impacts of green building extend beyond decarbonization through improved energy performance. Our capital green buildings:

- Make the City more durable, adaptive and secure through **resilient design** strategies
- Protect New Yorkers' health by **reducing pollution** and **improving air and water quality**
- Enhance New Yorkers' wellness and quality of life through **human-centric design strategies**
- Promote environmental justice and social equity through **inclusive design** strategies
- Save New Yorkers money by **reducing energy and water utility costs**
- Preserve and enhance the City's ecological resources and biodiversity through **regenerative design** strategies
- Reduce waste and help support a green economy through circular design strategies

The CGBP also helps to ensure that the foundational concepts underlying sustainability, resilience and environmental stewardship are woven into our shared public realm. By designing and constructing our public buildings to the high standards set by the CGBP, we are making sustainability integral to the daily life and culture of the City.

This report, which includes an in-depth case study for each of the Leading Green Public Projects, is offered to all project teams working across the City as a resource to support them in their collaborative efforts to design and construct the best performing, most innovative green buildings.

Join me in applauding the collective efforts of all those involved in delivering these exemplary projects to the people of New York City. These projects represent the height of design excellence employed in service of the wider public interest and good. On behalf of all New Yorkers, we express our gratitude and admiration for the innovation and leadership demonstrated by the teams that collaborated on these projects.

Hilary Semel
Director and General Counsel,
Mayor's Office of Environment Coordination

A photograph of a person in profile, looking out a window. The window is covered with a complex, abstract pattern of white lines on a yellow background. The person is wearing a white tank top and glasses. The overall image has a high-contrast, artistic feel with a mix of colors and textures.

NYC CAPITAL GREEN BUILDING PROGRAM

Photo: Jeff Goldberg

As codified in the [New York City Charter's Chapter 9: Capital Projects and Budget, Section 224.1 – Green Building Standards](#), most City-owned and City-funded capital building projects, including both renovations of existing buildings and new construction projects, are required to meet stringent design criteria.

The Green Building Standards require energy and water use performance that is significantly higher than the industry average, as well as the implementation of innovative design strategies to achieve resilience, ecological conservation and occupant health and wellness.

Beyond ensuring a minimum level of quality and performance on all public building projects, the purpose of the Green Building Standards is to guide and **promote innovation in pursuit of ever higher levels of design excellence achieved cost-effectively**. This in turn prompts the private sector to continuously innovate and target increasingly improved performance.

These Standards align with the City's goal to reduce 80% of our emissions by 2050, as well as the [Climate Mobilization Act](#), [OneNYC Plan 2050](#), and the various goals of [PlaNYC](#):

Protecting Us from Climate Threats

Capital Green Buildings play a key role in the City's decarbonization efforts, targeting significant reductions across a range of emission types including operational, embodied, refrigerant, and transportation emissions.

Capital Green Buildings are designed to be resilient and adaptive, helping their surrounding communities be better prepared for climate disruptions and increased natural hazards.

Improving Our Quality of Life

Capital Green Buildings improve health, well-being, and equity for their occupants and their communities, providing spaces that are comfortable, safe, humane, accessible, and equitable.

Capital Green Buildings achieve indoor environmental quality and support occupant wellness through both technical strategies like advanced filtration and air monitoring as well as qualitative strategies that target mental and behavioral wellbeing like biophilic design and active design.

Capital Green Buildings contribute toward ecological conservation and restoration, implementing strategies that limit environmental degradation and contribute to the regeneration of ecosystems, contributing toward the adaptation of our City's built environment so that it exists increasingly in harmony with nature.

Building the Green Economic Engine

Capital Green Buildings have lower operating costs and increased property value. By leading an ongoing citywide shift toward green building, these projects help to foster job creation in the sustainability sector, including roles in construction, design, and maintenance. And by specifying recycled, reused, and low-carbon building materials to promote waste reduction, these projects also support the development of a circular economy.

PROJECT CASE STUDIES



Photo: DATNER ARCHITECTS

FAR ROCKAWAY BRANCH LIBRARY

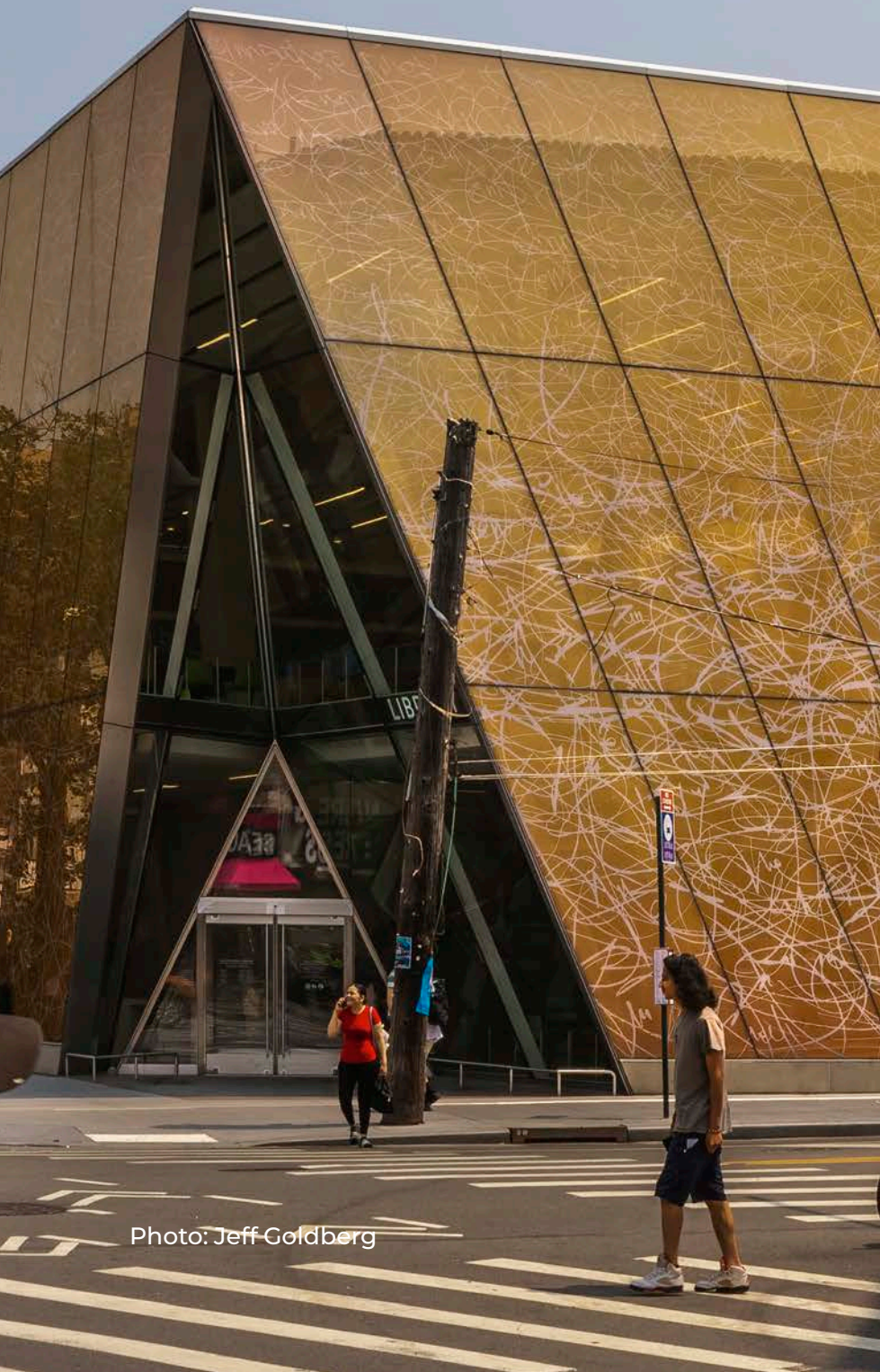


Photo: Jeff Goldberg

TEAM

Sponsor Agency:
Queens Public Library

Managing Agency:
Department of Design and
Construction

Architect: Snøhetta

Artist: José Parlá

MEP: Altieri Sebor Weiber

Structural:
Silman Associates

Civil: Thornton Tomasetti

Sustainability: Atelier Ten

General Contractor:
E.W. Howell

MINIMUM PERFORMANCE REQUIREMENTS

(Local Law 86 applicable)

- LEED Silver (min. 50 points)
- 25% energy use reduction
- 30% water use reduction

ACHIEVEMENTS

LEED Silver (56 points)

- 32% energy cost reduction
- 88% site EUI reduction
- 37% indoor water use reduction

IMPACTS

- 1,091,267 kWh savings / year
- \$338,293 savings / year
- 182,255 kgCO₂e avoided / year
- 91,650 gallons water conserved / year

OVERVIEW

The new Queens Public Library Far Rockaway Branch replaces the former library with a modernized, accessible building that is twice the size and that's been designed with the intent to connect the diverse communities of the neighborhood. The new library **celebrates the cultural history and creative spirit** of Downtown Far Rockaway while providing a shared, welcoming space that supports joy and learning. Its design demonstrates a progressive approach to the improvement of public space founded on the balance of environmental performance, climate resiliency, occupant experience, and architectural considerations of aesthetic beauty and spatial quality.

The new library is an excellent example of effective **placemaking**, helping to cultivate and sustain a strong sense of place within its urban context. The building's facade, composed of custom panels designed by Brooklyn-based artist José Parlá, visually reflects the neighborhood's lively street activity and vibrant culture, featuring the many languages spoken in Far Rockaway. Parlá's design for the facade references New York City's "Style Writing" youth subculture, an artistic movement involving the creation of street art on public walls and subway trains during the sixties and early seventies.

Additionally, the yellow-orange tint of the facade glazing evokes the atmospheric conditions of the project's location in Far Rockaway on the Atlantic coastline, specifically referencing the qualities of the sunset as viewed from Rockaway Beach. And the simplified form of the building provides a visual respite from the surrounding chaotic streetscape.

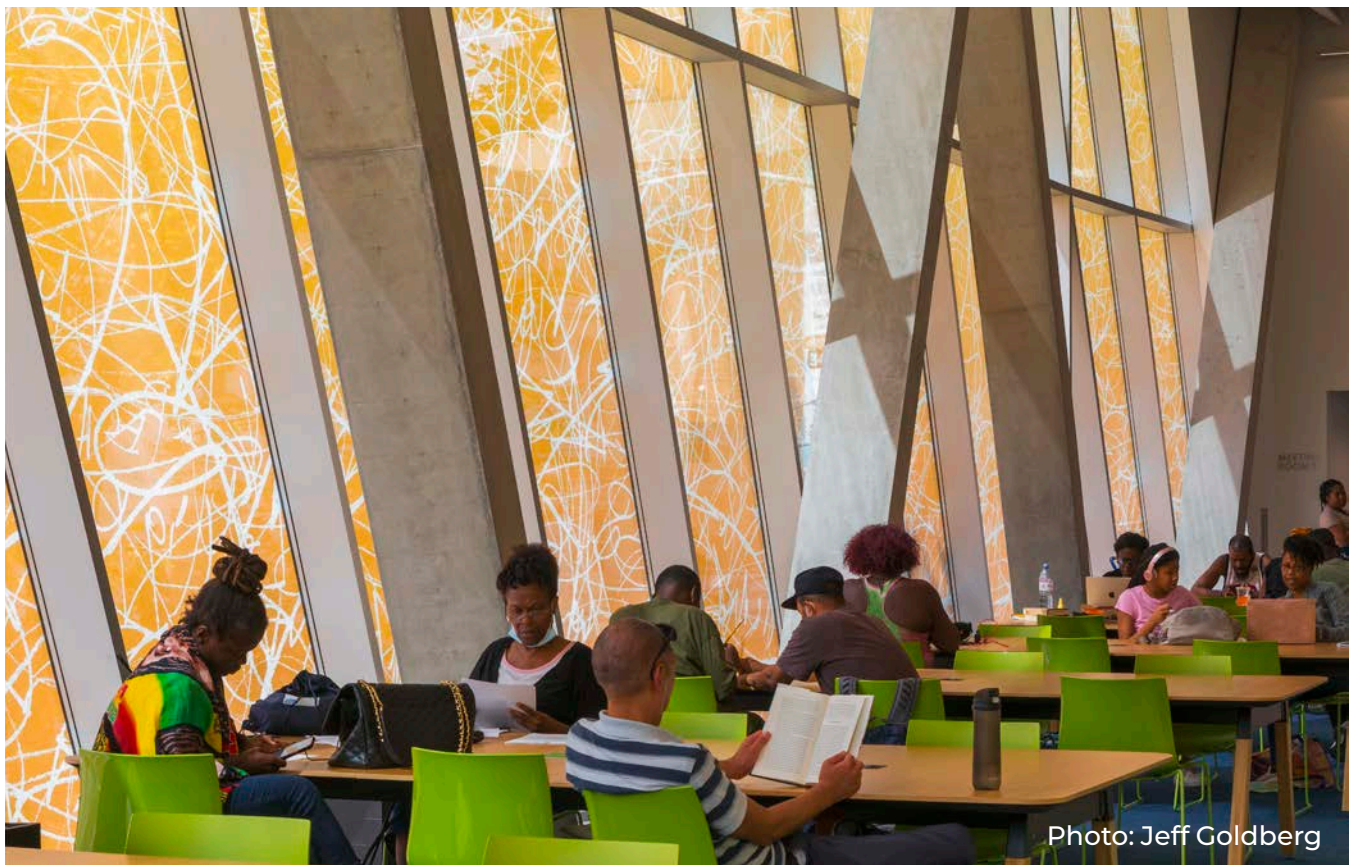


Photo: Jeff Goldberg

In these ways the project is attending not only to the functional and spatial characteristics of its site and context, but also to the neighborhood's socio-cultural values—its identity, climate, spirit, or atmosphere. By successfully contributing to its local area's unique sense of place, the new library helps to maintain an inclusive and enlivened spatial context for the daily human activities, experiences, and identities of those who live there. This helps people cultivate a strong bond to the place... which in turn helps to foster a sense of engagement and collective responsibility for the shared spaces of the neighborhood, leading to increased environmental stewardship among the community.

The new branch library reinterprets the traditional public library typology in support of the idea that such public spaces can serve as an essential component of the neighborhood's social infrastructure by fostering interpersonal connections and promoting well-being and cohesion within the community. More than a repository of books and resources, the new library also serves as a community hub, integrating a range of collaboration and social spaces to support programming for public engagement, including a public garden that can be used as a place to meet, work, play and rest.

The new library will also contribute toward the community's climate resilience by serving as a disaster response center, equipped with dedicated space for relief operations and a backup generator that can be operated during emergencies in the event of grid power loss.



Far Rockaway Branch Library

The high-performance envelope also contributes to the building's **passive survivability**, working to maintain thermally safe interior conditions for extended periods of time during an emergency power outage when the mechanical systems are inoperable.

These features amplify the previous library's role in the aftermath of Superstorm Sandy in 2012, which devastated the Rockaway community. The previous library provided a lifeline then, when it was used as a meeting place, and distribution point for food and supplies, as well as serving as a hopeful symbol of collectivity, supporting acts of mutual aid and community care. The new library will build on this role by additionally serving as a hub for learning and exchange to foster and strengthen **local, community-based resilience**.

The building was designed under [DDC's Design and Construction Excellence Program](#), which is used to pre-qualify firms to provide services for public buildings projects. This reduces the time

required to procure consultant services while ensuring that a consistently high level of quality and performance is achieved across the agency's projects.

The program establishes clearly defined requirements for quality and innovation in architecture, engineering, and project delivery by incorporating strategies and practices that achieve a balance between functionality, cost, constructability, and durability. The basis for implementation is a collaborative and transparent process to achieve the following design principles:

- Civic and community-oriented
- Inclusive, healthy, and safe
- Sustainable and resilient
- Functional, durable, and cost-sensitive

The result is a range of high-performing projects that, like the new Far Rockaway library, invest the City's public spaces with deep meaning and architectural form.

The project also features new public art as part of the NYC Department of Cultural Affairs' [Percent for Art Program](#), which seeks to further enrich the City's public built environment by integrating site-specific artworks by local artists whose approach and sensibility reflect New York's diversity. The program makes art more accessible throughout the City, underlining the role of public art as both a cultural landmark and an expression of the community. At the new Far Rockaway library, the "Feynman Code" by Mexican artist Pablo Helguera serves as a tribute to the Nobel Prize-winner and theoretical physicist Richard Feynman, who grew up in the Rockaway neighborhood.

GREEN BUILDING DESIGN FEATURES

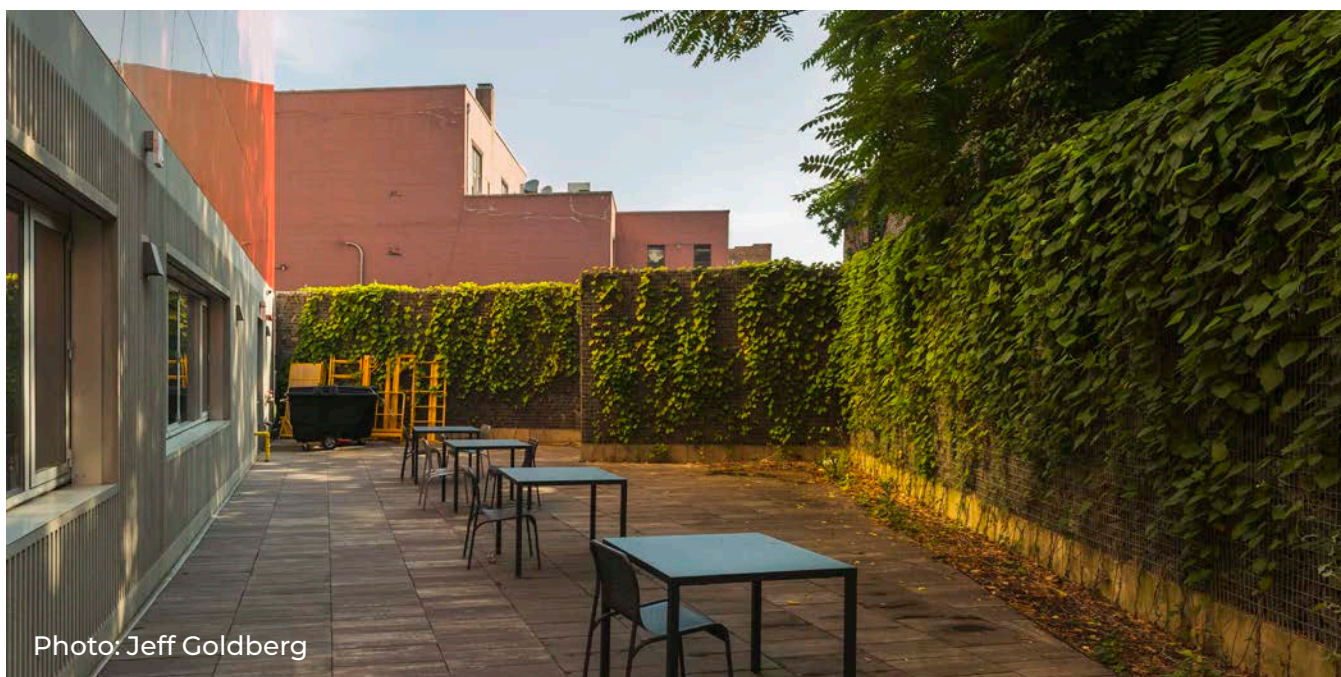
To meet and exceed the minimum requirements of the Capital Green Building Program, including LEED certification and substantial reductions in energy and water use, the project implemented a range of sustainable design features:

SITE + COMMUNITY

To promote land conservation and support compact, connected communities, the project is **located on the previously developed site** of the former library, situated within a densely developed area with a **diversity of accessible uses and amenities** and with established **access to quality public transit**.

The redevelopment of the site included the **remediation of pollutants and hazardous materials** to reduce human and wildlife exposure to environmental pollution and improve environmental health.

To help mitigate the negative impacts of urban heat islands and extreme heat events on the surrounding community, the **project installed roofing and paving materials with high solar reflectivity**. The project's **"blue roof"** - a system that retains, filters, and then slowly releases storm water to the sewer system - helps to prevent flooding of the coastal neighborhood's drainage infrastructure and streets during heavy rainfall events.



The library's public garden **promotes biodiversity** while also providing the urban community with access to a new open green space. The garden is designed to be fully accessible from the ground floor and is enclosed with gabion block walls. Perimeter vines were planted to grow cover the gabions, creating vegetated wall surfaces throughout the warm seasons.

Exterior lighting is minimized to avoid over-lighting the street and to reduce **light pollution**.

WATER CONSERVATION

The project's **landscaping is designed to be water efficient**, incorporating only **native and adapted plant species** that do not need permanent irrigation. This contributes to the project's total conservation of potable water through each year of operation. However, the greatest contribution toward the project's water conservation achievement is due to the installation of **efficient indoor plumbing fixtures**, which resulted in a **37% reduction** from the baseline annual indoor water use projected for the building.

ENERGY USE REDUCTION

The project achieved a **31% energy cost reduction** (compared to ASHRAE 90.1-210 baseline) by implementing a range of energy efficient features including:

- Daylight and occupancy sensors that integrate with the building's BMS system to reduce electric lighting use when not needed
- A concrete raised floor forced air system for radiant heating and cooling
- The system, composed of interlinked metal domes covered with a secondary concrete topping slab and finish floor, was selected for its high energy efficiency and its ability to deliver fresh air into occupied spaces, as well as the fact that it eliminates the need for overhead ductwork. The system is composed of electric heat pumps on the roof with air handling units delivering tempered air to

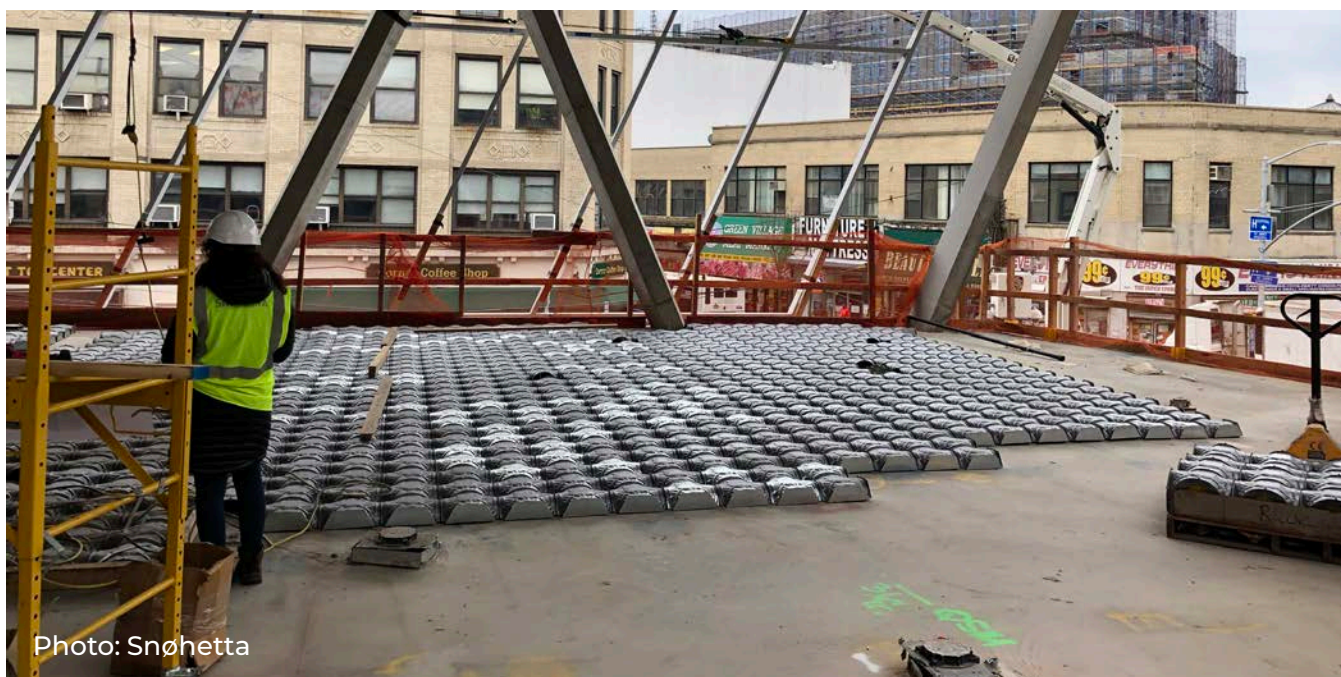


Photo: Snøhetta

the floor domes from below. The low-velocity air discharged at the perimeter floor grills counter summer heat loads as well as drafts and condensation during the cold months.

- Energy Recovery Ventilation system
- High-performance building envelope
 - Glazing with frit pattern to reduce solar heat gain
- Reduced lighting power density

The project's high **efficiency HVAC system** and the implementation of **Energy Recovery Ventilation** together contributed the most toward the project's energy use reduction achievement.

In combination with reducing the project's energy demand to the greatest extent feasible, the project has committed to **procuring 100% of its electricity from renewable sources (Green-e certified).**

MATERIALS

The project implemented a **Construction Waste Management Plan** and successfully **diverted 88.26% of construction waste** generated on-site from landfill.

Construction Waste Management strategies like **on-site source separation**, which targets waste materials that are easily separated and have established recycling markets, such as steel, wood, and concrete, effectively reduce both environmental pollution and the embodied carbon impacts of manufacturing new materials while also helping to create green jobs and markets for building construction services.

The project specified that steel building products, including concrete reinforcing steel and structural steel contain minimum **50% recycled content.**

OCCUPANT COMFORT + WELLNESS

A primary objective for the project was to provide a comfortable interior environment to support the wellness of the library's staff and visitors. The project achieved enhanced indoor air quality by installing an **outdoor air delivery monitoring** system, using carbon dioxide sensors to ensure that an adequate quantity and rate of fresh air is continuously supplied to the library's occupied spaces. The project also implemented a **Construction Indoor Air Quality Management Plan** throughout the construction phase and performed a **building flush-out** prior to occupancy to remove contaminants generated by construction activities.

Low-emitting interior construction materials and finishes were specified to further enhance indoor air quality:

- Low / No VOC paints and coatings
- Low / No VOC adhesive and sealants
- Low / No VOC flooring systems
- Low / No formaldehyde composite wood and agrifiber products

To ensure a thermally comfortable indoor environment, the project's HVAC system was designed in accordance with the **ASHRAE 55 Standard**, which specifies the combinations of indoor thermal environmental factors (temperature, thermal radiation, humidity, air speed) and personal factors (activity and clothing) that produce thermal conditions acceptable to the majority of occupants.

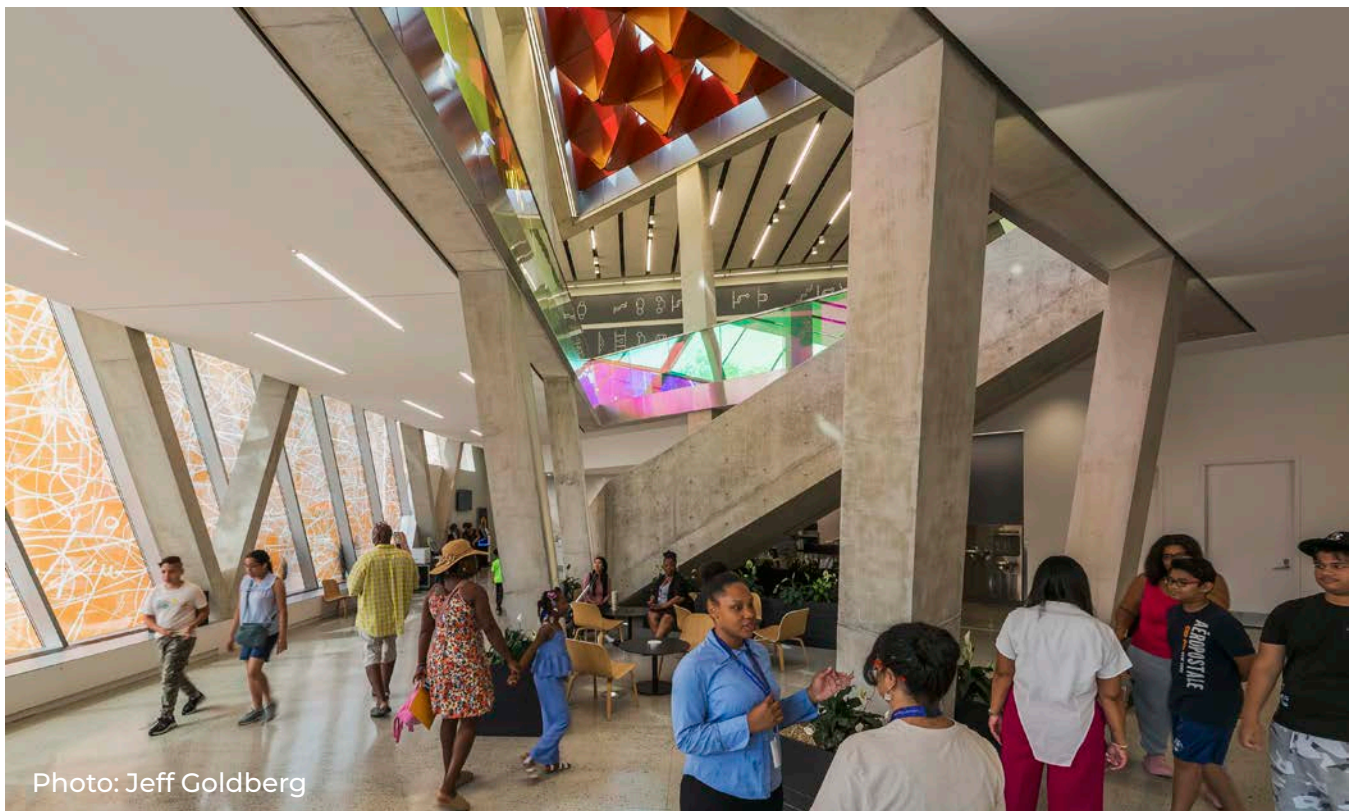


Photo: Jeff Goldberg

To provide the library's occupants with a connection to the outdoors, the project was designed to maximize the penetration of daylight deep into the space while also **providing 94.3% of regularly occupied spaces with access to quality views** of the sky and the exterior environment. This involved close collaboration with the project's glazier to design the fritted glass facade to meet precise specifications to balance color, transparency, reflectivity, and thermal performance.

The project further supports occupant wellness through the implementation of [Active Design Guidelines](#), which outline strategies for promoting an active lifestyle through the placement and design of stairs, elevators, and indoor and outdoor spaces. The new library's open, interconnecting central stairway was designed to invite use. It is highly visible from paths of travel, easy to access, and features a hand railing made of dichroic glass that creates a kaleidoscopic effect in the atrium.

PROCESS + STRATEGY

The project was able to include all these features cost-effectively and achieve design excellence beyond the minimum requirements of the Capital Green Building Program by implementing an **integrative design process**. The project had a **dedicated sustainability consultant** that helped to lead environmental design goalsetting and continuously track progress toward the achievement of specific performance goals. The status of the project's environmental performance goals was reviewed regularly as part of the design team meetings.

Critically, Queens Public Library as the owner agency and lead stakeholder engaged closely with the design team throughout the project's development to ensure that environmental performance goals were informed by and coordinated with the project's programming and operational requirements.

The project's longer development schedule also allowed the project team the opportunity for a **community engagement** process during which they gathered direct feedback from institutional and neighborhood stakeholders about their desired goals for the new library building. A primary aspect of this analysis was to better understand all the potential roles the new branch library might serve within the neighborhood and to study the range of interactions the community might have with the new building. This research informed the team's decision-making throughout the design process, guiding the project to an outcome that achieves a diverse set of goals related to operational function, environmental performance and resilience, as well as responding to specific social needs of the community.

Starting during the Conceptual Design Phase, the project team performed a range of **site, climate, water use, and energy use analyses** to inform decision-making as the project design was developed and refined. **Daylighting analysis** was used to inform the design of the facade and interior spaces so that access to daylight and views were maximized.

The project team performed **whole building energy modeling** (using EQuest software) throughout the design phase to analyze and identify the most impactful energy conservation measures.

The project's commissioning team provided direction for the development of **commissioning procedures and tasks** during all the project phases, to ensure full functionality all building systems. This process, which included verification that the building systems and envelope comply with design standards, project requirements, contract documents, and sequential revisions, ensured that all systems can be operated and maintained in conformance with QPL's operational needs, and DDC's project delivery expectations.

The commissioning process yielded significant benefits to the project, identifying a **total of 226 contract deficiencies** during pre-functional and functional checks, all of which were closed by the time of building hand-over to QPL. These included installation issues, equipment malfunctions, digital/analog communication errors between equipment and controls, and non-conformance with design plans and specifications.

One significant issue was related to the "manual" Automatic Transfer Switch. As it is critical for the library to serve as a staging area in the event of a natural disaster, a connection for an emergency power source was included in the design of the facility. As part of the testing process, the commissioning team sought to verify that this transfer switch would perform as expected. After exhaustive review and return visits from construction team personnel to make necessary adjustments, the testing of the transfer switch was successful, ensuring that the library has the capability needed to serve as a staging area for community and local government in the event of an emergency.

In addition to **building systems commissioning** to verify installation, calibration and performance of the project's energy-related systems, the project also implemented a **Building Enclosure Commissioning (BECx)** process to ensure the quality and effectiveness of the building envelope design and construction.

During the design phase, the BECx team reviewed envelope options and advised the design team on aspects of affordability, constructability, durability, and maintainability based on climate, location, and budget. By reviewing detail drawings, the BECx team was able to check for continuity of air barriers and moisture membranes and correct any problems that might exist in the details of the envelope's construction. Addressing problems in the design phase can save a lot of time and money as most issues would be much more costly to correct post-construction. During the construction phase, the BECx team provided quality control field inspections as the envelope was assembled and conducted air and water tests to verify performance. This close assessment and monitoring of the envelope design and construction helped to ensure the project achieved its energy efficiency and durability goals.

During the project's construction phase, coordination between the design team and the General Contractor was critical to the achievement of the environmental performance goals. In cases where the construction team has limited experience working on LEED projects, collaboration to cost-effectively implement and document sustainable design strategies can be a significant challenge.

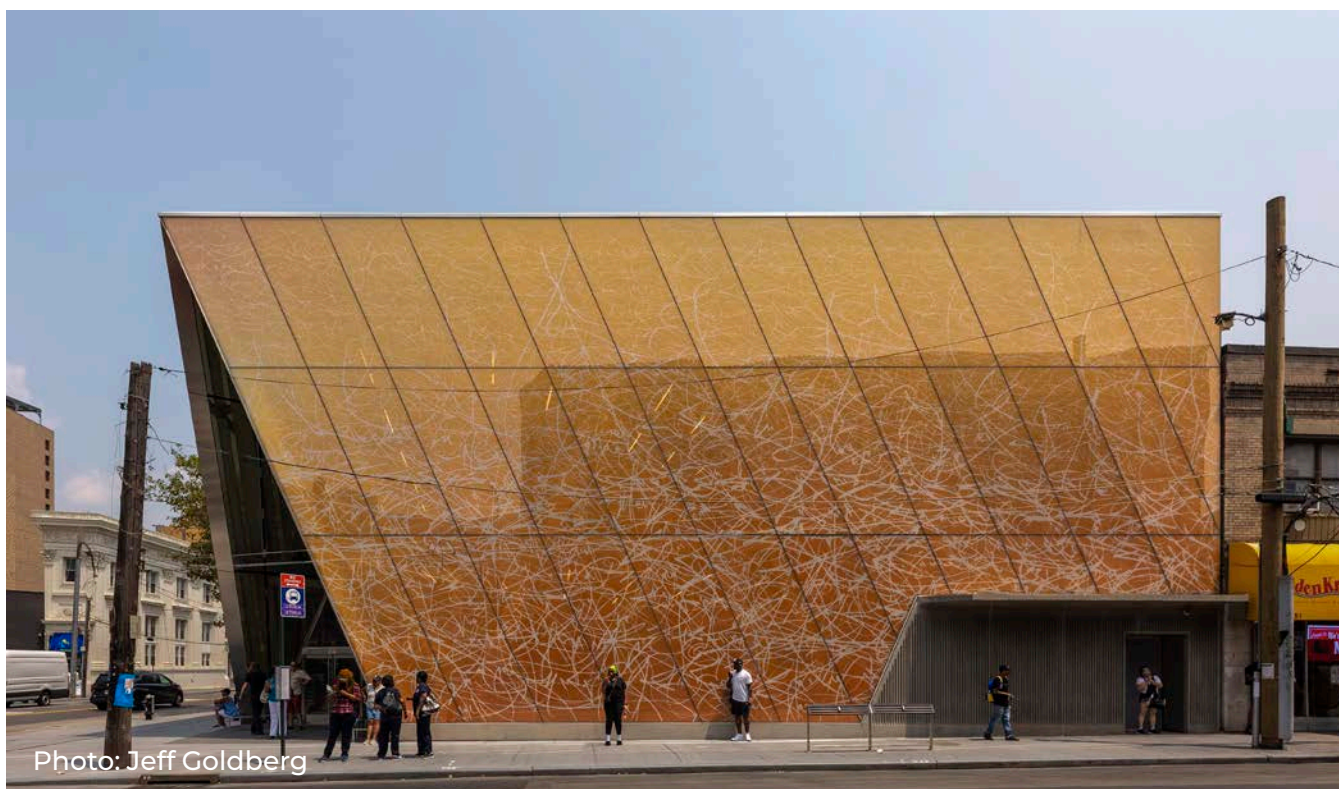


Photo: Jeff Goldberg

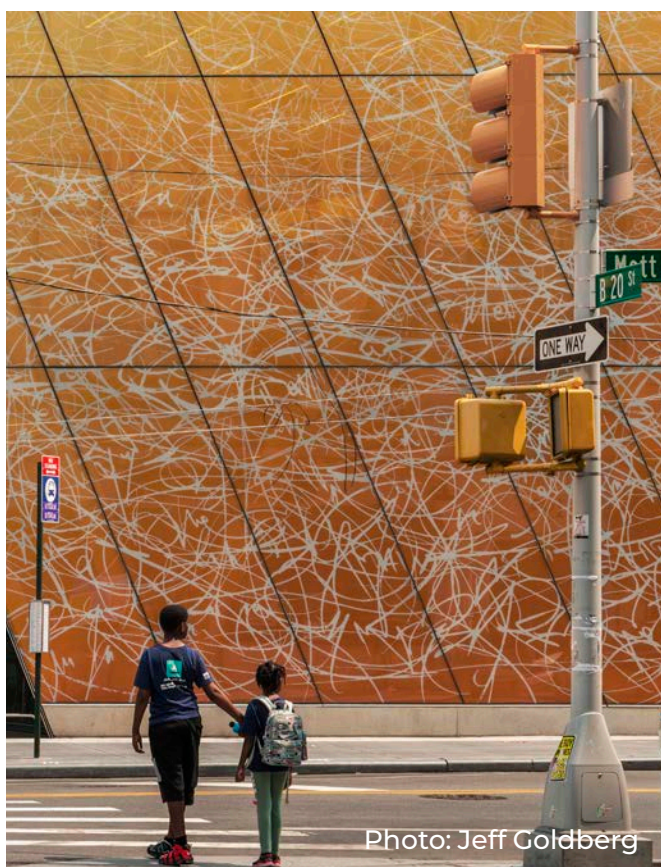


Photo: Jeff Goldberg

RESOURCES

- [Snøhetta drapes Far Rockaway Library in yellow-tinted glass | The Architect's Newspaper](#)
- [Snøhetta's Vibrant Library for a Queens Neighborhood Embraces Artistic Flair | Architectural Record](#)
- [Eric Klinenberg: Libraries and Social Infrastructure | Library Journal](#)
- [Building Enclosure Commissioning: Ensuring Durable and Energy-Efficient Buildings | BuildingGreen](#)
- [Atmospheric Dimension of Place in the Design Process | The Centre for Conscious Design](#)



425 GRAND CONCOURSE

TEAM

Sponsor Agency:

Housing Preservation & Development

Managing Agency:

Housing Preservation & Development

Owner Organization:

Trinity Financial + MBD Community Housing Corporation

Architect: Dattner Architects

MEP: Dagher Engineering

Structural:

GACE Consulting Engineers

Sustainability Consultant:

Steven Winter Associates

Passive House Consultant:

Steven Winter Associates

Lighting: Goldstick Lighting Design

Acoustics/AV:

Shen Milsom & Wilke, LLC

General Contractor:

Monadnock Construction

Monitoring Design:

Bright Power

MINIMUM PERFORMANCE REQUIREMENTS

(Local Laws 31/32 applicable)

- Enterprise Green Communities certification

ACHIEVEMENTS

- Passive House certification
 - (PHIUS+ 2018 CORE)
- Up to 70% energy use reduction
- Predicted site EUI: 22.1 kBtu/sf/yr
- 30%+ indoor water use reduction

IMPACTS

- 2,989,325 kWh savings / year
- \$926,690 savings / year
- 783,628 kgCO₂e avoided / year

Photo: DATTURNER ARCHITECTS

OVERVIEW

425 Grand Concourse, a Bronx 26-story, 300,000 square foot, mixed-use multifamily residential building, is one of the largest Passive House-certified projects in North America to date, consuming up to 70% less energy than conventional buildings.

Containing 277 affordable housing units (all units are income-restricted, and 193 units are categorized as permanently affordable per regulatory requirements), a medical facility, supermarket, community support space, and a student services center for CUNY Hostos, the project demonstrates how advanced environmental building performance can be achieved alongside and integral with the successful provision of critical public services and amenities.

The project's mixed-use programming successfully serves the community's diverse needs by providing access to:

- fresh food, a crucial resource for addressing a range of health issues;
- preventative health care for low income, uninsured and under-insured families;
- community college education facilities offering financial resources & academic support services for students;
- community space for hosting arts, education and other cultural programming

The project is also equipped with features that **encourage and support an active lifestyle and social cohesion** among residents, including a recreation room, a landscaped roof terrace, a lounge space, a fitness room, and bike storage.

Developed in accordance with the New York City Department of Housing Preservation and Development's [Design Guidelines for New Construction](#), the project achieves the core principles of:

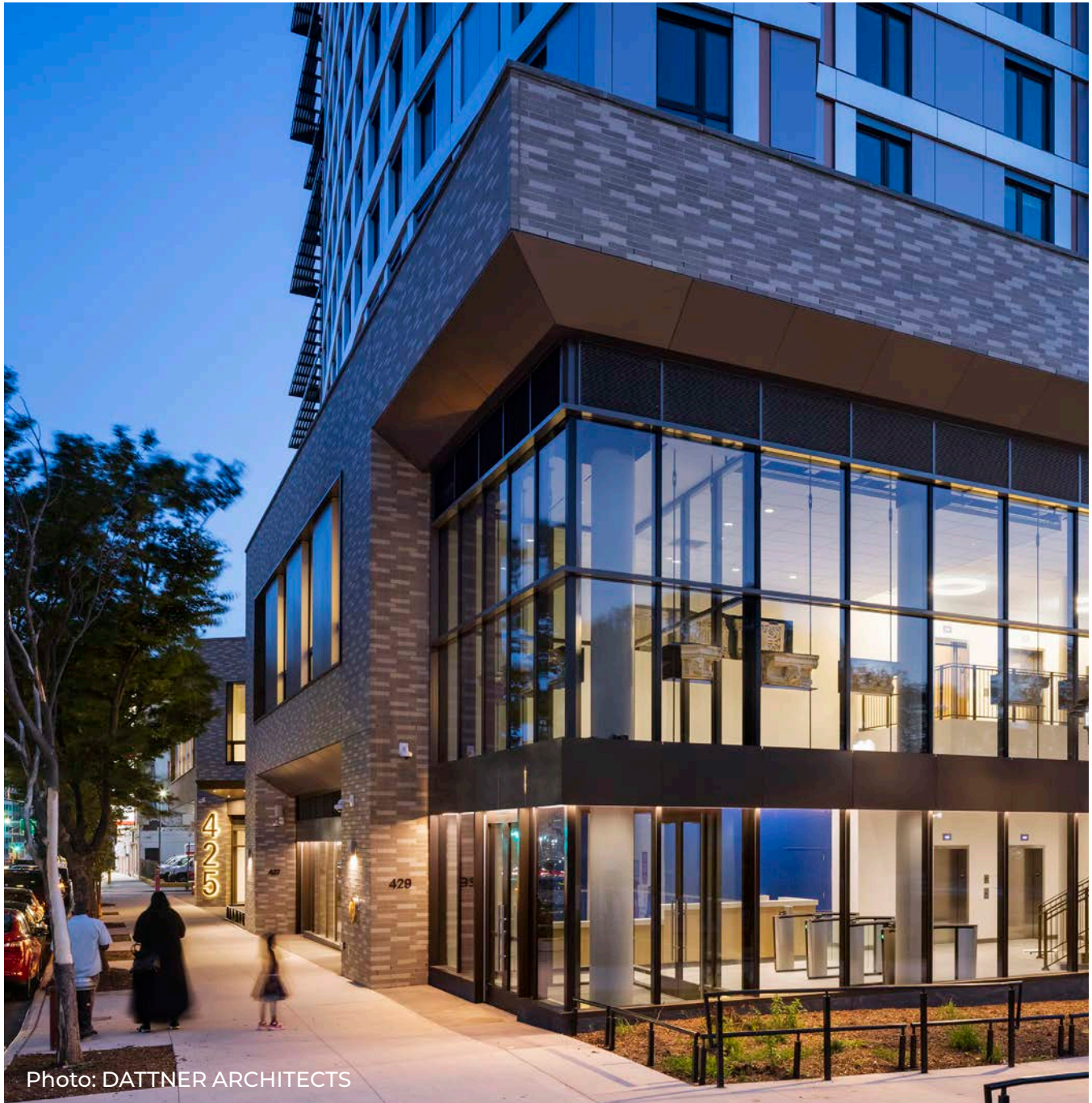
- Establishing and maintaining a strong relation to the neighborhood through the application of urban design and building planning guidelines
- Meeting the needs of households and individuals through the application of apartment planning and accessible design guidelines
- Promoting greater equity
- Encouraging [active design](#) and better health outcomes
- Minimizing [climate impact](#) and [enhancing climate resiliency](#)

Additionally, as required of all New Construction, Substantial and Gut Rehabilitation projects that receive funding from HPD, the project also complies with the [Enterprise Green Communities \(EGC\) Criteria with NYC Overlay](#), a comprehensive green building framework designed explicitly for affordable housing projects and based on proven, cost-effective standards for designing healthy and efficient homes.

The project is an exemplar of how to achieve the mission of the City's strategic housing blueprint, [Housing Our Neighbors](#), to ensure that all New Yorkers have a safe, affordable home. Specifically, the project offers a clear demonstration of how the following Blueprint strategies for improving the health and safety of New Yorkers can be implemented cost-effectively:

- Improve housing quality to ensure healthy and safe living conditions
- Keep New Yorkers safe in their homes in a changing climate
- Create healthier and more sustainable homes

The project was named a first-round winner of [NYSERDA's Buildings of Excellence Competition](#), which promotes the design and construction of low-carbon, energy-efficient multifamily buildings in New York State.



Passive House Performance and Benefits

425 Grand Concourse is one of several projects completed by HPD in recent years to have achieved certification under [Passive House](#), a high-performance building standard developed by the Passive House Institute (PHI) and the Passive House Institute US (PHIUS). The standard focuses on passive design measures and the use of building components such as **insulation, airtightness and heat recovery ventilation** to provide tenants with **enhanced indoor environmental quality** while also increasing long term viability for building owners and tenants by **lowering utility costs**.

Beyond significant energy use reduction, there is a range of additional benefits of Passive House certification for residential projects. Not only do residents in Passive House buildings have significantly reduced energy bills, but the systems provide superior indoor air quality, **consistently comfortable thermal conditions, and improved acoustic comfort** due to reduced noise attenuation from neighbors and street noise.

The building's **Energy Recovery Ventilation (ERV) system**, a key component of Passive House design which continuously exchanges stale indoor air with outdoor air while recovering heat from the outgoing air, **provides residents with fresh, filtered air and helps manage interior humidity levels to prevent mold growth**. This feature is especially meaningful for the project, which is located in a district with one of the worst childhood asthma rates in the country due to high air pollution from heavy traffic and nearby waste transfer stations. By implementing Passive House design, the project is able to reduce energy use and carbon emissions while also addressing a serious health disparity common in dense urban sites.

The project's Passive House design also helps to make the building extremely **durable**, contributing to a prolonged lifespan. In particular, the project's **high-quality and airtight envelope components** will help to ensure that the building remains **resilient in the case of extreme weather** or an extended period without power.

In the case of a winter power outage, the project's envelope system will retain heat inside the building, maintaining a safe interior temperature through passive heat gains. This increases the project's **passive survivability**, keeping the residential units safe and livable without active systems or power for an extended period and allowing tenants to shelter in place. This same temperature-retaining quality of the high-performance building envelope will also help reduce the risk of freeze damage to the building components during extreme cold weather.

In the event of a power outage in the summer season, the building's **ventilation** system has limited connection to the emergency generator to help prevent interior temperatures from increasing to unsafe levels. Additionally, all corridors on residential floors have been designed to maximize daylighting, limiting the need for electric lighting to maintain interior visibility during power outages.

The project's climate resilience is further enhanced by the inclusion of a gas-fired **back-up generator** that can provide both code-required emergency power (fire alarm, emergency lighting, and evacuation elevator use) as well as longer-term power for domestic water pumps, access control, limited plug loads on every floor, Wi-Fi near the lobby, and limited elevator use—crucial for accessibility.

The value of this resilient design feature is significant based on experience from Superstorm Sandy in 2012, where high-rise residential buildings were seen to be especially vulnerable to prolonged power outages as emergency power systems typically only address short-term emergency loads, not the longer-term loads required for sheltering in place.

Cost

The project's total construction cost, calculated to be **2% more than a comparable building**, was significantly impacted by the scope and location. To achieve the proposed density on the project site, under 30,000 square feet, required high-rise development, which is significantly more expensive than low- or mid-rise projects. As the project site is also located on a topographical ridge and adjacent to a subway tunnel, rock excavation, transit engineering, vibration monitoring, and railroad insurance were also needed, further increasing the construction cost. It should be noted that the added costs were somewhat balanced by the reduced operating costs of the building, which helped underwrite a larger permanent loan.

As there is currently limited data on Passive House high-rise construction cost, performance, and economic viability, the project's developer has committed to demonstrating that Passive House is a **replicable solution** by sharing the project's data, details, construction methods, and lessons learned with the wider housing development community.

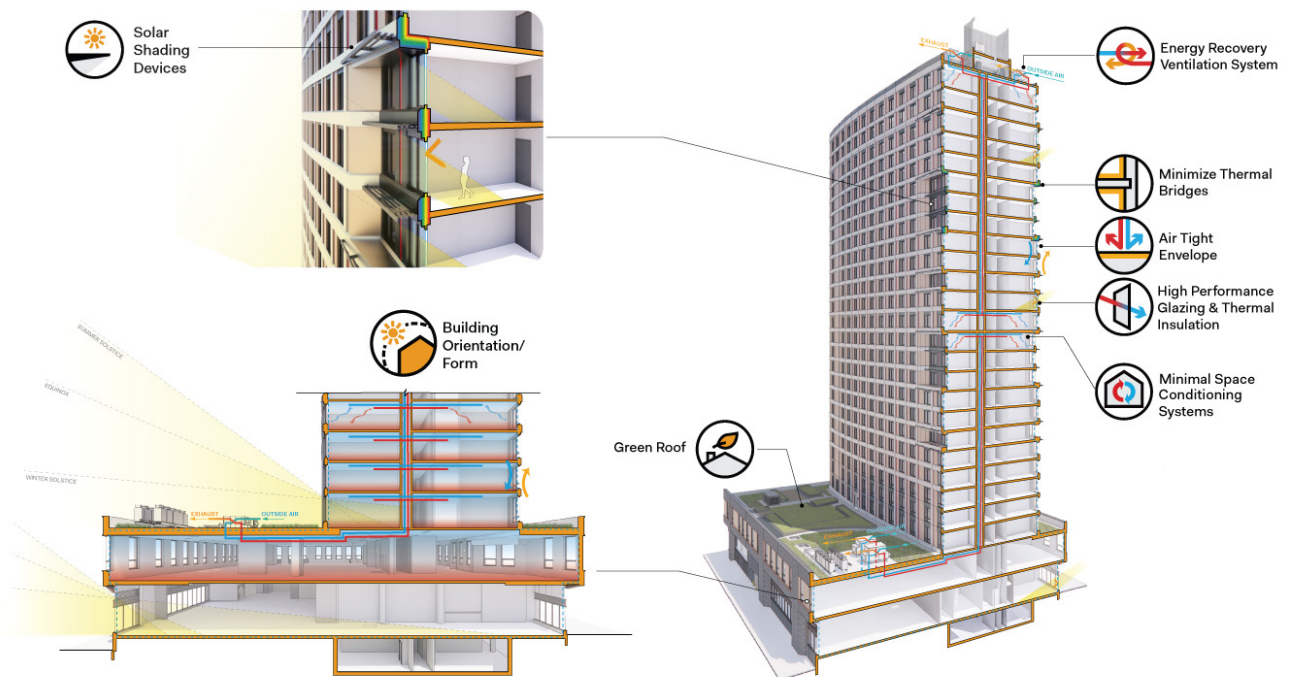


Image: DATNER ARCHITECTS

GREEN BUILDING DESIGN FEATURES

To meet and exceed the minimum requirements of the Capital Green Building Program, including **Enterprise Green Communities** certification and reductions in energy and water use, the project implemented a range of sustainable design features:

SITE + COMMUNITY

The project's massing and site design were developed to achieve **contextual harmony** with the existing surrounding urban environment. The building's north-south massing **minimizes overshadowing** on the adjacent park. The ground-level facade of the building incorporates material transparency to **activate and engage the street front**, while faceted metal panel cladding that varies in color was selected to produce **facade articulation** and break down the large scale of the building.

To promote land conservation and support compact, connected communities, the project is **located on previously developed land**, situated within a densely developed area with a **diversity of accessible uses and amenities** and with established **access to both quality public transit and a bicycle network**. By incorporating community-oriented program spaces for education, health, culture, and retail, the project also contributes to the neighborhood's density of diverse uses and serves as a model of compact development.

The redevelopment of the project site included **environmental remediation** to remove hazardous materials, reducing human and wildlife exposure to pollution and improving ecological health.

To help mitigate the negative impacts of urban heat islands and extreme heat events on the surrounding community, the **project installed roofing and paving materials with high solar reflectivity**. The project's **green roof** areas further contribute to the **reduction of heat island effect** while also **reducing stormwater runoff** by capturing and retaining precipitation, which is then evaporated and transpired back into the atmosphere through the vegetation. This in turn helps to delay the peak discharge of stormwater, reducing the volume of runoff and the associated negative environmental impacts.

WATER CONSERVATION

The project's green roofs and landscaped areas are **planted with native and adapted species** only, allowing for a more **efficient drip irrigation system**.

The building's indoor water use is reduced through the installation of **efficient indoor plumbing fixtures**. Cold water **leak detection** and the **metering of water subsystems** support water management and help the building's operators to identify opportunities for additional water savings by tracking water consumption.

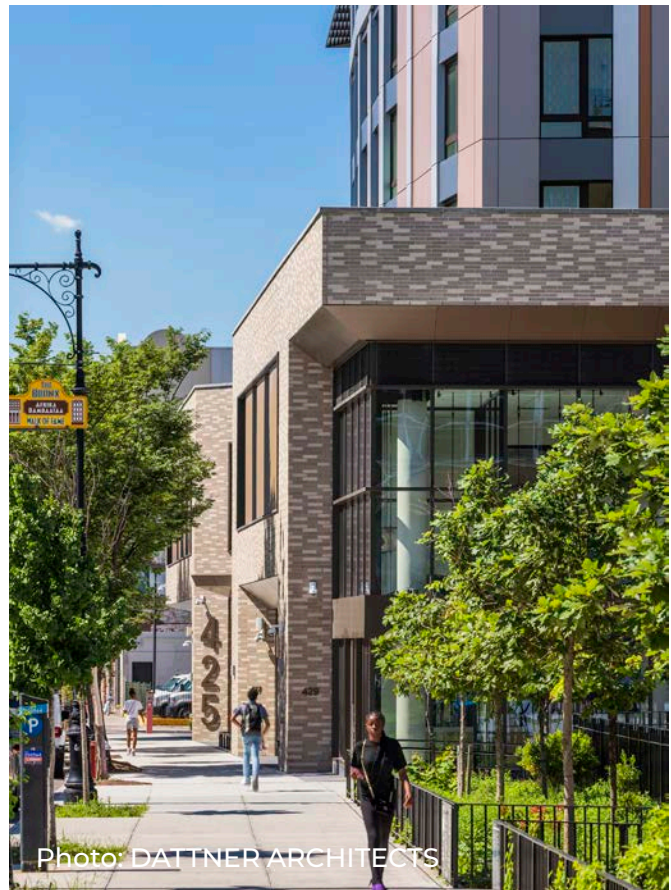
The project is expected to achieve a minimum **30% reduction in annual potable water use** compared to the baseline.

ENERGY USE REDUCTION

- The project is expected to achieve a **Site Energy Use Intensity of 22.1 kBtu/SF/yr**, using up to 70% less energy for heating & cooling than a conventional housing project by implementing Passive House design ([PHIUS+ 2018 CORE certified](#)) that includes:
 - A highly efficient, airtight building envelope designed to meeting strict PHIUS+ performance requirements:
 - 28% window-to-wall ratio
 - Double-pane windows (REHAU uPVC) with a U-factor of 0.32 and solar heat gain coefficient (SHGC) of 0.27—a lower SHGC is helpful in a cooling-dominated building
 - Large-scale sunshades are installed on south facade to further control solar heat gain
 - R-18.5 insulation in above grade walls (continuous mineral wool, CMU backup wall)
 - R-36 polyisocyanurate insulation in roof assembly
 - Continuous thermal and air barriers

The envelope system was carefully detailed to minimize thermal bridging. However, the design team worked to ensure that the envelope construction details were similar enough to standard details, with limited but targeted differences, to allowing the assembly to be easily replicated with standard trades and trade practices.

The project team found that, due to the building's high multi-family occupant density, low surface-to-volume ratio, and efficient envelope system, the building's internal heat gains are sufficient to offset the small amounts of heat loss during the winter and even make the building cooling dominated most of the year.



Prefabricated exterior wall panels were evaluated early in the design process based on the increased quality assurance that would be provided by a controlled assembly environment. Ultimately, it was decided that it would be too great a risk to rely on a single fabricator, which would mean that the panels would need to be installed in sequence and that any error or damage to a panel would halt the installation process until it could be refabricated and delivered. The project's tight construction schedule would not be able to accommodate such delays. Further, the use of prefabricated panels would have substantially limited competitive bidding. Finally, a tower crane would have been needed for installation of the prefabricated panels, which would have significantly increased the project's construction cost.

The team instead designed a wall section that enabled on-site assembly that could be performed by standard building trades. The project's non-load-bearing CMU backup wall allows for the facade to be weatherproofed entirely from the interior side. This is an advantage in high-rise construction as the interior can then be fit out in a controlled environment while the superstructure is still under construction.

- A high efficiency, all-electric HVAC system:
 - Variable refrigerant flow (VRF) air source heat pump (ASHP)
 - To enhance summertime dehumidification capacity and limit short cycling, which can hinder the VRF system's longevity, the team selected wall-mounted indoor evaporator units with a floor-mounted unit located at the partition wall between a bedroom and the living room, where feasible. This calibrates the indoor VRF unit capacities to the building's especially low loads.
 - Branch controllers supply entire floors, allowing for the transfer of energy from an apartment in cooling mode to heat an apartment in heating mode, removing energy load from the ASHP.
 - Energy recovery ventilation (ERV)
 - The centralized ERV system brings in continuous fresh air and removes stale air while exchanging energy between the two streams to precondition the incoming fresh air.
 - This system is ideal for this project given its high level of efficiency based on the typology, resulting in significant construction and operational cost savings while still allowing for Passive House certification. The project team cited maintenance concerns as a key motivation in the selection of a centralized ERV system, as the intake louvers need to be cleaned regularly. Due to the building's height, a decentralized system would have made these louvers inaccessible.

Additionally, the project implemented a range of energy efficient features including:

- Condensing boiler for domestic hot water heating
- ENERGY STAR-rated equipment and appliances
- Electric dryers
- Electric stoves
- Equipment right-sizing
- High-efficacy LED lighting throughout the building, interior and exterior
- Lighting controls:

- Common areas and back of house spaces have bi-level lighting with occupancy sensors
- All corridors have daylight sensors coupled with daylighting design strategies
- Exterior lights have photocell control
- Building monitoring and controls:
 - An extensive system tracks indoor temperature, thermostat settings and readings, and relative humidity in all apartments and common spaces as well as metering energy consumption of all individual building equipment, such as pumps and fans, compressors, and evaporators

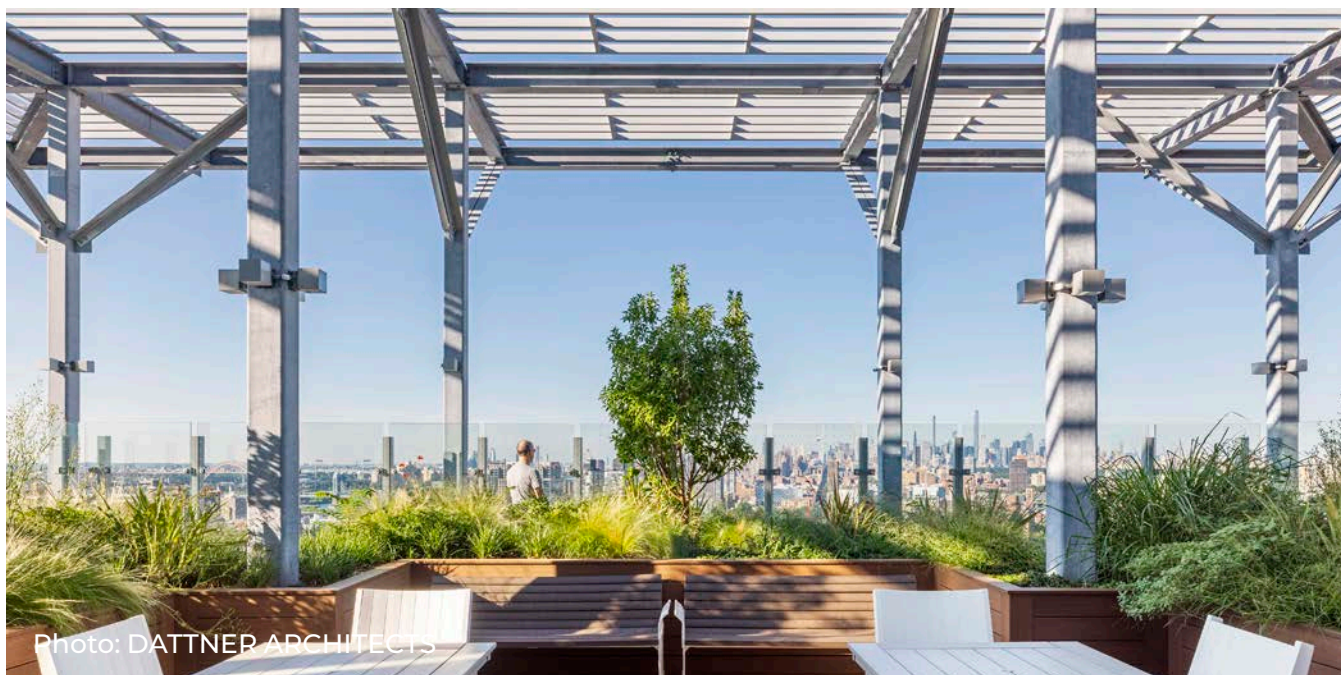
Although each of these measures are considered relatively standard practice, the impact of appropriately aggregating and balancing them all resulted in the project's dramatic energy use reduction. This form of innovation, of **smartly integrating common, proven strategies** to maximize combined impact, further demonstrates that most building projects should be able to achieve similar performance achievements without necessarily having to increase cost by using new or premium components.

The project team identified the DHW system as the biggest challenge to achieving full electrification on this project. Providing an electric DHW system while maintaining the building's high performance would require centralized heat pump water heaters that are large enough and efficient enough to meet the building's water heating load in the summer and, more critically, in the winter season when heat pump performance is reduced. However, at the time of equipment selection, there were limited options in the U.S. market for heat pump water heater options for this type of building. As a result, the project team instead designed a gas-fired condensing boiler that maximizes recirculation efficiency to reduce fossil fuel consumption as much as possible.

The project team carefully design the centralized hot water recirculation layout to reduce the water heating load. Given the project's size and height, the team developed a box design approach, splitting the system into two main zones, with a horizontal loop located at the upper floors and a typical loop on the lower floors. Compared to conventional, less efficient "3-pipe" systems, this approach allowed for a 50% reduction of vertical recirculation risers. In concert with strategically clustered water taps, this box design system greatly reduced recirculation piping and subsequent heat loss. This achieved significant construction and operational cost savings.

Early in the design process, the project team evaluated the potential for on-site photovoltaics and found that it was not economically feasible given that the limited roof availability and high density of the project would mean that PV would offset only a very small percentage of the building's total energy load.

Tenants of the building are also provided access to an **online dashboard that allows for real-time review of their current energy consumption** compared with the average for the building. This method of **occupant engagement** aims to help foster a building-wide culture of energy conscious residents. By making it easier to track and understand their energy use, this strategy empowers residents, helping them to make more informed decisions about how to reduce their energy costs.



MATERIALS

To achieve its goal of **diverting at least 50% of construction waste from landfill**, the project contracted a waste hauler with experience sorting and reclaiming waste materials off-site.

OCCUPANT COMFORT + WELLNESS

The project's airtight and continuously insulated Passive House building envelope **reduces noise transmission, eliminates drafts and cold interior surfaces, limits temperature fluctuations, and optimizes humidity levels**, maintaining a comfortable interior environment. Dwelling units are protected from air pollutants while the mechanical ventilation system continuously provides occupants with filtered (MERV 13), fresh outside air.

To protect indoor air quality from combustion gases, the project team **specified electric dryers and cooktops** for the dwelling units, and the domestic hot water boilers' combustion gases and dryer vents are exhausted directly outdoors.

Low-emitting interior construction materials and finishes were specified to further enhance indoor air quality:

- Low / No VOC coatings and primers
- Low / No VOC adhesive and sealants
- Low / No formaldehyde composite wood products
- Environmentally preferable flooring

Mold-resistant building materials were specified for bathrooms, kitchens and laundry rooms.

The project supports occupant health and wellness through the implementation of [Active Design Guidelines](#), which outline strategies for promoting an active lifestyle. The project features an **on-site**

fitness room, outdoor recreation spaces, and 155 indoor bicycle storage spaces, including space for bike maintenance.

To meet mandatory requirements of Enterprise Green Communities Criteria related to **operations and maintenance and resident engagement**, the project developed a range of resources to help ensure that the building will perform optimally throughout its operational lifetime, including an O+M manual with thorough building operations and maintenance guidance and associated O+M plan, an emergency management manual, and a resident manual that explains the intent, benefits, use and maintenance of the building's sustainable features and that encourages green and healthy practices. To further support O+M and enhance occupant engagement, all residents, property managers, and buildings operations staff were provided a walk-through and orientation to review the project's features, procedures and emergency protocols.

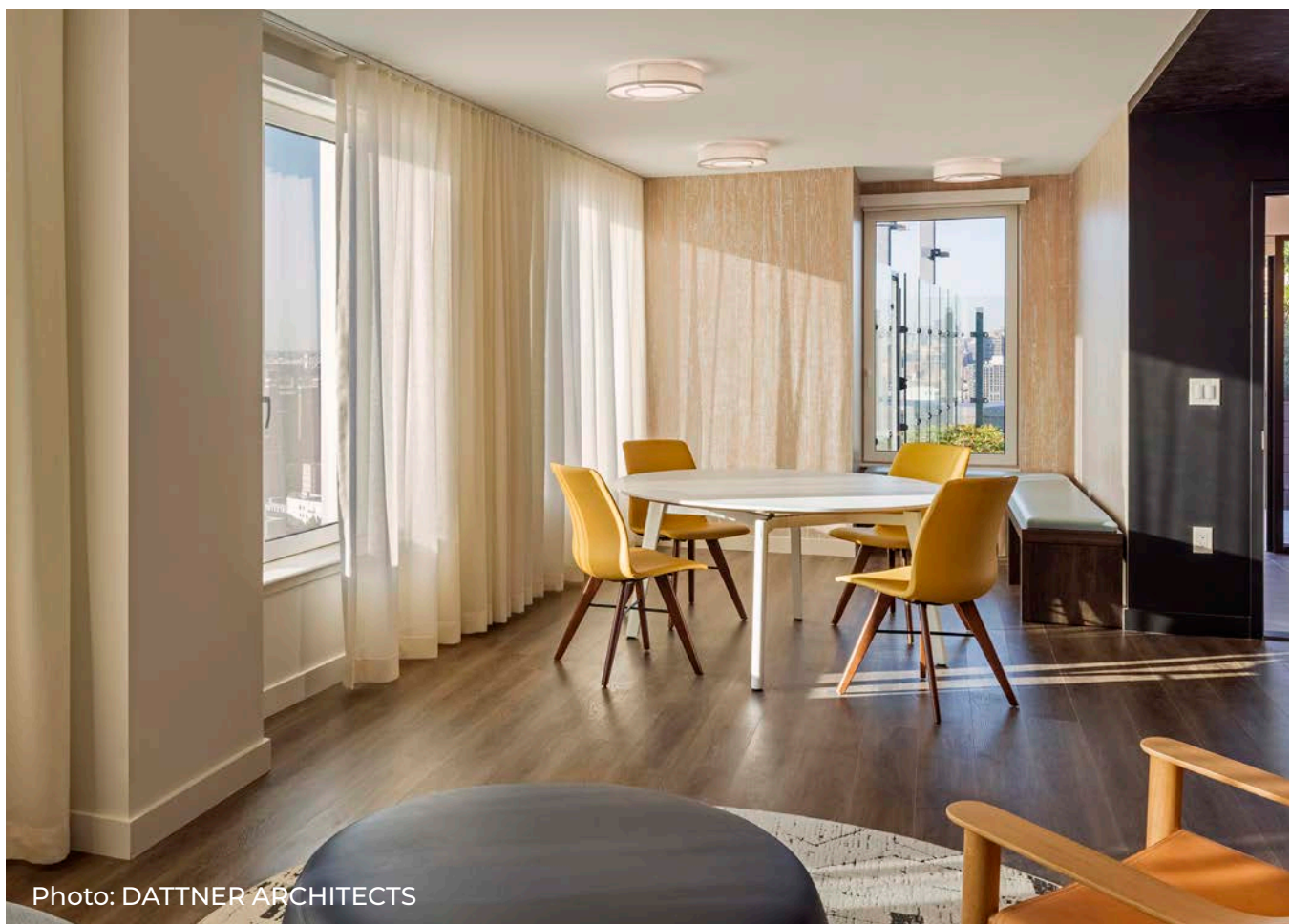


Photo: DATTNER ARCHITECTS

PROCESS + STRATEGY

The project was able to achieve design excellence beyond the minimum requirements of the Capital Green Building Program by implementing an integrative design process. This involved bringing consultants on early in the design process to inform design decisions and maximize collaborative development of synergistic strategies.

Having the general contractor fully involved during the project's design phase was integral to ensuring the project was feasible to construct with widely available trades and helped to avoid delays and cost overruns.

For example, the construction team conducted a cost-benefit analysis early in the design process to evaluate the viability of the backup wall system and the air barrier document sets were reviewed at major design milestones before being finalized. Having a team capable of and willing to make design adjustments collaboratively allowed for a more flexible development process, which helped to meet design goals and reduce costs.

As the redevelopment of the project site to increase development density required rezoning through the [Uniform Land Use Review Procedure \(ULURP\)](#), the design process included and was informed by community engagement and outreach to elected officials.

The project had a dedicated sustainability consultant team that helped to lead environmental design goalsetting and continuously track progress toward the achievement of specific performance goals.

Passive House certification was set as a primary performance target at the very beginning of the project, during goalsetting. Its achievement required close and continuous collaboration between all design team members, the ownership team and the contractor throughout the project. Regular meetings, joint product and equipment research and the establishment of modeling and design parameters were implemented to support this collaborative process throughout.

The energy analysis process began early in the design phase, with updated iterations performed at all design milestones. In the interim, the design team collaborated on system selection research and the development of construction details to continuously refine the design toward the stated performance goals. The team used [WUFI Passive](#) hygrothermal modeling software to assess both specific envelope details and analyze whole-building energy models to assess overall performance and to balance envelope insulation values and their impact on heating, cooling and ventilation systems designs.

During the construction phase, quality control was managed by the general contractor through regular inspections, and intermediary air tightness testing of the critical façade geometries was conducted by the project's Passive House consultant.

The building's mechanical systems were commissioned. The primary goals of the project's MEP commissioning process included verification of:

- proper ventilation flow rates at all constant airflow regulator dampers and ERV units
- correct configuration of the VRF system's control schemes



Photo: DATTNER ARCHITECTS

- balanced and efficient operation of water systems

RESOURCES

- [Improving Resilience in Affordable Housing | BuildingGreen](#)
- [How Six Affordable Housing Projects Got to Green | BuildingGreen](#)
- [When Passive House Goes Big | BuildingGreen](#)
- [Housing design for socialisation and wellbeing | Journal of Urban Design and Mental Health - Centre for Urban Design and Mental Health](#)
- [Multifamily Passive House: Connecting Performance to Financing | Building Energy Exchange](#)
- [Sustainable Practices – Passive House & Affordable Housing | Dattner Architects' Sustainable Practice Group](#)



FASHION INSTITUTE OF TECHNOLOGY

ELECTRIC CHILLER INSTALLATION

TEAM

Sponsor Agency:
Fashion Institute of Technology

Managing Agency:
Department of Citywide
Administrative Services, Division
of Energy Management

MEP: Kallen & Lemelson Engineers

General Contractor:
Johnson Controls/TDX

MINIMUM PERFORMANCE REQUIREMENTS

(Local Laws 31/32 applicable)

- 5% energy use reduction
(from ASHRAE 90.1-2013)

ACHIEVEMENTS

- 19% energy cost reduction
- 24% site EUI reduction
- 21% source EUI reduction
- 11% monthly peak demand
reduction

IMPACTS

- 32,421,282 kWh savings / year
- \$1M+ savings / year
- 1,000,000 kgCO₂e avoided / year

OVERVIEW

The Fashion Institute of Technology's (FIT) installation of a new all-electric chiller at its Pomerantz Art and Design Center **reduces the college's annual greenhouse-gas emissions by about 1,000 metric tons** (equivalent to the energy consumption of approximately 3,000 households) and **saves over \$1 million in annual energy costs**. Due to a closely collaborative approach and a quality planning process, this achievement was completed **without causing significant disruptions** to campus activities.

The project meets and significantly exceeds the minimum energy use reduction requirements of the Capital Green Building Program, achieving a **19% energy cost reduction** compared to ASHRAE 90.1-2013 baseline.

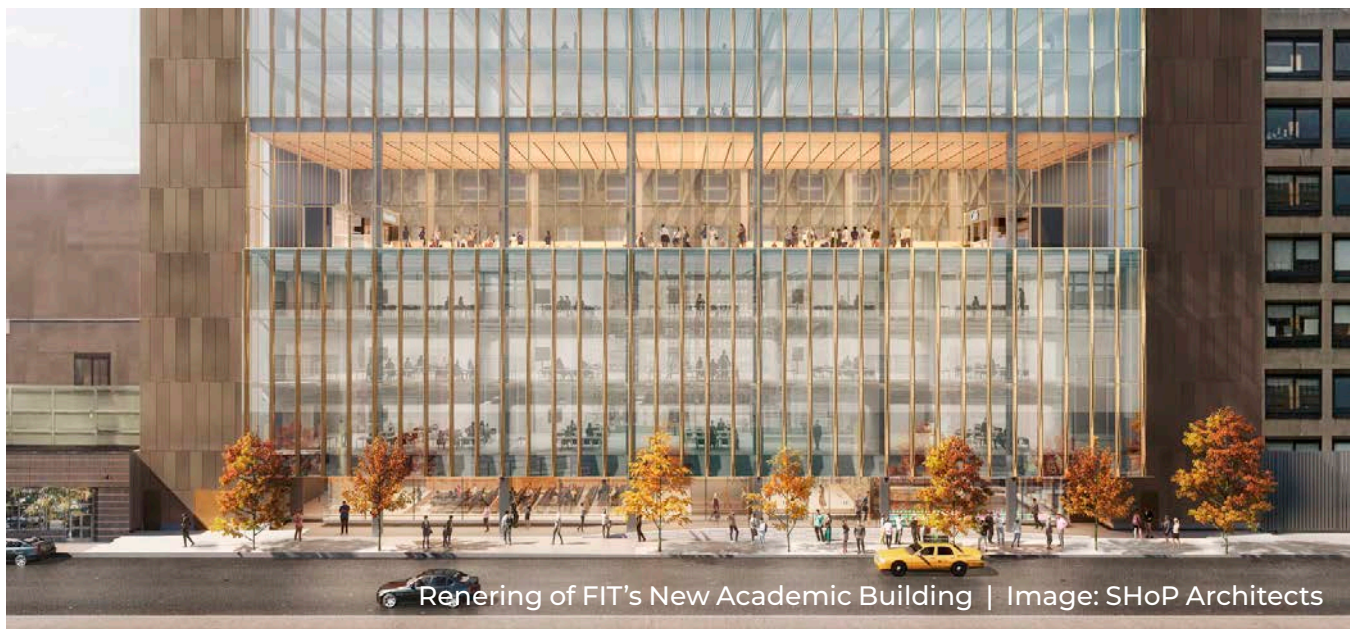
This project significantly contributes toward the achievement of the school's decarbonization goal of reaching **zero emissions by 2050**, and is a model for how the City's public agencies and institutions can make substantial progress toward fulfilling the City's **commitment to phase out fossil fuel infrastructure, as outlined in [PlaNYC: Getting Sustainability Done](#)** and in line with the **[Climate Mobilization Act's centerpiece Local Law 97 of 2019](#)**.

The project, developed and implemented as part of FIT's **Climate Action Plan (CAP)**, adopted in 2007, in collaboration with the **Department of Citywide Administrative Services' (DCAS) Division of Energy Management (DEM)**, demonstrates how building system upgrades can be optimized to eliminate fossil fuel combustion, improve occupant comfort, and save money, helping lead the way toward a carbon neutral, resilient New York City.

The new high-efficiency 1,500-ton electric centrifugal chiller (York MaxE), serving **1,263,000 square feet across five academic buildings** on FIT's Midtown Manhattan campus, replaced the existing 1,000-ton steam turbine centrifugal chiller, which typically utilized fossil fuels for power and which was hampered by low reliability and performance that resulted in higher maintenance and operating costs and higher carbon emissions despite undergoing a refurbishment in 2006.

Electric chiller cooling systems, typically used in large buildings or industrial settings, regulate ambient air temperature and consume less energy compared to steam-driven chillers. As electric chillers are powered by electricity, which can be generated through a mix of renewable energy sources such as wind, solar, and hydropower, they are a key component of the City's shift toward beneficial electrification and are a prime example of the kind of strategies that existing facilities can implement to be able to **reap the benefits of new large-scale renewable energy projects** now coming online to serve the City's electrical grid. For example, in 2026, the City will complete installation of a [transmission line from Canada containing 100 percent renewable power](#).

FIT developed a master plan for the chiller plant to ensure that new and existing equipment are properly integrated, optimized, and able to meet the heating and cooling demands of its expanding campus, including the 100,000 square foot [New Academic Building](#) which is targeting LEED Gold certification—a goal which is significantly supported by the increased energy performance of the chiller plant that will serve it. Among a wide range of green building design features, the new building



project will include a rooftop photovoltaic array, low-carbon construction materials, smart building technology, energy efficient systems, daylighting, filtered water dispensers, efficient indoor plumbing fixtures, and sustainable construction practices.

DCAS COORDINATION

Coordination with DCAS was critical to the success of the chiller upgrade project.

DCAS, which serves as the City's hub for energy management of government operations, serves 80 agencies and more than 4,000 buildings and is tasked with leading the City's efforts to [reduce greenhouse gas emissions by 80% by 2050](#).

Before committing to the chiller upgrade project, FIT conducted a feasibility study, with funds from [DEM's Expenses for Conservation and Efficiency Leadership \(ExCEL\) program](#), to evaluate the viability of multiple replacement options, including direct-fire gas absorption, single-effect lower pressure steam absorption, single-effect absorption steam chillers, double-effect high pressure steam absorption chillers as well as the electric centrifugal system that was ultimately selected.

The **ExCEL Program** provides City agencies with expense funding for energy-saving retrofit projects, operations and maintenance improvements, diagnostic tools, studies, and specialized training for building staff. Between 2014 to 2018, 680 projects across 540 buildings were completed through the ExCEL Program, representing a total investment of \$24M and an expected GHG emissions reduction of 26,800 MT, equivalent to the removal of 5,740 vehicles from the road, with \$11M in annual energy savings and an expected average payback of 2.3 years.

The chiller upgrade project itself was completed as part of [DCAS's Accelerated Conservation and Efficiency Program](#) which provides funding and technical support for energy efficiency, emission reduction and distributed generation capital projects that are identified, managed, and implemented by partner City agencies.

Through the **ACE Program**, DCAS evaluates project proposals from agencies based on their expected emissions reductions, energy usage savings, energy cost savings, and other benefits for the City. Through the program, DCAS has invested in projects including boiler retrofits, chiller upgrades, fuel oil conversion projects, and lighting upgrades, process equipment changes and photovoltaic installations.

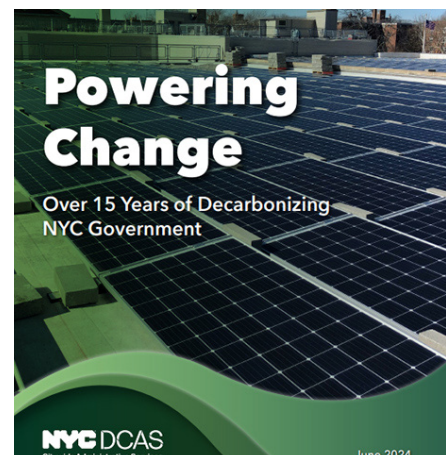
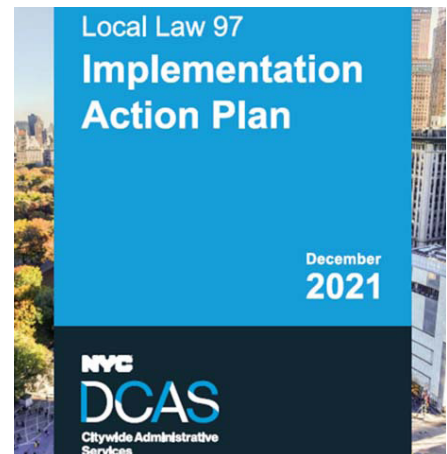
The chiller upgrade project received **DEM funding that covered up to 97% of total costs**, and by collaborating with DCAS, the project was able to achieve **substantial emissions reductions, cost savings, and job creation**, all while maintaining a **simple payback period of under 10 years**.

The FIT chiller upgrade project builds on other recent energy efficiency projects supported by DCAS, including the installation of a new [heating cogeneration plant at the Bronx Zoo](#) in March 2024, and a [55kW solar panel installation at Elmhurst Hospital](#) in January 2024.

The installation of the new, larger capacity electric chiller has also allowed FIT to increase its load commitment to the [City's Demand Response \(DR\) Program](#), launched by DCAS in 2013 to provide city agencies with the ability to earn revenue by reducing their energy usage during periods of peak usage. As part of the energy industry's increasing use of pricing incentives to add flexibility to energy delivery systems, the revenue from this Program is paid by utility companies and New York State's grid manager. City agencies are then able to use earned revenue for building improvements and energy efficiency upgrades.

The Demand Response Program has significant impacts on the City's **decarbonization and resilience** goals by:

- Lowering GHG emissions and contributing to a cleaner environment
- Reducing energy costs by cutting demand charges and earning revenue during DR events
- Enhancing grid reliability during periods of high electricity usage
- Helping to prevent blackouts and brownouts
- Minimizing reliance on inefficient, highly polluting backup power plants



Between 2013 and 2024, City agencies earned total program revenues of more than \$153 million.

FIT CLIMATE ACTION PLANNING

The chiller upgrade project is part of a [broader efficiency effort at FIT](#), begun in 2007 with the development of its **Climate Action Plan (CAP)**, that had already resulted in reducing the college's energy use by 50% (compared to 2005 baseline, saving more than \$3.1 million annually) and its GHG emissions by 57% even before this chiller upgrade project was implemented.

Under this plan, FIT has prioritized measures based on projected energy, carbon, and cost savings, as well as alignment with other scheduled capital projects.

By adhering to this **long-term master plan**, the college has not only dramatically reduced its operating costs and carbon footprint, but has also **improved its ability to coordinate, schedule, and budget for projects** in accordance with the plan's well-defined multiyear strategy. The plan has helped to **streamline maintenance and capital planning practices** and enabled the college to access crucial project funding.

Highlights of the work completed to date under the plan include:

Heating, Cooling, & Ventilation

- Refurbished existing steam turbine chillers; replaced electric chiller with more efficient model
- Upgraded to a higher capacity, more efficient cooling tower
- Installed variable frequency drives (VFDs) on pumps and motors
- Installed HVAC with temperature and humidity controls
- Upgraded ventilation systems
- Installed CO2 sensors, fan VFDs and demand-controlled ventilation

Domestic Hot Water

- Replaced DHW heaters with instantaneous heaters to reduce heat waste
- Refurbished steam condensate recovery units and installed heat exchangers to pre-heat DHW

Lighting

- Converted fluorescent lamps to high-efficiency LEDs
- Installed occupancy and daylight sensors

Controls

- Upgraded elevator, escalator, HVAC, and chiller plant controls
- Upgraded the building management system (BMS) to improve monitoring & management of energy systems

Envelope

- Installed highly insulated windows
- Installed vegetated green roof
- Installed solar panels along with new energy efficient roofs

Additional Measures

- Installed efficient, instantaneous hot water heaters and ENERGY STAR appliances
- Installed 65kW of rooftop solar PV
- Ongoing participation in demand response program

These efficiency upgrades have made FIT a leader in the fight against climate change and an example to other institutions. Funding from DEM, leadership from the college's administration, and a [strong campus culture of sustainability](#) have proved essential to these achievements.

The institute shares several important lessons learned over the course of implementing its plan:

Planning

- Organizations should develop and closely follow a comprehensive, long-term strategy plan to be more strategic in their approach to plant maintenance and to facilitate coordinated scheduling and budgeting.
- Organizations should integrate energy efficiency upgrade initiatives with other scheduled capital projects to promote cost-effectiveness and to minimize disruption to occupants.
- By analyzing the costs and benefits of potential projects as part of their planning process, organizations will increase their access to crucial funding programs.

Commissioning

- It's critical that new equipment be properly commissioned and maintained to achieve projected performance improvements.
- Facilities staff should be trained when new equipment is installed to ensure reliable and efficient operation.

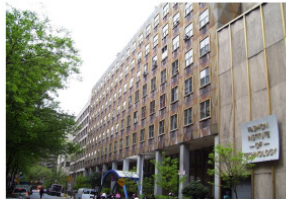
Data Collection

- Plant performance should be monitored in real-time using BMS that is integrated with sensors and equipment to help maximize operational efficiency and to identify preventative maintenance measures.
- Organizations should maintain a historical database on plant performance and energy use to demonstrate the impact of completed upgrades and to identify opportunities for future improvements.

Community Engagement

- Organizations should secure buy-in from affected stakeholder groups and make environmental performance an integral part of organizational culture to maintain momentum for energy efficiency efforts.

Fashion Institute of Technology
By implementing an energy efficiency master plan, FIT reduced their energy use by 50% over twelve years, saving more than \$3.1 million annually.



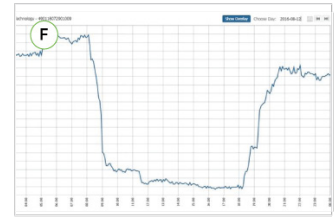
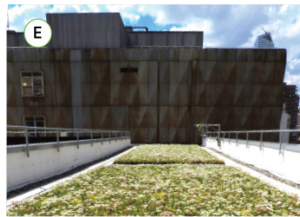
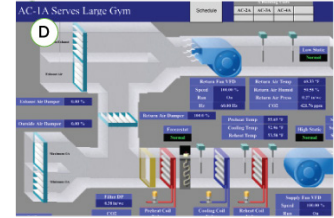
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ex**
 building
 energy
 exchange

NYC Citywide
 Administrative
 Services
 Energy
 Management

project overview
 Project Type
 Energy Efficiency
 Master Plan
 Location
 Manhattan, NY
 Year Project
 Completed
 2020–Ongoing
 Year Base Buildings
 Completed
 1956–1993
 Project Size
 1.8 million sq ft
 9 buildings
 Building Types
 Campus:
 Residential &
 Mixed Academic

project team
 Project Owners
 FIT Administration
 & NYC Department
 of Citywide
 Administrative
 Services/Division
 of Energy
 Management
 (DCAS DEM)
 Oversight, Energy
 Management, &
 Planning Services
 FIT Facilities;
 AEM;
 Kallen & Lemelson
 Grant Funding
 Provider
 DCAS DEM

primary energy figures
 Grant Funding
 97% capital costs
 Simple Payback
 6.6 years
 Annual Savings
 \$3.1 million
 Percentage Energy
 Use Reduction
 (2005–2017)
 • Before
 • After
 Percentage Carbon
 Reduction
 (2005–2017)
 • Before
 • After



APR 2018 1

PROCESS + STRATEGY

The following summarizes the process by which FIT implemented its plan to upgrade the campus's chiller plant in coordination with and supported by DCAS programs.

- FIT began **developing its comprehensive roadmap** to meet the [NYC Carbon Challenge](#) in 2009, outlining specific goals, timelines, and potential projects to achieve GHG reductions across campus operations.
- Between 2010 and 2014 the institute **conducted internal assessments, researched potential technologies, and explored various sustainability initiatives** to inform future GHG reduction projects.
- In 2015 FIT was prepared to **request funding from DCAS ExCEL FY15 to study the feasibility of replacing its steam systems with electric systems** to modernizing the institute's energy infrastructure. The study, completed in 2016, assessed technical requirements, potential energy savings, and environmental impact of transitioning from steam to electric and allowed FIT leadership and sustainability teams to make **informed strategic decisions** and begin preparing for the implementation phase, **including budgeting, resource allocation, and project planning**
- FIT **requested funding from DCAS ACFY17 (ACE)** in 2017 for the implementation of the new electric chiller. Work on **designing the new electric chiller's integration into the campus's existing HVAC systems**, ensuring optimal efficiency and compatibility, took place between 2018 and 2019. The **construction phase**, lasting from 2019 to 2023, involved installation of the new chiller, modifying existing infrastructure, and implementing necessary controls and monitoring systems. As construction concludes, **rigorous testing and commissioning** of the new electric chiller was performed at the conclusion of construction to ensure the system met all performance and efficiency standards.

- Alongside the electric chiller installation project, FIT also initiated an overall chiller plant optimization project, beginning in 2017 with a **request for funding from DCAS ExCEL FY18** for a study. Following the study, in 2018, funding was secured from **DCAS ACE FY19** to implement the chiller plant optimization measures.
- Between 2020 and 2021, engineers developed detailed plans for optimizing the chiller plant, and over the course of time between 2021 and 2023, the optimization measures were implemented, which **involved installation of new control systems** and sensors to enhance overall efficiency.

The project offers lessons learned for how to address the types of challenges it encountered during both planning and construction phases:

PLANNING CHALLENGES:

Integrating sustainability into strategy plan

Strategies:

- Develop clear, measurable sustainability goals
- Integrate GHG reduction and energy efficiency projects into Campus Master Plans
- Develop a long-term electrification strategy

Navigating changes in building use and expansions

Strategies:

- Develop deep, comprehensive knowledge of all campus buildings
- Develop clear tracking systems to maintain awareness of future plans for all campus buildings
- Anticipate ongoing changes to building use and/or expansion

Funding availability

Strategies:

- Develop clear understanding of all available DEM programs
- Partner directly with DEM to advocate for further GHG reduction and energy efficiency initiatives

CONSTRUCTION CHALLENGES:

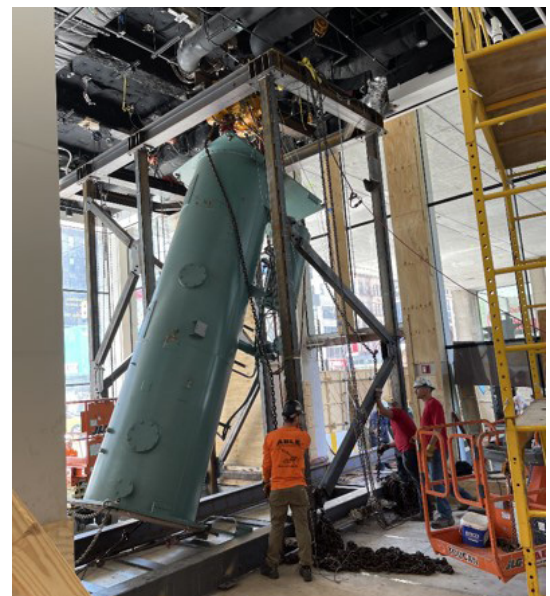
As is common with electrification projects, the new electric chiller required that FIT make modifications to its electrical infrastructure, including the addition of a new 460/480-volt, 4,000-amp electric service connected to a new switchboard and metering section in the sub-basement of one of the buildings. Additionally, a new main service switch for the chiller and a second new main service switch for other assorted power requirements needed to be installed to replace the previous service line and associated switchboard. The project also required the installation of new chilled water flow meters. Coordinating the new equipment with the existing Building Management System (BMS) required significant effort.

Another significant challenge encountered during the construction phase was the COVID-19 pandemic, which caused major delays for the installation of the new electric chiller. Equipment

had been delivered, but the installation and commissioning processes were halted for over a year. This emphasized the importance of proactively addressing warranty terms when external events disrupt timelines, with the key takeaway lessons to always clarify warranty start triggers in contracts, especially for large equipment, and to document project delays and maintain communication with vendors during long interruptions.

FIT shared several keys to the project's success, including having a dedicated operations team that worked in close collaboration with a range of different stakeholders, including the design and engineering team, the institute's administrative services and budget team, as well as the building's various user groups. It was also critical to determine a clear scope of work for each contractor involved.

The success of this project as a component of FIT's larger Climate Action Plan is due in no small part to the Institute's deep and ongoing commitment to sustainability which can be seen to penetrate throughout all levels of administration and operation.



RESOURCES

- [GreenNY Case Study on the Fashion Institute of Technology](#)
- [Building Energy Exchange Case Study - FIT Energy Efficiency Master Plan](#)
- [Competitive Funding Programs - Department of Citywide Administrative Services](#)

L10 ARTS + CULTURAL CENTER



Longitudinal Section Rendering - Programming Insertions
Within Cultural Landscape | Image: Andrea Steele

TEAM

Sponsor Agency:

Department of Cultural Affairs

Managing Agency:

NYC Economic Development Corporation

Architect:

Andrea Steele Architecture

MEP:

Ettinger Engineering Associates

Structural:

RGCE | Rosenwasser / Grossman Consulting Engineers

Energy, Sustainability, Commissioning:

Steven Winter Associates

Lighting:

Horton Lees Brogden Lighting Design

Acoustics:

Lally Acoustical Consulting

A/V:

Boyce Nemec Designs

Theater Consultant:

Fisher Dachs Associates

General Contractor:

SKANSKA

MINIMUM PERFORMANCE REQUIREMENTS

(Local Law 86 applicable)

- LEED Silver (min. 50 points)
- 25% energy use reduction
- 30% water use reduction

ACHIEVEMENTS

- LEED Gold (70 points)
- 28% energy use reduction
- 40% indoor water use reduction

IMPACTS

- 311,672 kWh savings / year
- \$96,618.32 savings / year
- 70,631 kgCO₂e avoided / year
- 179,974 gallons water conserved / year

OVERVIEW

The L10 Arts and Cultural Center is the **City's first multidisciplinary arts hub of its kind**, integrated into a larger mixed-use development which includes affordable housing, retail, and public plaza space. The project, managed by the New York City Economic Development Corporation on behalf of the NYC Department of Cultural Affairs, **presents a model for how to co-locate new housing and cultural spaces, delivering multiple essential community facilities with green building techniques while increasing support to low-income families**, particularly in areas where land for new development is not readily available.

Such projects are a response to the evolution of cities and how expectations of public, private, and commercial space are shifting, causing a reexamination of how different functions can coexist within a single architectural typology, and suggest that buildings no longer need be dedicated to distinct activities, but should instead choreograph a range of activities to reflect the actual rhythms of everyday urban life.

The project is dedicated to **fostering cultural expression and social equity** and strives to promote and amplify underrepresented voices across the arts. Programming will include performances, film screenings, lectures, and exhibitions that will spotlight the diverse creativity of the City.

Serving as a community anchor within the thriving [Downtown Brooklyn Cultural District](#), the project includes approximately 50,000 square feet of cultural space and is **designed to facilitate collaboration among the four partner institutions** it serves:

[Brooklyn Academy of Music \(BAM\)](#)

- 18,500 SF: cinemas, screening rooms, black box theater, lobby, mezzanine circulation area, concessions, flex space
- The project houses BAM KBH, the first public home for the BAM Hamm Archives and the Leon Levy & Shelby White reading room. Together these spaces provide a fully accessible hub for artists, students, and educators to research, experiment, and present community-based art and public programming across film, archive, and performance.

[Museum of Contemporary African Diasporan Arts \(MoCADA\)](#)

- 7,000 SF: exhibition space, education and administrative space, gift shop, café
- The museum's Culture Lab II space celebrates Africa's global diaspora via a diverse lineup of programming, including MoCADA Radio and a Food Residency series.

[The Library for Arts & Culture, Brooklyn Public Library](#)

- 2,500 SF: educational and multipurpose spaces
- The branch features an ever-changing curated collection that reflects the dynamism of the borough, and BPL Presents, the library's cultural programming division, will host events to inspire visitors to interact with their community, experience visual and performing art for the first time, or deepen their connection to the cultural world.

651 Arts

- 12,500 SF: black box theater, rehearsal studios, dressing rooms, gallery/gathering space, education and administrative spaces, artist studio rentals
- The organization's mission is to deepen awareness of and appreciation for the contemporary culture of the African Diaspora and provide opportunities for artists of African descent by presenting live performance-based art, investing in professional and artistic development, supporting cultural exchange, and providing educational arts programming.

The cultural space programming extends outdoors into the Plaza at 300 Ashland, which provides the neighborhood with opportunities for community participation in an open and inclusive space. This plaza is a much-needed new public green space amid the neighborhood's high development density and heavy traffic, and it serves to extend the public streetscape into the project's interior cultural spaces.

[Research](#) has demonstrated that projects like this can serve as vibrant hubs where cultural values, community needs, and sustainability goals intersect. Such projects have the potential to catalyze meaningful dialogue, knowledge sharing, and collective action by:

- Connecting stakeholders
- Fostering learning
- Pioneering new practices
- Championing social, environmental and economic causes
- Creating spaces for engagement
- Preserving heritage and identity

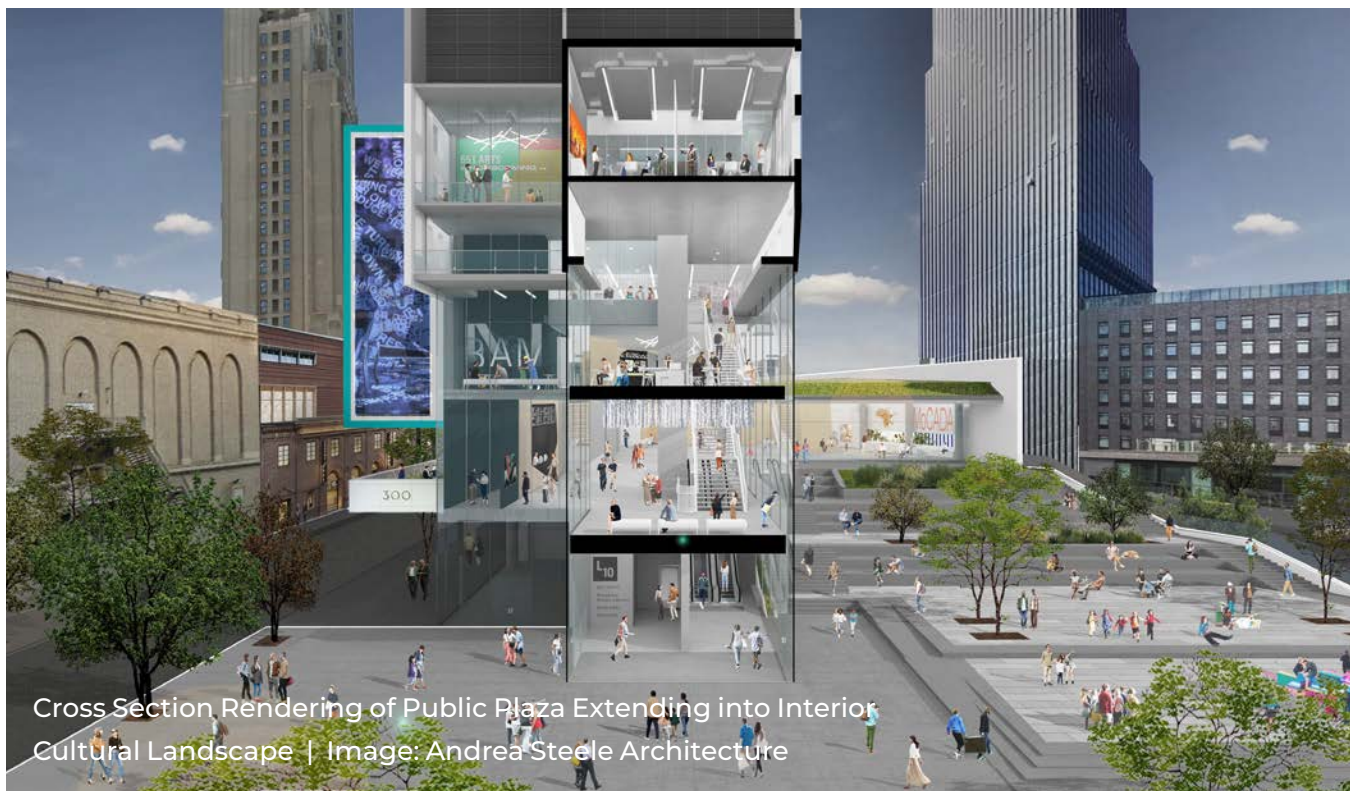
These kinds of projects are indispensable in the effort to address multifaceted and complex societal challenges, as they are uniquely positioned to help shape and direct social transitions in ways that are just, equitable, deeply impactful and long-lasting.

ENVIRONMENTAL + CULTURAL STEWARDSHIP

The project team, in collaboration with the four partner organizations, established specific environmental design priorities:

- High energy performance and reduced operational carbon emissions through efficient lighting and HVAC
- Increased water conservation through efficient plumbing fixtures
- Reduced embodied carbon emissions through the specification of high-recycled content building materials
- Maximized occupant wellness through enhanced indoor air quality, verified thermal comfort design, and access to daylight and views

The project is an example of how the sustainable design of cultural centers **generates opportunities for more meaningful engagement with environmental issues through the lens of cultural and artistic practices.** Through its public commitment to sustainable building design, this cultural



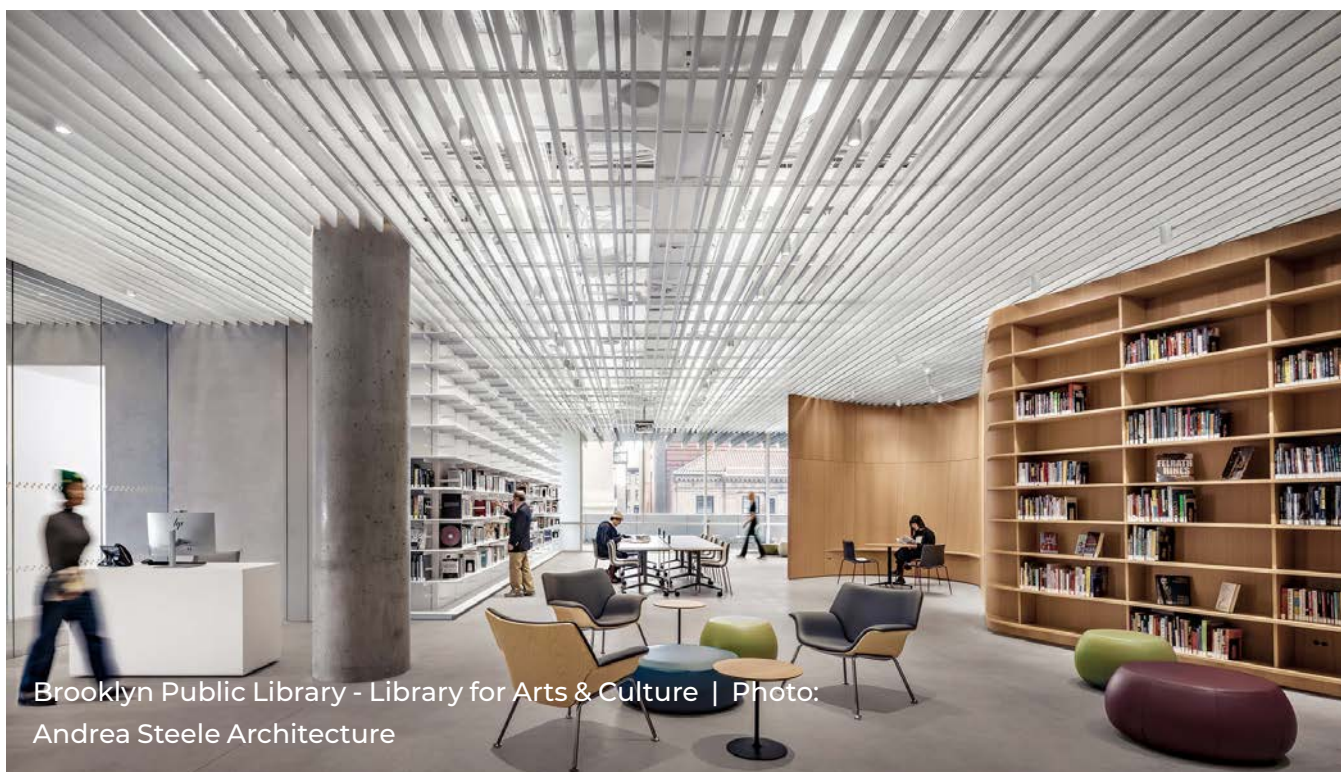
project has the potential to significantly **impact the environmental consciousness of the wider community** by demonstrating the ways in which local artistic practices and traditions are integral to cultivating meaningful connections to place, which in turn promotes **active engagement with and stewardship of the City's diverse social and ecological resources**.

The project models **how environmental and cultural stewardship are not only mutually reinforcing, but equally necessary to the success of the other**. For environmental action to be effective, it must be informed by cultural values and practices. At the same time, for the arts to be sustained and continue to evolve, an ecologically sensitive and regenerative mode of operating is needed.

By intertwining environmental design and inclusive arts programming, the project also highlights how the intersection between sustainable development and cultural diversity are critical to achieving **environmental justice**.

GREEN BUILDING DESIGN FEATURES

As part of the Capital Green Building Program, the project was required to achieve LEED Silver certification and substantial reductions in energy and water use. The project exceeded these minimum requirements, achieving **LEED Gold certification under the Interior Design and Construction (ID+C) rating system** as well as significant energy and water use reductions by implementing a range of sustainable design features:



SITE + COMMUNITY

To promote land conservation and support compact, connected communities, the project is situated within Downtown Brooklyn, a densely developed area with a **diversity of accessible uses and amenities** ([Walk Score: 100](#)) and with established **access to quality public transit** ([Transit Score: 100](#)).

WATER CONSERVATION

The project was able to achieve a **40.33% reduction in indoor potable water use** through the usage of very efficient low flow water fixtures. This includes:

- Water Closets: 1.28 gallons/flush (baseline: 1.6)
- Urinals: 0.125 gallons/flush (baseline 1.0)
- Public Lavatory Faucets (metering): 0.10 gallons/cycle (baseline: 0.25)
- Kitchenette & Concessions Faucets: 1.5 GPM (baseline: 2.2)
- Showerheads: 1.75 gallons/minute (baseline: 2.5)

The installation of the metering low-flow public lavatory faucets and pint-flush urinals were the most impactful strategies for reducing the project's anticipated annual water use. The **pint-flush urinals alone achieved 87% savings** from the baseline, while the metering faucets alone achieved 60% savings.

As the project is located within a newly constructed base building, the project team determined that the installation of low flow plumbing fixtures would be appropriate, without concern that the internal waste line pipes would require the use of pressure assist fixtures, as is often the case with older existing buildings.

ENERGY USE REDUCTION

The project achieved a **28% energy cost reduction** (compared to ASHRAE 90.1-2013 baseline) by implementing a range of energy efficient features including:

- **Efficient lighting system:**
 - 35% lighting power density reduction / LED lighting
 - Lighting controls – daylight and occupancy sensors
- **ENERGY STAR equipment and appliances**
- **Demand Control Ventilation (DCV)**
- **Water-cooled HVAC with high-efficiency plant equipment (boilers and cooling towers)**
- **Energy submetering**
- **Green power purchase**
 - NYC DCAS provided renewable energy credit (REC) coverage for 100% of the project's estimated annual energy use of 1,126,824 kWh (Green-e certified)

The project team identified the lighting system, the demand control ventilation system, and the high-efficiency HVAC plant equipment as the most impactful strategies for achieving the reported savings.

The **energy modeling** software eQuest (v3.65) was utilized to perform all energy simulations for the purposes of evaluating and documenting performance for associated LEED credit requirements and Capital Green Building Standards.

The project team faced several challenges typical to commercial interior fit-out projects within occupied residential buildings, related to coordination with base building MEP systems and differing occupancy schedules. The complexities of programming the HVAC for four cultural tenants with different equipment operational schedules and zoning also had a significant impact on the project's calculated energy performance.

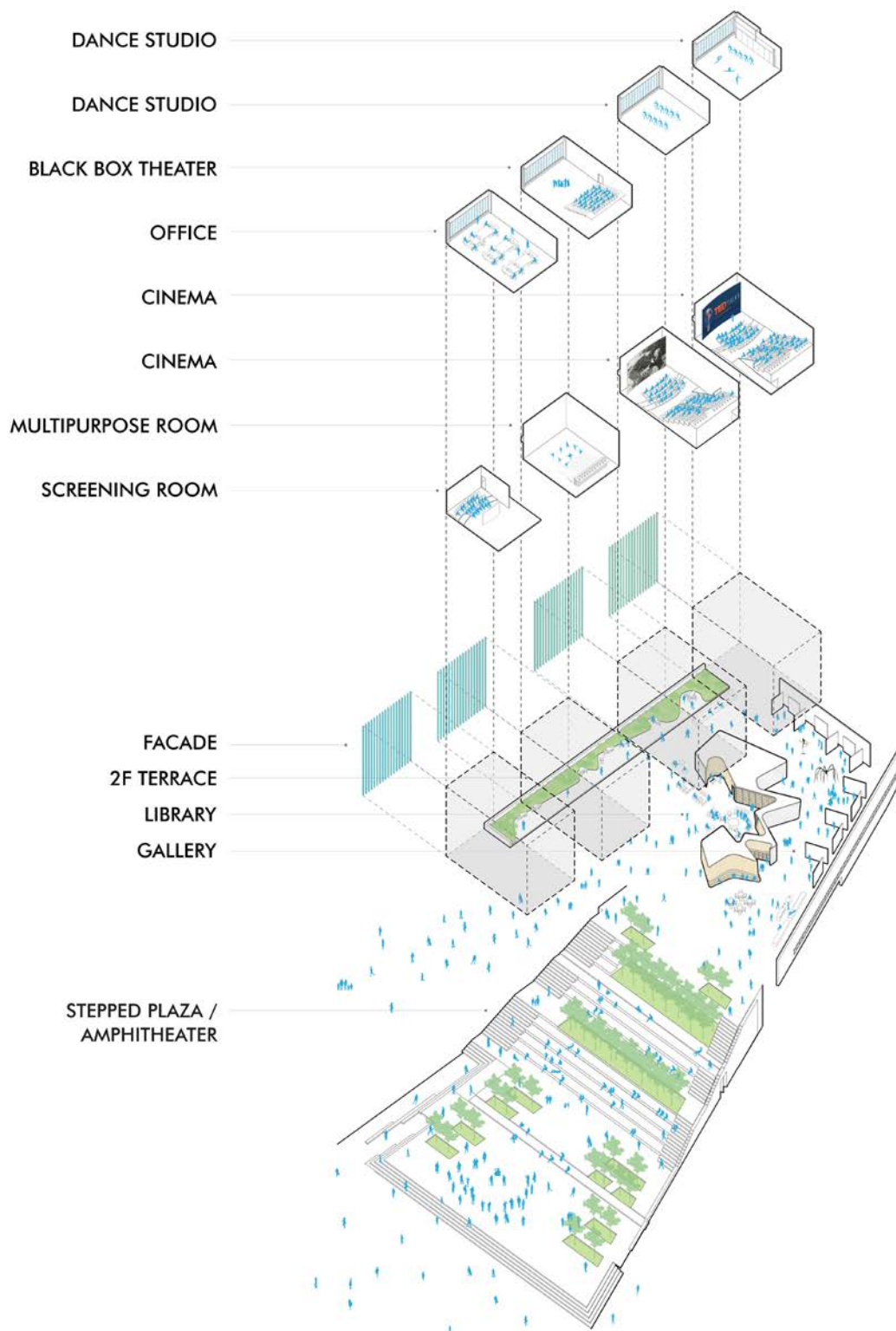
MATERIALS

The project implemented a **Construction Waste Management Plan** and successfully **diverted 90% of construction waste** generated on-site from landfill by implementing strategies like on-site source separation, which targets waste materials that are easily separated and have established recycling markets, such as steel, wood, and concrete.

Approximately **30% of the project's building materials (by cost) contain recycled content**. The project team achieved this by integrating sustainability criteria into the specifications.

OCCUPANT COMFORT + WELLNESS

The project implemented a **Construction Indoor Air Quality Management Plan** throughout the construction phase to minimize indoor air quality issues resulting from contaminants generated by construction activities. The Plan adhered to the SMACNA guidelines for Occupied Buildings Under Construction, which include maintaining a clean work site, protecting ductwork and AHU equipment from contaminants, and protecting absorptive building materials from moisture damage.



Exploded axonometric diagram showing programming components |
Image: Andrea Steele Architecture

Low-emitting interior construction materials and finishes were specified to further enhance indoor air quality:

- Low / No VOC paints and coatings
- Low / No VOC adhesive and sealants
- Low / No VOC flooring systems
- Low / No formaldehyde composite wood and agrifiber products

To ensure a thermally comfortable indoor environment, the project's HVAC system was designed in accordance with the **ASHRAE 55 Standard**, which specifies the combinations of indoor thermal environmental factors (temperature, thermal radiation, humidity, air speed) and personal factors (activity and clothing) that produce thermal conditions acceptable to the majority of occupants. The project team used time-averaged metabolic rates and thermal set points to show that the designed temperatures and anticipated metabolic rates would be comfortable per ASHRAE 55 calculations.

To verify that the project's HVAC system was installed and is operating in accordance with its design, the project team conducted a **post-occupancy thermal comfort survey** of building users. The survey collected anonymous responses about thermal comfort in the building to assess overall satisfaction with thermal performance and identify any thermal comfort-related problems. The team also developed a **corrective action plan** to be implemented if survey results indicate that 20% or more of occupants are dissatisfied with thermal comfort in the building.

The project was also designed to maximize daylight access while also **providing 90% of regularly occupied spaces (excluding theaters) with access to quality views** of the exterior environment.

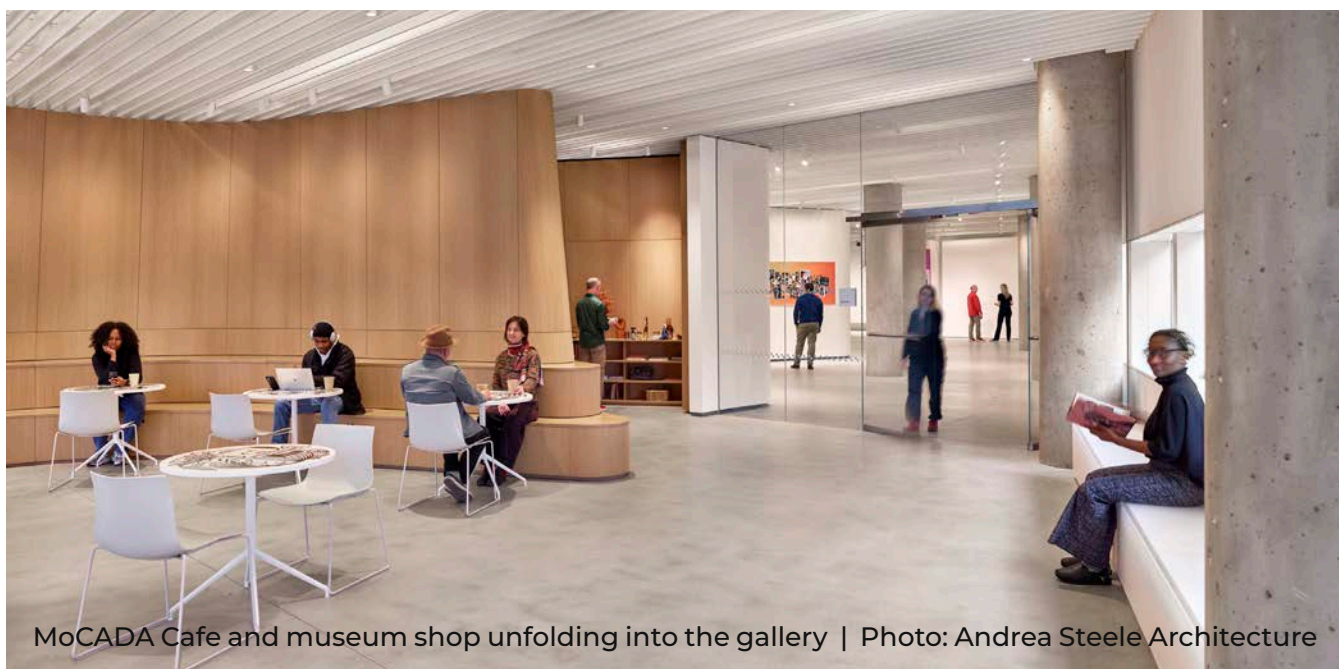
PROCESS + STRATEGY

The project was able to achieve design excellence beyond the minimum requirements of the Capital Green Building Program by implementing a **collaborative process that involved close tracking of sustainability goals** throughout the design and construction phases.

Throughout the development process, the project team worked to nurture and maintain **an integrative design culture** which emphasizes collaboration and inclusivity and helped to guide and focus all stakeholders toward achieving the priority goal of creating an **open, inviting space where art and culture are accessible to every member of the community**.

Project stakeholders and tenants were involved from the beginning of and throughout the design process to provide detailed programming requirements and participate in the discussion of how best to incorporate their respective communities' needs into the design.

The project had a **dedicated sustainability consultant** that helped to lead environmental design goalsetting and continuously review and track progress toward the achievement of specific performance goals.



A **LEED Kick-Off meeting** was held early in the design phase with the core design team members to **set specific sustainability goals and metrics**, including the **development of a detailed LEED Scorecard** indicating all LEED credits targeted for achievement and establishing clear next steps for implementation.

Tracking included the performance of detailed **plan reviews at major milestones** to ensure that targeted sustainability strategies and features were appropriately represented in the project drawings and integrated into the Basis of Design documents and Owner's Programming Requirements. A detailed LEED Checklist tracking tool was used to document assessments of each targeted LEED credit and to communicate specific recommended actions to address any deficiencies in the current design.

Additionally, the sustainability consultant performed multiple milestone **reviews of the project's specifications** to ensure that recommended environmental performance criteria was appropriately incorporated, as well as to identify and remove any building products whose attributes conflicted with the project's material optimization goals.

This LEED review process aligned with **iterative energy modeling** (using the eQUEST Parametric Analysis Tool) that the team used **to evaluate the individual and combined impacts of Energy Conservation Measures** including: high efficiency water source heat pumps, DHW heater systems and efficiency (condensing gas vs. electric), EC motors in HVAC systems, VFD/VSD pump control, cooling tower control, high performance windows, increased envelope insulation and LED lighting systems.

The energy modeling team **evaluated a range of savings metrics** (compared to an ASHRAE Appendix G baseline): operational energy cost, greenhouse gas emissions, source energy, and site energy.

At the start of the construction phase, the sustainability consultant facilitated an **on-boarding session with the construction manager as well as subcontractors** in relevant trades to **ensure cross-team alignment** on the project's environmental performance goals. Subcontractors were required to include specific sustainability criteria and performance documentation with relevant system and product submittals for review by the LEED consulting team.

Commissioning activities began during the design phase and included:

- BMS configuration support
 - setting detailed trends and alarms to help troubleshoot and tune efficiency features like operational schedules, unoccupied ventilation, setpoint setback
- review Code-required water-side economizers
- provide clarification on complex HVAC and humidity controls

The commissioning team's final report included key recommendations and identified **on-going opportunities to continuously improve** the project's energy performance.

RESOURCES

- [CO-LOCATING HOUSING WITH COMMUNITY FACILITIES: IMPLEMENTATION GUIDE | U.S. Department of Housing and Urban Development](#)
- [Just Sustainability from the Heart of Communities: The Transformative Power of Socio-Cultural Centres - European Network of Cultural Centres](#)

P.S. 47 CHRIS GALAS SCHOOL

TEAM

Sponsor Agency:
Department of Education

Managing Agency:
NYC School Construction
Authority

Architect:
Purcell | Everett Architects

MEP: Loring Consulting Engineers

Energy, Sustainability:
Vidaris / Socotec

Acoustics:
Ostergaard Acoustical Associates

General Contractor:
Citnalta Construction

MINIMUM PERFORMANCE REQUIREMENTS

(Local Laws 31/32 applicable)

- NYC Green Schools Guide certification
- Maximum source EUI of 70 kBtu/ft²/yr
- 30% water use reduction

ACHIEVEMENTS

- NYC Green Schools Guide certification
- Source EUI of 65 kBtu/ft²/yr
- 35% site EUI reduction
- 37% indoor water use reduction

IMPACTS

- 125,621 kWh savings / year
- \$38,942 savings / year
- 34,911 kgCO₂e avoided / year
- 190,085 gallons water conserved / year

Photo: Purcell | Everett Architects

OVERVIEW

The NYC School Construction Authority's (SCA) new Chris Galas school (P.S. 47) replaces the former school with a larger, modernized, all-electric building that features on-site renewable energy generation and achieves advanced environmental performance and resilience goals.

The previous building was significantly over capacity and had experienced extensive damage from Superstorm Sandy in 2012. It had also lacked a gym, cafeteria, library, and adequate outdoor play space for students. The new, fully accessible school, which serves grades 3K-8, has 260 seats and 14 classrooms. It includes specialized classrooms and resource rooms, as well as a cafeteria, a community room, a library, a gymnasium, an outdoor play area, and bicycle storage space.

The new school is designed and built to the standards of the [NYC Green Schools Guide \(2019 version\)](#) and is an example of how sustainable building design can be integrated with the SCA's core mandate of delivering high quality projects cost-effectively despite aggressive timeframes.

The project demonstrates a progressive approach to sustainable school design that balances environmental performance, climate resiliency, occupant wellness, and architectural quality. Such sustainable school projects provide a range of benefits to students, school staff and the City as a whole, including:

- Helping the City achieve energy use and carbon reduction goals
- Reducing facility operating costs
- Promoting a healthy environment
- Teaching environmental responsibility and stewardship
- Demonstrating a deep commitment to sustainability across all sectors

Schools like P.S. 47 are models of sustainability that demonstrate first-hand the strategies and solutions needed to achieve a healthy, resilient, prosperous City. Sustainable schools:

- Provide comfortable interior environments where students and teachers are less prone to illness and more focused on teaching and learning, which in turn significantly supports scholastic performance.
 - The improved air quality of sustainable schools has been shown to reduce [student absenteeism](#), which can greatly improve school budgets as the majority of a school's operating budget is dependent on average daily attendance.
- Generate utility cost savings through high-performance heating and cooling systems, energy-efficient lighting, daylighting strategies, water-efficient fixtures and lower operations and maintenance expenses.
 - Per the [Department of Energy, K-12](#) schools spend more than \$8 billion on energy annually, making energy utility costs the second-highest operating expense for schools after personnel costs.
- Provide opportunities for experiential learning as the building itself can serve as a teaching tool that provides real-life examples of concepts being learned in the classroom. Teachers can use the school facility as the basis for project-based, interactive learning in environmental and science, technology, engineering and mathematics (STEM) subjects.

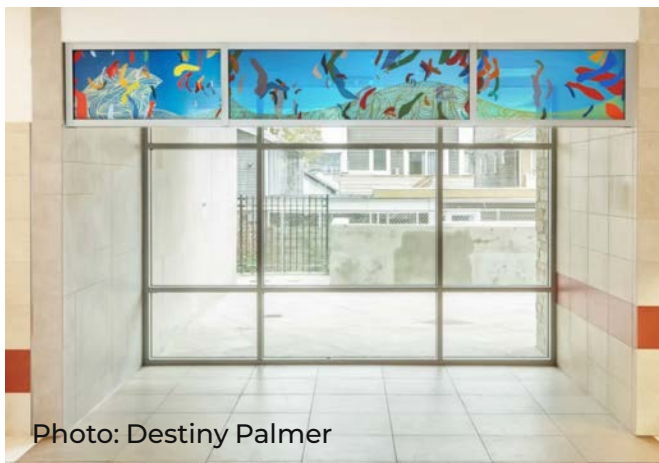
- Provide space for hosting community meetings and activities and serve as disaster-relief shelters, which also helps to educate community members about sustainable living and develop the [social infrastructure](#) of the surrounding neighborhood.
- Improve student behavior, leading to a [reduction in violence, vandalism, and bullying](#).
- Increase [property values](#), boost enrollment, and help to build confidence in a school or district.

As noted by the [Center for Green Schools](#), globally, 1 in 8 individuals set foot in a school every day, and state and local governments invest more capital in K–12 public school facilities than in any other infrastructure sector outside of transportation. These facts emphasize both the importance and the vast potential impact of designing school buildings to be healthy, high-performing, and resilient. The scale of the direct impact that school facilities have on student learning, student and staff health, and school operating costs is massive. The opportunity presented by each new or capital improvement school project is also therefore hugely significant.

In addition to directly impacting health, environmental performance, and costs, sustainable schools can also act as centers of community that impact how community members—students, teachers, staff, parents, neighbors—perceive their fellow citizens, their shared institutions, and their shared future. Sustainable schools play a key role in fostering and maintaining the type of healthy democratic culture of shared responsibility and stewardship that is critical to achieving long-term sustainability and resilience goals.

PUBLIC ART

As part of the [SCA's Public Art for Public Schools program](#), artist Destiny Palmer was commissioned to create an artwork specifically for the new school's lobby. The artwork, titled “Energize. Then go with the flow.” is a printed glass installation of an abstract composition designed to evoke the dynamic energy and life force of local Jamaica Bay. The artwork's luminous color palette, which responds to changing natural light conditions throughout the day, suggests a school of fish or a churning current, symbolizing the joy and energy of learning.



Public Art for Public Schools, established in 1989, is the only public art program dedicated to schools in the country. The program commissions site-specific projects for new school buildings and oversees the maintenance of nearly 2000 existing artworks in the Department of Education's Citywide collection with the goal to provide schools with artworks that visually enhance the learning environment, serve as unique and exciting resources for teaching, and inspire students.

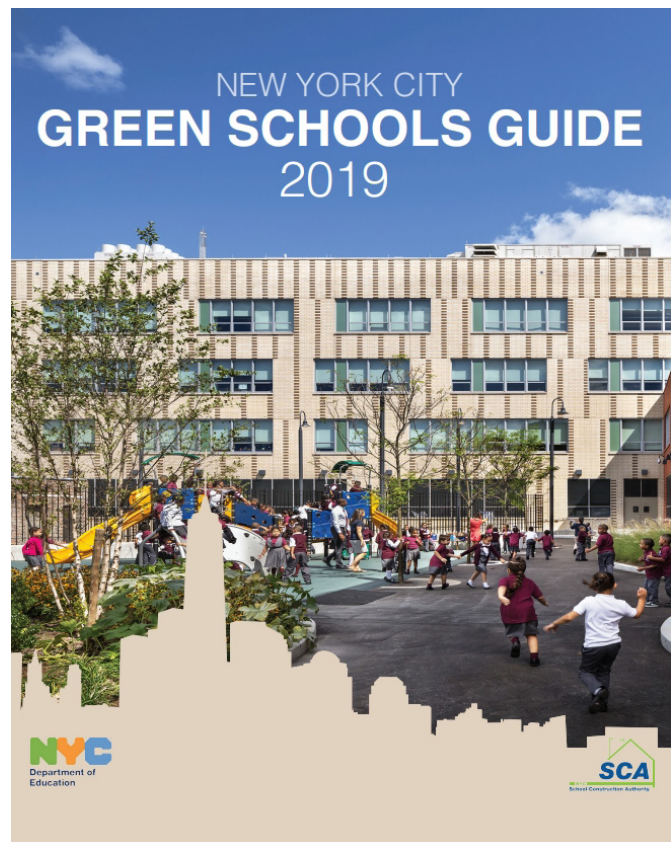
NYC GREEN SCHOOLS GUIDE DEVELOPMENT + SCA DESIGN STANDARDS

The SCA and DOE developed the [NYC Green Schools Guide](#) rating system (GSG) to fully integrate and embed the City's capital green building standards into its standard design and construction processes. The GSG development process involved analysis of each LEED credit to evaluate its specific applicability to NYC school projects. Additional state guidelines for sustainable schools were also reviewed, and best practices based on prerequisites and credits from the [Collaborative for High Performance Schools \(CHPS\)](#) rating system were incorporated. The result of this process is a tailored green building rating system that better addresses and targets the specific sustainable issues in the design, construction and operation of New York City public schools, which helps to reduce the cost and complexity of achieving a high level of environmental performance in the City's school buildings.

Along with the SCA's full range of design standards, which cover all aspects of school design from architectural planning to specific MEP systems and include Design Requirements, Standard Specifications, Standard Details and Room Planning Standards, the GSG system supports the SCA's mission to standardize the approach to sustainability in order to **contain costs, reduce complexity, maintain aggressive project delivery schedules and to direct Design Teams** in a systematic and efficient manner. This is critical to the SCA's ongoing ability to meet the consistently high-volume demand for school construction projects in the City.

Because the SCA has embedded the requirements of the CGBP into its standard processes through the application of the GSG, the project **did not incur additional costs or scheduling impacts** to achieve compliance.

The design and construction of sustainable school buildings like P.S. 47 also support the [DOE in achieving its mission](#) to embed sustainability into every aspect of the organization and help achieve the City's climate goals through the following initiatives:



- Reducing energy use in school buildings to reduce greenhouse gas emissions
- Providing resources and support to reduce and manage waste
- Offering climate leadership programs for educators, students, and facilities staff
- Promoting access to school gardens and outdoor learning

GREEN BUILDING DESIGN FEATURES

To meet and exceed the minimum requirements of the Capital Green Building Program, including NYC Green Schools Guide certification and reductions in energy and water use, the project implemented a range of sustainable design features:

SITE + COMMUNITY

To promote land conservation and support compact, connected communities, the project is **located on the previously developed site** of the former school, situated within a **densely developed area** with a **diversity of accessible uses and amenities** and with established access to quality public transit.

The project also includes **bicycle storage** and shower facilities to promote transportation efficiency and reduce vehicle distance traveled while also encouraging physical activity.

The redevelopment of the site included the **remediation of pollutants and hazardous materials** to reduce human and wildlife exposure to environmental pollution and improve environmental health.

To assess site conditions prior to design, evaluate sustainable options and inform site design decisions, the project conducted an **enhanced site assessment** that included the following information:

- Topography
- Hydrology
- Climate
- Vegetation
- Soils
- Human use
- Human health effects

To reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation, the project implemented a **soil erosion and sediment control plan**.

To create exterior open space that encourages interaction with the environment, social interaction, passive recreation, and physical activities, at least **30% of the project site is vegetated, pedestrian-oriented open space**.

To **reduce light pollution**, increase night sky access, improve nighttime visibility, and reduce the consequence of development for wildlife and people, the project's exterior lighting **is designed to meet upright and light trespass requirements**.



To help mitigate the negative impacts of urban heat islands and extreme heat events on the surrounding community, the **project installed roofing and paving materials with high solar reflectivity.**

The project's **green roof** also contributes toward the reduction of urban heat island effect in addition to **removing pollutants** from the air, **sequestering carbon**, and **enhancing stormwater management and water quality** by slowing stormwater runoff and filtering pollutants from rainfall.

To facilitate a high level of parent and community access and involvement, the project is **designed to enable joint use of the school facility.** This allows for neighborhood meetings, recreation activities, and other community functions to be held at the school safely and securely.

WATER CONSERVATION

The project's **landscaping is designed to be water efficient**, incorporating low-maintenance and drought-resistant **native** plant species that do not need permanent irrigation. This contributes to the project's total conservation of potable water through each year of operation.

Due to the installation of **efficient indoor plumbing fixtures**, compliant with SCA Standard Specifications and Plumbing Design Requirements for high efficiency toilets, urinals, shower heads, and aerated metered faucets, the project achieved a **37% reduction** from the baseline annual indoor water use projected for the building.

The project includes **water sub-metering** to monitor the water use for domestic hot water, exterior wall hydrants and indoor plumbing fixtures.

ENERGY USE REDUCTION

The project achieved a source **EUI of 67.6 kBTU/sf/yr**, a **26% reduction** and a **32% energy cost reduction** from the ASHRAE 90.1-2013 baseline by implementing a range of energy efficient features including:

- Right-sized, all-electric high-efficiency heating and cooling system
 - Heating: Packaged Variable Air Volume with heat pump
 - Cooling: Split DX

Per SCA design requirements, all major **HVAC components must be designed to correctly match loads to preclude unnecessary over-sizing** and to ensure energy efficient operation. HVAC systems are required to be configured to efficiently handle peak design load conditions and to operate in an energy-efficient manner during a wide range of partial load conditions, which represent the operating ranges that HVAC systems typically manage most of the time.

Full building electrification required SCA to update design requirements and MEP standards and design practice, including equipment selection, for use on this project, setting a precedent for future projects. The SCA's energy modeling guidelines and school-specific energy analysis templates also needed to be updated for use on this all-electric project.

- Heat recovery ventilation
- Demand-controlled ventilation
- High-performance building envelope
 - Roof: R-value: 40 / U-value: 0.024
 - 8" extruded polystyrene
 - Exterior mass wall: U-value: 0.057
 - Precast sandwich panel system with 4" of insulation
 - Glazing: U-value: 0.3 (fixed) / 0.4 (operable)
- Reduced lighting power density: 0.42 W/sf
- Lighting controls: daylight and occupancy/vacancy sensors

A primary challenge for school projects pursuing advanced energy reduction goals is the high energy intensity of their kitchens, which account for about a third of a school building's annual energy consumption.

The project's **high-efficiency interior lighting and all-electric HVAC systems**, along with the implementation of **Heat Recovery Ventilation** together contributed the most toward the project's energy use reduction achievement. The final energy model report shows predicted energy savings achieved per end use:

- Interior Lighting: 27%
- Space Heating: 33%
- Space Cooling: 16%
- Domestic Hot Water: 12%



- Ventilation Fans: 9%
- Exterior Lighting: 2%
- Miscellaneous Equipment: 1%

This project is equipped with a **Building Management System (BMS)** to allow complete monitoring and control of the school's HVAC systems, exterior lighting, and hot water systems.

Additionally, to support ongoing energy management within the school and identify opportunities for additional energy savings by tracking building-level and system-level energy use, the project installed **energy sub-meters** to track consumption of all individual energy end uses that represent 10% or more of the total annual consumption of the building.

To reduce ozone depletion and minimize direct contributions to global warming, the project **specified HVAC equipment refrigerants with low ozone depletion potential (ODP) and low global warming potential (GWP).**

The project's **rooftop solar photovoltaic system** will generate an estimated **32,263 kWh per year**, which accounts for **9%** of the building's total annual energy use.

In combination with reducing the project's energy demand to the greatest extent feasible, the project has committed to **procuring at least 50% of its electricity from renewable sources (Green-e certified).**

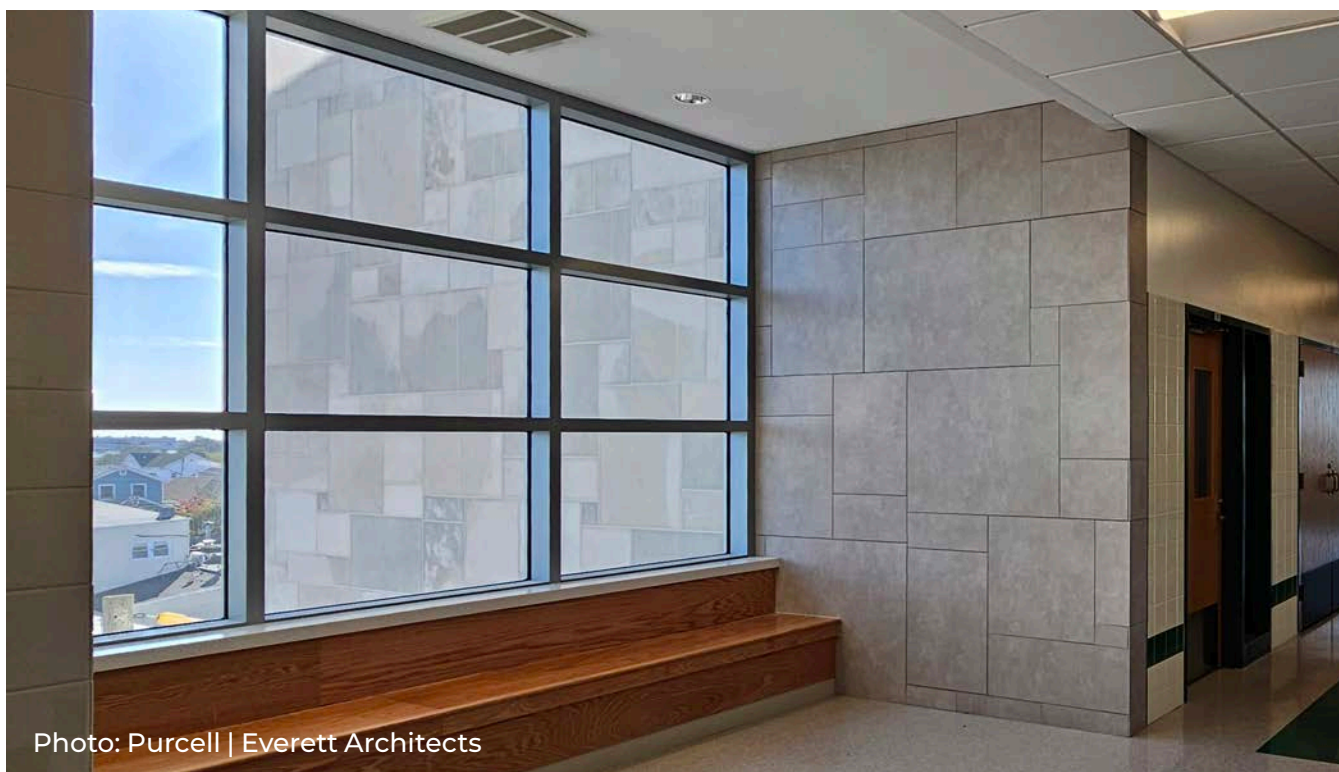


Photo: Purcell | Everett Architects

MATERIALS

The project implemented a **Construction Waste Management Plan** and successfully **diverted at least 75% of construction waste** generated on-site from landfill.

To encourage the use of products and materials for which critically reviewed life-cycle information is available, the project specified that the contractor install a **minimum of 20 products** from at least 5 manufacturers with **Environmental Product Declarations**.

To encourage the use of products and materials for which material ingredient information is available, the project specified that the contractor install a **minimum of 20 products** from at least 5 manufacturers with qualified **material ingredient reporting** (manufacturer inventory, Health Product Declaration, Cradle to Cradle certification, Declare Label).

OCCUPANT COMFORT + WELLNESS

To contribute to the comfort and well-being of building occupants and to ensure a minimum level of indoor air quality (IAQ), the project's ventilation systems were designed to meet requirements of **ASHRAE 62.1-2010**.

To further enhance IAQ, the project was designed to **reduce and control pollutant entry into buildings and later cross-contamination of all occupied areas** via the following strategies:

- Employ permanent entryway systems to capture dirt and particulates from entering the building at regular entry points that are directly connected to the outdoors.
- Sufficiently exhaust each space where hazardous gases or chemicals may be present or used.

- Provide occupied areas with air filtration media that provides a Minimum Efficiency Reporting Value (MERV) of 13 or better.

An **ASHRAE Outdoor Air Assessment** was also performed to verify that no facilities with the potential to affect the outdoor air quality are located near the school.

Low-emitting interior construction materials and finishes were specified to further enhance indoor air quality:

- Low / No VOC paints and coatings
- Low / No VOC adhesive and sealants
- Low / No VOC flooring systems
- Low / No formaldehyde composite wood and agrifiber products

The project implemented a **Construction Indoor Air Quality Management Plan** throughout the construction phase and performed a **building flush-out** prior to occupancy to remove contaminants generated by construction activities.

To ensure a thermally comfortable indoor environment, the project's HVAC system was designed in accordance with the **ASHRAE 55 Standard**, which specifies the combinations of indoor thermal environmental factors (temperature, thermal radiation, humidity, air speed) and personal factors (activity and clothing) that produce thermal conditions acceptable to the majority of occupants.

To promote occupants' productivity, comfort, and well-being, the project specified **light fixtures that meet enhanced quality standards** and installed **lighting controls** that enable occupants to adjust the lighting to suit their individual tasks and preferences.

To provide students and staff with a connection to the outdoors, the project was designed to maximize daylight access while also **providing at least 75% of regularly occupied spaces with access to quality views** of the sky and the exterior environment.

To provide classrooms that support clear teacher-to-student and student-to-student communication through effective acoustic design, the project implemented a range of strategies, including:

- Limiting **HVAC background noise** to 40 dBA
- Implementing acoustic treatment and other measures to minimize noise intrusion from **exterior sources and control sound transmission** between classrooms and other core learning spaces.
- Installing sound absorptive materials to adhere to **reverberation time** requirements for classrooms and other core learning spaces.

To incorporate regular physical activity into daily life and school routines, the project implemented **active design features** including a main staircase that enables occupants to travel between floors, and an on-site recreation space with exercise opportunities for both adults and children that is open and accessible to all users.

To **prevent mold growth and protect building users** from the harmful effects of exposure to mold, the project incorporated **mold resistant wallboard and roof deck materials**.



Photo: Purcell | Everett Architects

RESILIENCE

The project team performed a **climate resiliency assessment** as part of the GSG IDP process, evaluating heat, precipitation, and sea level/storm surge risks. Based on the outcomes of this assessment, the project incorporated resilient design strategies including **elevating the building above flood levels** and **installing a green roof** to enhance stormwater management.

PROCESS + STRATEGY

The project was able to include all these features cost-effectively and achieve design excellence beyond the minimum requirements of the Capital Green Building Program by implementing an **integrative design process** including all consultants and sub-consultants.

All projects pursuing Green Schools Guide certification are required to implement an [Integrative Design Process \(IDP\) as developed by SCA](#) to **identify opportunities to achieve synergies across disciplines and building systems** using a range of analyses of potential schemes to inform the project design:

- Energy ([SCA Box Model Summary Template](#))
- Daylight
- On-Site Renewable Energy (per Charter Section 224.1; [SCA Report Template](#))
- Geothermal Feasibility (per Local Law 6 of 2016; [Geothermal Tools](#))
- Water

- Green Infrastructure (per Charter Section 224.1; [NYC Stormwater Manual](#))
- Life-Cycle Impacts ([SCA LCA Discovery Tool](#))
- Active Design ([SCA Template](#))
- Acoustics
- Climate Resiliency (per [NYC Climate Resiliency Design Guidelines](#))

The project had a **dedicated sustainability consultant** that helped to lead environmental design goalsetting and continuously track progress toward the achievement of specific performance goals. The status of the project's environmental performance goals was reviewed regularly as part of the design team's GSG submission review meetings at major design phase milestones.

The project team performed **whole building energy modeling** (using eQuest) throughout the design phase to analyze and identify the most impactful energy conservation measures. The SCA has developed templates for use in project-specific energy modeling based on its prototypical design case and different size buildings to give designers a guide to creating their own project-specific models that are repeatable and use consistent information. The use of a uniform format allows for a more efficient and higher-quality review of submitted energy models.

The project implemented a **building systems commissioning process** to verify installation, calibration and performance of the project's energy-related systems in accordance with ASHRAE Guideline 0-2013 and ASHRAE Guideline 1.1-2007 for HVAC&R Systems. This process helped to ensure that the project will achieve its specified operational performance goals for energy and water use, indoor environmental quality, and durability.

A primary challenge for all SCA projects derives from the need to balance the NYC Public School System's urgent and increasing need for greater classroom capacity to meet rapidly growing demand with the need to meet evolving high performance design standards. As public school projects not only need to be delivered on ambitious and accelerated timeframes but also need to cost-effectively achieve progressive environmental performance goals, the SCA relies on its strong partnerships with those design and construction consultants leading the building industry and driving adoption of innovative solutions.

RESOURCES

- [NYC Green Schools Guide](#)
- [Center for Green Schools | Advancing green schools](#)
- [Collaborative for High Performance Schools \(CHPS\)](#)
- [Schools as Community Infrastructure - Siegel Family Endowment](#)

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