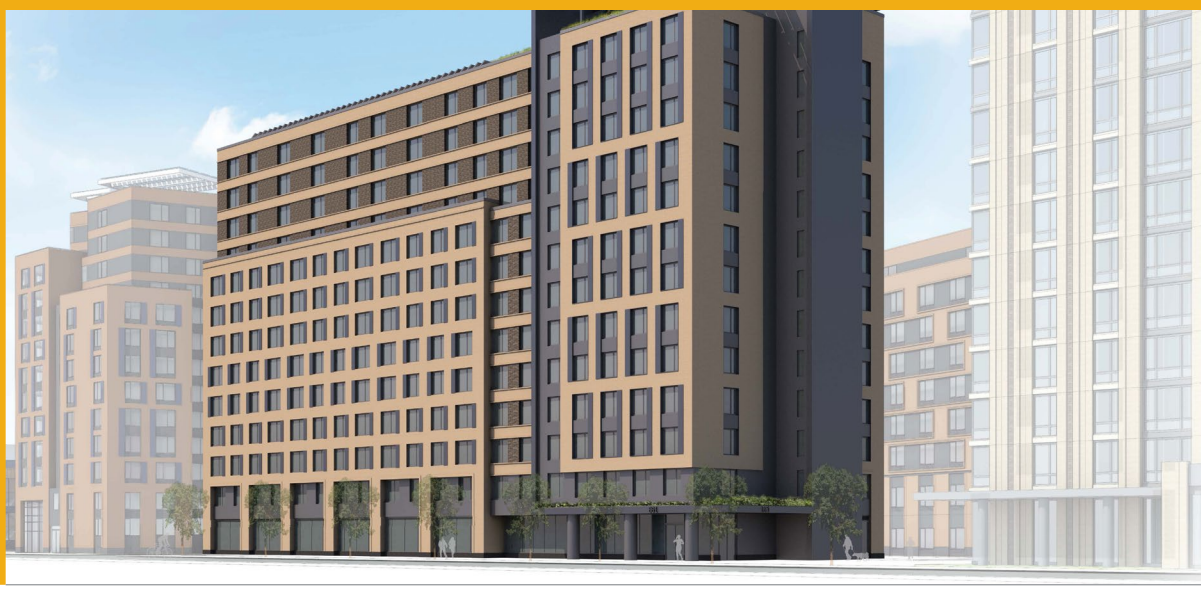
La Central Building C

NEW YORK STATE OF OPPORTUNITY. Buildings of Excellence

As part of the State's effort to achieve a carbon-neutral economy, NYSERDA initiated the Buildings of Excellence (BOE) Competition in early 2019. The competition recognizes and rewards the design, construction, and operation of very low- or zero-carbon emitting multifamily buildings.

nyserda.ny.gov/boe



Project Details

Location:
Bronx, New York

Project Area:
166,711 sq.ft.

Number of Buildings:
1

Number of Stories Per Building:
13

Number of Units:
168

Project Cost:
$86,149,665

Cost per Gross Square Foot:
$516.76

Market Sector:
LMI

Construction Type:
New

Construction Start Date:
December 2022

Completion Date:
December 2025

REDC Region:
New York City

Developer:
Hudson Companies and BRP Companies

Architect & Design Team Lead:
FX Collaborative and MHG Architects

Technologies Used:
VRF, ERV, (potential) central HP water heating under review, induction cooktop, PV

All-electric, passive house design in mixed-use affordable multifamily

Background

La Central is a five-building, 1000-unit, mixed-use development that will deliver in two phases housing, new retail, community space in a 50,000 square foot YMCA, and a television studio. Located in the Melrose neighborhood of the Bronx, the development's residential units are 100% affordable housing. Eligibility to reside in La Central will be limited to households that earn between 30% and 130% area median income (AMI), and 60% of all units will be reserved for those below 80% AMI.

La Central Building C will be designed to achieve Passive House certification, and the design team is using both financing and design strategies to ensure the project is both cost-effective and replicable for future development. The development team is also aiming to meet the requirements of Passive House+ and LEED Gold as well as to make the project all-electric.

The project is designed to be integrated into the surrounding neighborhood to demonstrate that highly energy-efficient buildings can fit within the surrounding context without looking out of place.

Key Project Features

Key high-performance building strategies in La Central Building C include:

- ✓ **HVAC:** Air source heat pumps (ASHP), variable refrigerant flow (VRF), system energy recovery ventilators (ERV), sensors and controls.
- ✓ **Water Heating:** ASHP, centralized hot water recirculation layout.
- ✓ **Envelope:** Continuous exterior mineral wool insulation.
- ✓ **Passive:** PHI
- ✓ **Lighting:** LED with controls
- ✓ **Appliances:** Electric laundry and cooktops
- ✓ **Renewables:** On-site solar photovoltaics (PV)
- ✓ **Resilience strategies:** Passive survivability
- ✓ **Other:** Energy management system (EMS) and building management system (BMS).

Predicted Site Energy Use Intensity (EUI): 14.6 kBtu/SF/yr
Net Site Energy Use Intensity (EUI): 11 kBtu/SF/yr
Predicted Renewable Production Intensity (RPI): 3.6 kBtu/SF/yr

Energy Code Baseline: 2016 NYS Energy Conservation Construction Code (ECCC)
Performance Path: Passive House Institute US+ (PHIUS+)
Certification: Passive House, LEED Gold, aiming for PHIUS+

Planning and Design Approach

Project Goals

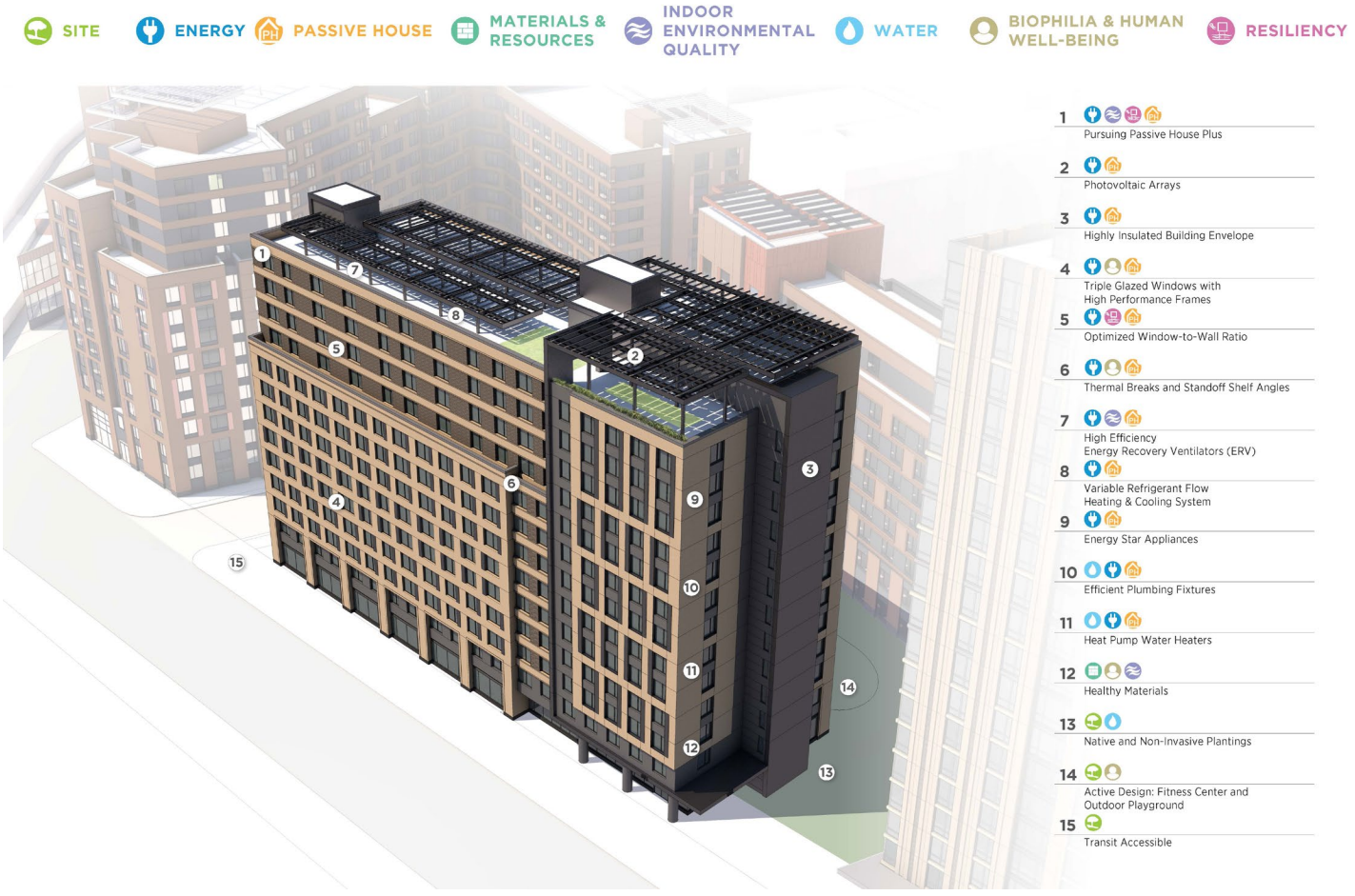
The project team for La Central Building C has committed to achieving Passive House certification and a minimum of LEED Gold. They are also aiming for the all-electric design to meet PHIUS+ standards. The largest challenge in achieving all-electric and PHIUS+ for a building of this size is the domestic hot water (DHW) system. For a building of this scale, the convention is to use centralized gas fired boiler plants with hot water recirculation. Designing the building with electric hot water without affecting performance will require new large-scale heat pump water heater technology, which is expected to be available to the market when the project undergoes construction. If the project achieves PHIUS+, it would be one of the first buildings of this scale and typology in the world to achieve such certification.

Building C is part of the second phase of the five-building development, and it was identified as the most cost-effective portion of the development to pursue these goals. The development team has made a commitment to the Bronx Borough president that they will attempt to design and build the final phase of the project to Passive House standards. The owners plan to showcase this building as an example for future high-performance, affordable multifamily developments.

Project Team

The project team includes forward-thinking consultants who have market leading experience in high-performance building projects, and the team members are largely based in NYC. The design team is led by BRP Companies and Hudson Companies, who are co-developing the project together. The architects are FX Collaborative and MHG Architects, and the mechanical, electrical, and plumbing (MEP) engineer is Dagher Engineering. The energy consultant for the project is Steven Winter Associates, and the sustainability consultant is Bright Power. The full project team was engaged from early on in the design process. A Passive House feasibility analysis was conducted during the schematic design phase to see how far the design could push its energy reducing strategies.

The project is expected to be financed by NYC Department of Housing, Preservation & Development (HPD) as well as the NYC Housing Development Corporation (HDC).



The image above shows some of the key sites, the sustainable design, occupant comfort , and resilience features of Building C by MHG Architects.

Building Design

La Central Building C is a mixed-use, 100% affordable housing development that includes housing, retail, community space, and media space. It is part of phase two and is the fourth of five buildings in the La Central development.

Building C has a cast-in-place concrete superstructure with steel stud backup walls and a brick exterior façade. The project uses standard galvanized steel brick ties to achieve high R-value while remaining a cost-effective wall system that meets Passive House criteria.

The building is designed to fit into the immediate surroundings of its location in the dense urban environment of the Bronx. The ground floor retail, community-based programming, thoughtfully designed streetscapes, and strategically distributed entrance points promote circulation throughout the site. The design team aimed to create a sense of identity and place through architectural expression, dividing the development into five separate buildings to break down the scale of the project and to include a central landscaped courtyard in the heart of the development.

Energy Modeling

The project was modeled using the Passive House Planning Package (PHPP) Version 9.7. The modeling parameters included the following:

- Heating and cooling was modeled with VRF ASHP systems with an 18 seasonal energy efficiency ratio (SEER) for cooling and 3.0 coefficient of performance (COP) for heating.
- Ventilation system was modeled as an ERV with 80% heat recovery efficiency and 50% humidity recovery efficiency.
- DHW system was modeled as a 120-gallon central heat pump water heater (HPWH) with a COP of 2.7, 5,000 feet of 1 inch circulation pipes with 1 inch of insulation, and a shower drain heat recovery system with 45% dynamic efficiency.
- Windows were modeled with an average U-value of 0.17 and window-to-wall ratio of 0.25.
- The R-values of the roof, above-grade wall, below-grade wall, and below-grade slab were modeled as 31, 20, 11, and 1 hr-SF-F/Btu, respectively.
- The modeled thermal bridges were slab edges, the roof parapets, 60-point thermal bridges for PV or other equipment, and the buffer.
- The model used a treated floor area of 135,971 SF, compared to the building area of 166,711 SF used to calculate final site EUIs.

The building met the criteria for PHIUS+ with a heating demand of 3.1 kbtu/SF/yr, heating load of 3.6 btu/hr/SF, cooling demand of 4.8 kbtu/SF/yr, cooling load of 3.4 btu/hr/SF, air tightness of 0.6 ACH50, Primary Renewable Energy demand of 16.7 kbtu/SF/yr, and renewable energy generation of 45.6 kbtu/SF/yr (per building footprint).

With all-electric heating, central DHW systems, a supertight envelope, and efficient outdoor air ventilation system, the project is at the leading edge of efficient high-rise building design and can serve as a model for future buildings.

Energy Efficient, All-Electric Design

High-Efficiency Lighting Fixtures and Appliances

The project includes the following high-efficiency components:

- Highly efficient lighting and lighting controls.
- All non-apartment common spaces will have either bi-level lighting, occupancy, or vacancy sensors.
- Laundry: standard electric exhaust dryers.
- Cooking: induction.
- High-efficiency and low-flow fixtures in units.

Building Envelope

The Passive House design of La Central Building C required the design team to focus especially on the building envelope. The triple pane windows, with either uPVC or fiberglass frames, will achieve a U-value of less than 0.167. These windows not only drastically reduce heating and cooling costs for the owners and residents, but also reduce drafts, cold interior surface temperatures, and the amount of noise transfer. This makes the interior space much more comfortable for residents, and much more durable over the building's lifespan.

Building C will utilize a cast-in-place concrete superstructure with steel stud backup walls and a brick exterior façade. The typical exterior wall assembly has 3 inches of continuous exterior mineral wool insulation and 5 inches of mineral wool in the stud cavities to achieve an effective total R-value of 20. The project is able to achieve this R-value by utilizing standard galvanized steel brick ties to help keep the wall cost-effective while still meeting the Passive House requirements. Thermally broken or stand-off shelf angles will be utilized to minimize thermal bridging at the slab edges. To minimize thermal bridging and eliminate the need for insulation that wraps around the entire parapet wall, the roof is made up of thermally broken parapets, utilizing a form of insulative masonry block, autoclave aerated concrete.

All-Electric Systems

The PHIUS+ design strategies utilized in La Central Building C could result in carbon emissions of approximately 0.36 metric tons of CO_2e per person per year, which is expected to vastly outperform peer buildings and help New York City achieve its 80 x 50 goals. While the project team is committed to Passive House design, the largest challenge they face in achieving full-building electrification—and therefore, in PHIUS+ certification—is the building's DHW system. The team will aim to design an all-electric DHW system using large-scale heat pump water heater technology that should be available to the market by the time of project construction. They will also carefully design the centralized hot water recirculation layout by optimizing placement of horizontal recirculation piping and clustering of water taps to limit the number of recirculation risers. In addition to facilitating the electrification of the DHW system, these techniques minimize the hard and soft costs for expensive copper piping and reduce water heating and cooling costs.

The heating and cooling system will utilize VRF-ASHP units. Ventilation will be provided by high-performing ERV units, which are expected to recover at least 80% of heat from the exhaust air in the kitchens and bathrooms.

Renewable Energy

The project team is committed to maximizing renewable energy production at Building C. The solar electric Photo Voltaic panels are expected to produce over 1.4 million kBtu/yr of on-site, owned solar energy, which represents 23% of the total annual source energy.

Smart Building Technologies and Energy Consumption Feedback

The project will include an energy monitoring system (EMS) and building management system (BMS) with data available at the apartment and common area level. Resident outreach and transparency are very important to the community. Individual apartment consumption and aggregated data by floor will be provided to residents. The development team is looking into feasibility of providing tenants with real-time energy feedback. Additionally, an ongoing review of energy consumption as well as the maintenance and operating budget will occur to continually improve the building's performance.

Commissioning

In addition to detailed envelope commissioning, commissioning of the building's mechanical systems will also be implemented at Building C. This includes, but is not limited to, ensuring the proper ventilation flow rates are achieved at all registers and at the ERVs, ensuring the VRF system's control schemes are set up and running properly, and ensuring that the building's water systems are running efficiently and are balanced across all areas of the building.

Leasing Structure

The La Central development consists of 100% affordable multifamily rental units, and Building C is anticipated to reserve up of 65% low-income units for households earning less than 80% of AMI. It is a true mixed-income community wherein there will be apartments available to residents earning between 30% and 130% of AMI. Rental prices will range from $472 to $2,290. Rents will be regulated for at least 40 years, and a portion of the units will remain affordable indefinitely.

Cost Comparison

The developer undertook the design understanding that there is currently a cost premium for Passive House construction, but that the payback for these measures in energy savings would be relatively short term. The construction cost of Building C is 3–5% above comparable structures. Rents are regulated, so the relative sale price and rent in comparison to typical code compliant buildings do not apply. It is estimated that after the initial one to two years of commissioning and stabilization, overall maintenance and operating costs will be below average buildings.

Occupant Engagement

Upon move-in at La Central Building C, residents will receive a package of information explaining that they live in a Passive House building . This package will include information on how to optimize the heating and cooling units to run as efficiently as possible. In addition, the package will encourage residents to be conscious of plug load and other conservation efforts and will highlight the efficiency and low-flow fixtures in the unit. Information sessions will be offered annually to residents to inform them about ways that they can contribute to the energy performance of their building.

The development team will engage residents by providing consumption feedback and by holding workshops. These workshops will focus on ways that residents can reduce consumption through daily habits. The consumption information will provide feedback on the effectiveness of these actions. In addition, the development team will commit to providing training and education to staff to ensure that the building systems are performing optimally.

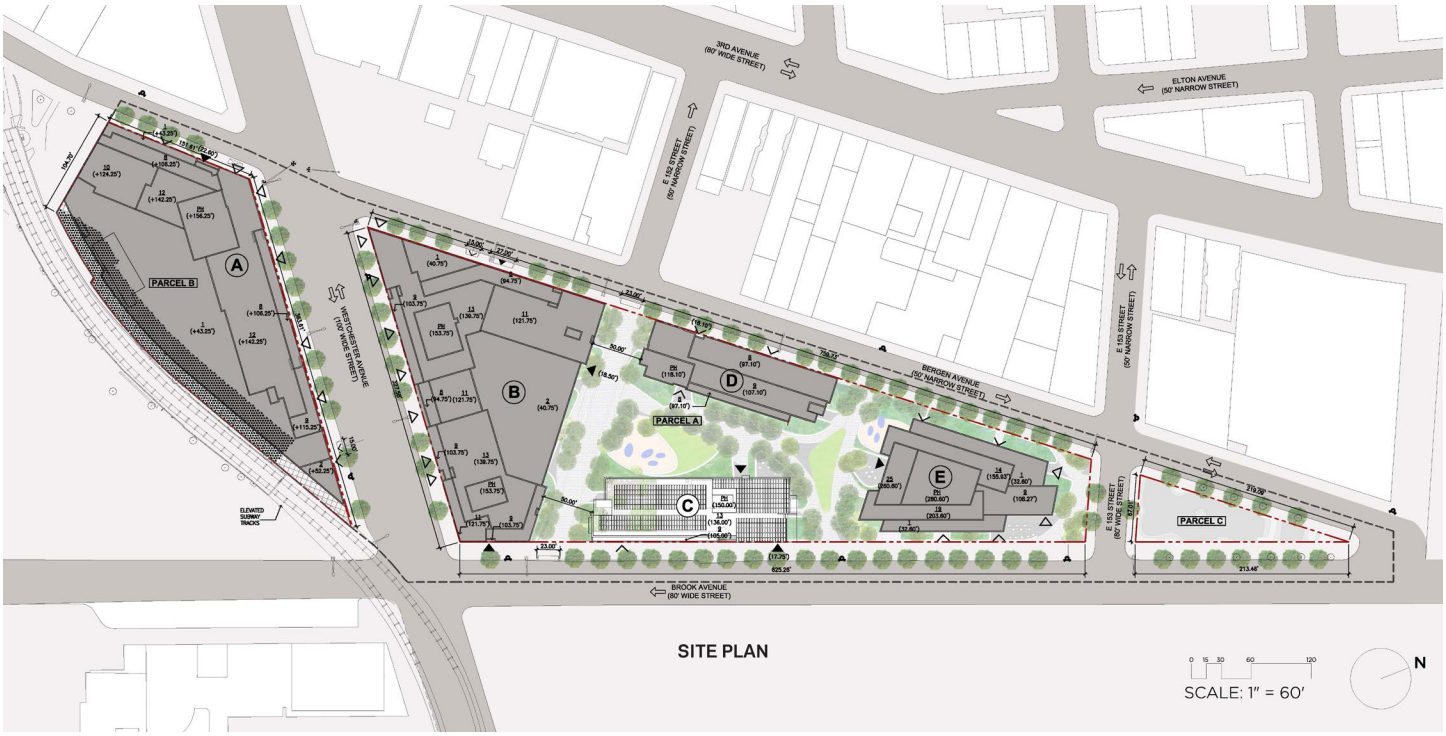
Energy Management

The details of the specific EMS and BMS systems are still under consideration by the project team, but some key elements of the building energy management features include:

- Electricity, heating, and cooling: Sub-metered.
- Domestic Hot Water (DHW) and water: Directly metered.
- Electricity and cooling: Tenants billed for usage.
- Heating, DHW, and Water: Tenants not billed for usage.

Additional Benefits

Site Context



The site plan above shows the full five-building La Central development, with Building C located on the eastern side of the site on Brook Avenue and bordering the central community park space. by MHG Architects.

The site is located in the Melrose neighborhood of the Bronx Community District 1, which has only 3% of its land designated as park space, equating to 13 parks for over 82,000 people. The larger five building development will create two total acres of public and private open space across a large interior courtyard and private green roofs within the buildings.

The design intends to capture and extend this vitality of the surrounding dense urban environment, making the development an integral part of the neighborhood. This is achieved through activating streets with ground-level retail and community uses; the promotion of circulation around and through the site, distributed building entrances and thoughtfully designed streetscapes; breaking down the scale of the development into five distinct buildings, which includes Building C; the creation of a sense of identity and place through architectural expression; and the creation of an open central landscaped courtyard creating the heart of La Central.

In its commitment to creating an enticing public realm, La Central engages a range of active design strategies to promote the health of both residents and neighbors. Its location is within walking distance of transit and key amenities, which automatically encourages an environmentally safe mode of travel.. The courtyard, streetscape, and park design promote walking and provide areas for passive and active recreation. Seating and play areas are integrated throughout the open space.

La Central is adjacent to the 2 and 5 MTA subway lines as well as numerous bus lines that will allow residents to access midtown Manhattan in as little as twenty minutes. This proximity to transit will greatly reduce overall reliance on cars and improve commute times for residents of La Central. Community resources located nearby include Lincoln Hospital Greenmarket, Fine Fare Supermarket, PS 1 Courtland School, Eagle Slope Community Garden, Universal Hip Hop Museum, numerous restaurants, shops, grocery stores, and pharmacies.

Community Engagement

Through its materials, variety, and scale, La Central is designed to integrate seamlessly into the neighborhood, while at the same time creating an identity and a sense of place that speaks to its mission of providing affordable homes and fostering a thriving community.

Within the larger La Central development there will be a state-of-the-art 50,000 square foot YMCA and a BronxNet studio, a second location of the local cable news station. It will also include new retail spaces, such as a sit-down restaurant and a grocery store.

Occupant Health, Comfort, and Productivity

As a result of Building C's superior quality of design, its residents will not only realize energy cost savings over a typical new-construction affordable housing development, but they will also be living in a building with enhanced indoor air quality, comfort, and resiliency. The building is within blocks of a major subway rail that travels above ground, adding to significant noise pollution in the neighborhood. The tight building envelope combined with the VRF heating and cooling systems will limit sound penetration through exterior walls creating a quieter interior environment as well as safe air quality. Also contributing to better air quality is the practice of directly venting combustion equipment and dryer exhaust outdoors as well as the use of electric stoves instead of gas. The Passive House design strategy creates a robust building envelope. This will limit street noise and mitigate potential health problems that can arise from condensation and mold growth.

Resiliency

La Central Building C demonstrates sustainability by both minimizing its climate impact and maximizing its readiness for disruptions. Systems that reduce energy, water, and waste have been integrated into the building to provide a unique two-step level of resiliency. First, the project is able to sustain itself by generating its own energy resources and, second, it will draw less upon city resources. In addition, the high-efficiency thermal envelope enables passive survivability in the event of extreme weather and extended periods of power outage.

Lessons Learned

- Integrated design used in the development process with a contractor team—meeting early and often—that has experience in high-performing building techniques is critical to efficient construction in Passive House projects. The collaborative process helped the team break down the scale of the project to be careful and thoughtful in their technology approaches and identify the most cost-effective route.
- Passive House residential construction can be visually integrated into the surrounding neighborhood to demonstrate that highly energy-efficient buildings can look natural in the local context.
- While there is currently a cost premium for Passive House construction, the payback for these measures in energy savings is relatively short term, so the additional upfront cost makes sense for owners who are holding the asset a few years beyond the development phase.

Ready to get started?

Visit nyserda.ny.gov/lrnc or call 1-866-NYSERDA to learn how you can reduce energy consumption and costs.

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