Bushwick Alliance – 63 Stockholm Street

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:
Brooklyn, New York

Project Area:
20,111 sq. ft

Number of Buildings:
1

Number of Stories Per Building:
4

Number of Units:
20

Project Cost:
$10,041,995

Cost per Gross Square Foot:
$499.33

Market Sector:
LMI

Construction Type:
New

Construction Start Date:
Spring 2022

Completion Date:
Spring 2023

REDC Region:
New York City

Developer:
RiseBoro Community Partnership, Inc.

Architect & Design Team Lead:
STAT Architecture

Technologies Used:
PV, VRF, ERV, SandenCO2 ASHP (DHW), panelized rain screen, LED lighting, high performance envelope

All-electric, carbon neutral success in affordable multifamily housing

Background

RiseBoro Community Partnership and St. Nicks Alliance, two local non-profits with a long history of community service, teamed up to develop Bushwick Alliance, a project consisting of three buildings in different sections of Brooklyn with highly affordable rental units. The largest of the three will be a 20-unit building at 63 Stockholm Street that raises the bar for affordable, low-carbon, and sustainable living in New York City. With special attention to the community impact of these buildings, some units are set aside for formerly housing challenged individuals or families. The success of this low-carbon project proves that resilient, carbon neutral, Passive House design can be delivered for the same price as standard buildings with ongoing health, wellness, and operational benefits.

Key Project Features

Bushwick Alliance's 63 Stockholm building is designed to the Passive House standard, and is an all-electric net-zero building, meeting the PHIUS+ Source Zero 2018 standard.

- ✓ **HVAC:** VRF, Energy Recovery Ventilator (ERV)
- ✓ **Water Heating:** SandenCO2, Air Source Heat Pump (ASHP)
- ✓ **Envelope:** Panelized rain screen, high performance
- ✓ **Passive:** PHIUS
- ✓ **Lighting:** LED, daylighting
- ✓ **Appliances:** Electric dryer, induction cooktop.
- ✓ **Renewables:** Onsite PV
- ✓ **Resilience Strategies:** Passive survivability

Predicted Site Energy Use Intensity (EUI): 12.5 kBtu/SF/yr

Net Site Energy Use Intensity (EUI): 1.3 kBtu/SF/yr

Predicted Renewable Production Intensity (RPI): 13.8 kBtu/SF/yr

Energy Code Baseline: 2016 NYS Energy Conservation Construction Code (ECCC)

Performance Path: Passive House Institute US (PHIUS)

Certification: PHIUS+ Source Zero 2018

Planning and Design Approach

Project Goals

The Bushwick Alliance 63 Stockholm Street building set out to achieve significant goals. The project demonstrates that it is the responsibility of developers, architects, and builders to design buildings that are not only sustainable, but affordable, replicable, and supported with social infrastructures to maintain high building performance and resident quality of life. Bushwick Alliance's 63 Stockholm building is designed to meet the PHIUS+ Source Zero 2018 standard, with features achieving all-electric, net-zero design with reduced embodied energy and quality assured refrigerant installation. This building will provide a safe, healthy, comfortable environment for its occupants, even in emergency conditions. It will be an all-electric, net-zero building, meeting the PHIUS+ Source Zero 2018 standard. 63 Stockholm will further fight climate change with reduced embodied energy, quality assured refrigerant installation, and low-carbon living. All this will be delivered at a lower cost of ownership than standard construction, and with affordable rents, encouraging widespread adoption, and setting a new standard for multifamily construction in New York City. This project is a crucial opportunity to prove an all-electric sustainable design model to NYC housing agencies and to prove that sustainable and cost-effective buildings are possible for the city's most vulnerable populations.

Stakeholder Engagement

Two local non-profits with a long history of community service, RiseBoro Community Partnerships and St. Nicks Alliance, created Bushwick Alliance in 2017. RiseBoro Community Partnerships and St. Nicks Alliance each have over 40 years of experience in the Brooklyn community. They were selected by the New York City Department of Housing Preservation and Development (HPD) to co-develop a cluster of vacant lots in Bushwick with affordable rental housing. The overall project, which consists of three buildings on three distinct sites in different sections of the neighborhood, was designed by STAT Architecture, a Women-Owned Business Enterprise. This includes the all-electric, net-zero carbon designed building at 63 Stockholm St. This project also teamed up with Right Environments as the Passive House and sustainability design consultant and Levy Partnership as third-party verifier.

Building Design

This project is a crucial opportunity to prove an all-electric sustainable design model to NYC housing agencies and to prove that sustainable and cost-effective buildings are possible for the city's most vulnerable populations. 63 Stockholm will be an all-electric, net-zero building, meeting the PHIUS+ Source Zero 2018 Standard. Keeping in mind this building is a part of a cluster of affordable rental housing (three buildings, three different sites), the design team designed the building's enclosure for occupant health and comfort, durability, energy performance to PHIUS standard, and ease of construction at the lowest possible cost.

Interior construction of this building is being undertaken with a special focus on embodied carbon emissions. To achieve this, the design team specified low Portland cement content in concrete and grout and will build all non-bearing, non-demising partition walls using low-carbon and/or carbon sequestering material such as wood framing and board made of agricultural or post-consumer material (specific approach will be determined). This effort reduces embodied carbon in the construction without affecting the project's schedule and budget in a negative way.

Energy Modeling

Energy modeling helped achieve a balance between energy savings and cost-effectiveness. This project used WUFI Passive version 3.2.0.1 and will meet the PHIUS+ Source Zero 2018. By PHIUS standards, the energy model does not account for occupancy sensing lights and tier II smart power strips, but they provide a margin of safety in achieving net-zero. Additional technologies used are PV, VRF, ERV, SandeCO2 ASHP (DHW), panelized rain screen, and high performance envelope.

Energy Efficient, All-Electric Design

All Electric Systems

Building all-electric eliminates the cost of gas piping, permitting, and the meter room, and allows a 100% renewable, near-carbon neutral energy supply. The design team put great emphasis on energy systems being designed to realize net-zero carbon emissions. For excellent indoor air quality, ventilation is by energy recovery ventilators. Supply air for each apartment is 20% higher than ASHRAE 2013 standard. Additionally, incoming air is filtered to MERV-14, reducing occupant exposure to fine particulate matter (PM2.5).

Split air source heat pumps provide heating and cooling, with a separate thermostat for each apartment. Depending on system configuration, electric submetering or refrigerant flow metering is used to track heating and cooling energy use for performance monitoring and tenant billing.

Air-source heat pumps using CO_2 refrigerant generate domestic hot water. This design aspect provides heating using renewable energy and eliminates refrigerant leakage, both through the low GWP of the refrigerant itself and the limiting of refrigerant installation to (more easily quality assured) factory work.

Additionally, appliances and lighting are provided so tenants can minimize their in-unit energy use, through top-tier ENERGY STAR refrigerators, occupancy-sensing light fixtures, electric dryers, and induction cooktops/electric ovens.

Building Envelope

The Bushwick Alliance's building at 63 Stockholm is designed for occupant health and comfort, durability, energy performance to PHIUS standard, and ease of construction at the lowest possible cost. The high-mass Concrete Masonry Unit (CMU) structure will stabilize interior conditions and block outdoor noise, have generous hygric buffer capacity to tolerate incidental leaks, and be easy for NYC masons to build. The air weather barrier is applied to the face of the CMU, behind the insulation for durability. The whole building air barrier meets PHIUS standard, for low risk of moisture damage or mold, excellent thermal comfort and acoustical isolation, and low energy use. Waterproofing is designed for high quality with ease, both of installation and quality assurance.

A 6 inch layer of continuous exterior insulation keeps the structural wall dry and warm or cool depending on season, and reduces thermal bridges. The front wall is a screen, with cladding supported by thermoset resin grits to minimally impact R-value. The side and rear walls back drained Exterior Insulation Finishing System (EIFS), for high thermal performance at a low cost. Details are designed for waterproofing, air barrier continuity, and thermal barrier continuity at lowest possible cost. A single course of aerated concrete block at the parapet provides a thermal break adequate to keep the interior above dew point and keep thermal loads within budget.

Windows have fiberglass frames with quad-pane glazing and krypton gas fill. They are mounted at the exterior face of the block, projecting only far enough for sufficient overlap at the sill so that the drainage plane is inexpensive and well installed.

The site is oriented 45 degrees off cardinal orientations, with the front facing southeast. The window details are customized per façade to serve as an effective shading technique.

Another benefit to the design of the building's shell is passive survivability. The low thermal transmittance of the enclosure, the orientation-specific shading, and the building's high thermal mass provide excellent passive survivability in the event of an extended power outage/extreme weather. This means in the event of a severe storm or natural disaster causing a power interruption, the building will have the ability to maintain critical life-support conditions.

High-Efficiency Lighting Fixtures

The lighting plan required the design team to consider the variety of lighting and areas within an apartment complex, while still considering high-efficiency lighting. They classified spaces into different types as defined below:

- Type "A" - Corridors
- Type "B" - Stairwells
- Type "C" - Refuse, laundry, closet, restroom, bike storage, and service spaces
- Type "D" - Common areas controlled by other means

While focusing on keeping construction and replacement costs low, common area lighting is designed to meet a PHIUS+ Source Zero 2018 energy budget. Type "A" and "B" spaces are lit with surface mounted linear LED wraparound strip lights. Controls are passive infrared (PIR) occupancy sensors. The standby lighting state is 33% illumination, which safely maintains 2 foot-candles minimum illuminance. Type "C" spaces are lit with LED T8 retrofit lamps in traditional fluorescent utility strip fixtures. Controls are dual technology (PIR and ultrasonic) occupancy sensors.

Smart Building Technologies

Some smart building technologies that were included in the design of the building were occupancy sensors with bi-level lighting controls, temperature and humidity monitoring in some units, electrical circuit logging of building systems, tenant meter electrical logging, and individual apartment controls with programmable thermostats. These features allow the operational processes to be more automated, responsive to tenant needs and weather conditions, and more efficient.

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Renewable Energy

The rooftop solar PV array offsets all carbon emissions on an annual basis. The array is expected to generate 13.8 kBTU/ft^2/year (or over 275,000 kBTU per year), while the modeled demand for the building is 12.5 kBTU/ft^2/year (or just over 250,000 kBTU/year). A photovoltaic canopy array, which this project will use, is costlier than a ballasted array, yet the additional output gives it a far higher net present value.

Energy Consumption Feedback

Awareness of energy consumption is not only beneficial to the property manager, but also the residents who live there. RiseBoro, who will be the property manager of this building, uses Bright Power's Energy Scorecards to track data. Usage and best practice data will be shared with other properties, partners of RiseBoro, and city/state officials. They will also provide full transparency with all residents and pass along all usage and post general building performance updates.

Building Operations

Leasing Structure

Bushwick Alliance's 63 Stockholm St. building units will be affordable at regulated rent levels. These units will be targeted to individuals/families who make 27% to 80% of the NYC Area Median income. This translates to monthly rents that are from $366 to $1,747 per month. Additionally, the building will contain four units set aside for formerly housing challenged individuals or families.

Cost Comparison

This project proves that resilient, carbon neutral, Passive House design can be delivered for the same price as standard buildings with ongoing health, wellness, and operation benefits down the line. The Bushwick Alliance development team intends to construct the building with no overall cost increases comparable to the per square foot construction cost of a standard similarly sized building in Brooklyn, NY in 2020. This means the project's construction cost is the same as comparable buildings and the resident energy costs are projected to be 59% less than comparable buildings. Additionally, the project assists a vulnerable population by contributing to affordable housing. This building's relative sales prices and rents are 53% less than comparable buildings.

Occupant Engagement

Occupants of the 63 Stockholm St. project will be encouraged to live a low-carbon life. Residents will have the benefits of being able to minimize in-unit energy by having ENERGY STAR refrigerators, occupancy sensing lighting, and tier II smart power strips in each unit. Additionally, the complex will encourage a culture of sustainability. This begins upon signing a lease as each resident will receive education on the importance of saving energy and the importance of low-carbon living. Residents will receive packets that include information on how to save energy and why it is important to do so. The management and maintenance staff will be trained in green technologies that are implemented in the building, and will help residents understand their usage, their billing, and best practices for efficient, comfortable life in the building.

Energy Management

The building will purchase electricity through a single meter at $0.224/kWh or lower and sell to tenants by submetering. Submetering makes it easier to collect detailed performance data at the unit level.

Facility Management

Riseboro, who will be the property manager, believes in full transparency with all residents. Management and maintenance staff are trained in green technology and will assist residents in understanding usage, billing, and best practices.

Additional Benefits

Site Context

The building is in the Bushwick neighborhood of Brooklyn, NY. This affordable housing project includes some units being set aside for formerly housing challenged individuals and families. Its community consists of a vibrant urban area with nearby amenities and excellent transit options. Residents will be able to walk to grocers, commerce, schools, recreation and public service located within a half mile radius.

Community Engagement

Public-facing narratives about the Bushwick Alliance project have already begun and have been positively received by the neighborhood. Early in the process, the team participated in a series of public meetings and community engagement events to promote the project and gain public support. The team presented renderings/building details and emphasized Passive House strategies and ethos of the project. Sustainable design and affordable housing are highly desirable in the community. The building promotes a resident culture of sustainability.

Residents get one secured bicycle parking space for every two residents. Additionally, by being centrally located by public transit including the JMZ and L subway lines and the Q24, B52, B60 bus lines, residents can easily engage in public transportation.

Occupant Health, Comfort, and Productivity

This project is designed to achieve PHIUS+ Source Zero 2018, which includes standards that require healthy indoor environments for occupants. The standard includes water sealing and drainage requirements for moisture reduction, low emitting building materials (including composite wood products, interior paints and finishes, carpet, carpet padding and carpet adhesive), and inclusion of radon-resistant and pest control features.

Resiliency

Bushwick Alliance's 63 Stockholm building designed to the Passive House Standard, all-electric, net-zero building, meeting the PHIUS+ Source Zero 2018 standard. Passive House is a highly efficient construction methodology with extreme insulation and air tightness, precise temperature control, better indoor air quality, and excellent noise attenuation. Another benefit to the design of the building's shell is passive survivability. The intent of the design allows the building to maintain critical life-support conditions in the event of an extended loss of power or severe weather.

Lessons Learned

- Sustainable design paired with affordable housing is a highly desirable opportunity in the Bushwick community
- Resilient, carbon neutral, Passive House design can be delivered for the same price as standard buildings with ongoing health, wellness, and operation benefits down the line, and can be available to the citizens who need them the most
- It is the responsibility of developers, architects, and builders to design buildings that are not only sustainable, but affordable, replicable, and supported with social infrastructures to maintain high building performance and resident quality of life

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