Sheridan Small Homes Case Study

The development of the first deed-restricted small homes, built using Passive House principles, in Providence, Rhode Island

ONE NEIGHBORHOOD BUILDERS

Contents

Context

ONE NEIGHBORHOOD BUILDERS

Founded in 1988, ONE Neighborhood Builders has established itself as a community development leader in Rhode Island. Our mission is to develop affordable housing and engage neighbors across Greater Providence to cultivate healthy, vibrant, and safe communities. We achieve our mission through robust housing development, addressing root causes of health disparities, and embracing innovation and building the community development field.

To date, we have developed 458 affordable apartments and 130 home ownership opportunities, as well as 35,000 square feet of commercial and community space. These developments represent a total investment of more than $133 million and include the remediation of blighted and environmentally contaminated land and the preservation of historic buildings.

In addition to real estate development, ONE|NB addresses the root causes of health disparities. We strive to generate the social and economic conditions in Central Providence that prolong life expectancy and work to eradicate systemic barriers that lead to health disparities. We lead the Central Providence Health Equity Zone, a collaboration of more than 25 community stakeholders who work collectively to identify and eliminate barriers to health.

ROSE FELLOWSHIP

Haley Hardwick-Witman, a licensed architect, joined ONE Neighborhood Builders in the fall of 2019 as a Rose Architectural Fellow. The innovative model of the Enterprise Rose Fellowship partners architects, landscape architects, and community-engaged artists with local community development organizations to facilitate an inclusive approach that results in sustainable, healthy, and affordable communities. As part of her two-year fellowship, Hardwick-Witman wrote this case study for ONE Neighborhood Builders.

Core Principles of the Rose Fellowship:

Excellence in Practice: Fellows draw on their experiences in the fields of architecture, landscape architecture, and the arts to embed creative practices into the work of their host organizations and as a means to improve the economic, social, cultural, health, and environmental outcomes in the neighborhoods where they serve.

Community Participation: Fellows become integral members of networks among residents, local leaders, advocates, and government officials to champion community-based design and development that reflects local residents' needs and desires.

Sustainability + Resilience: Fellows employ environmental sustainability and cultural resilience principles, such as Enterprise's Green Communities Criteria and Cultural Resilience Framework, among others, in support of their host organizations' and communities' missions to advance more equitable and just futures.

Rose Architectural Fellow Haley Hardwick-Witman

ONE NEIGHBORHOOD BUILDERS

INDUSTRY
Nonprofit Community Development

LOCATION
Providence, RI

SERVICES
Real Estate Development
Community Building
Health Equity

TOTAL ASSETS
$57 million

Olneyville Neighborhood Providence, RI

70% of carbon emissions in Providence, RI, are from buildings. Switching to all electric systems and cutting building energy use are key strategies to reach the City's Climate Justice Plan of carbon neutrality by 2050.

Size: 1/2 square mile

Residents: 6,933

Racial and Ethnic Makeup: 60.3% Hispanic, 20.2% Non-Hispanic White, 13.7% Black/African American, 4.3% Asian, 3.9% multiracial, and less than 1% each American Indian and Pacific Islander or Hawaiian

Median Household Income: $32,228 (Providence: $49,743)

Owner-Occupied Homes: 4,571

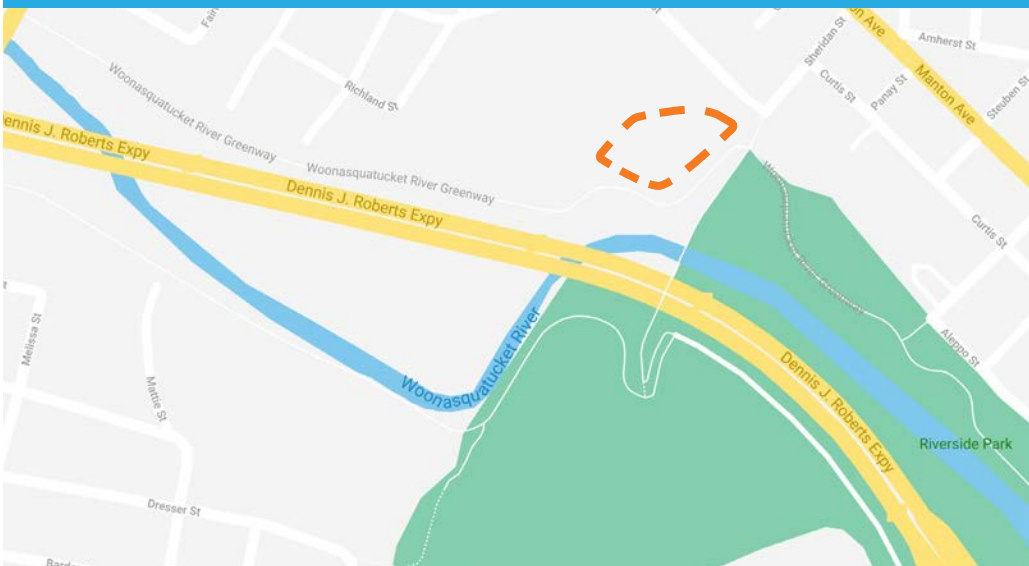
Renter-Occupied Homes: 9,596

Source: U.S. Census Bureau

35 Sheridan Street

Within walking distance of:

- **Olneyville restaurants & businesses**
- **RI Public Transportation Authority bus stops**
- **William D'Abate Elementary School**
- **Dr. Day Care**
- **Joslin Park & Recreation Center**
- **Riverside Park**
- **Donigian Park**
- **The Woonasquatucket River Greenway & Bike Path**



Our Mission

TO DEVELOP AFFORDABLE HOUSING AND ENGAGE NEIGHBORS ACROSS GREATER PROVIDENCE TO CULTIVATE HEALTHY, VIBRANT, AND SAFE COMMUNITIES.

STRATEGIC DIRECTION

Over the next three years, we will accomplish our mission through:

I. ROBUST HOUSING DEVELOPMENT AND QUALITY REAL ESTATE MANAGEMENT

ONE|NB will expand the availability of affordable, high-quality homes through the production, preservation, and acquisition of residential and mixed-used properties within our historic home of Olneyville and across Greater Providence.

II. ADDRESSING ROOT CAUSES OF HEALTH DISPARITIES

ONE|NB will engage residents and community-based organizations in our nine Central Providence neighborhoods to generate the social and economic conditions that prolong life expectancy and work to eradicate systemic barriers that lead to health disparities.

III. EMBRACING INNOVATION AND BUILDING THE COMMUNITY DEVELOPMENT FIELD

ONE|NB will emerge as a thought leader in the field by distilling the lessons learned from developing and managing housing and convening residents and community organizations. We will participate in local and regional community development conversations, produce research and case studies, and amplify the impact of our community partners.

PASSIVE HOUSE

The Passive House Institute U.S. (PHIUS) is one of the most stringent building design and construction standards that requires air-tight and well-insulated building envelopes as well as efficiently sized and balanced HVAC systems. Buildings that meet the PHIUS+ standard use 40-60% less energy for heating and cooling the interior of the home than conventional buildings and include a thorough verification process.

ZERO NET-ENERGY

This standard is also referred to as “zero energy” or “net-zero energy.” This certification requires that buildings produce as much energy as they consume. This is most commonly done through solar energy, but other renewable sources such as geothermal or wind energy can also help a building achieve this level.

The vision for Sheridan Small Homes was to demonstrate that it is economically feasible to build affordable housing to high sustainability standards and that people want to live in smaller homes. ONE|NB believes that everyone deserves to live in a healthy, high-quality home regardless of income. This project sought to address an issue of environmental justice, where lower-income communities are often hardest hit by infrastructure pollution, yet they are rarely the ones to reap the benefits of sustainable innovations.

Sheridan Small Homes was intended to serve as a pilot build to test this concept while providing training on Passive Homes for all members of the design team that led to even more wide-reaching community benefits. This project also demonstrates the long-term viability of zero net-energy affordable housing while training the next generation of construction professionals in zero net-energy home construction.

THE DEVELOPER TEAM

Developer + General Contractor: ONE Neighborhood Builders

Design/Architect: RISD students/BriggsKnowles A+D

Energy Consultant: CleaRESULT

Builder: Building Futures + Pezzuco Construction

Sitework: DiCenzo

Electrical: M&M Electric

Mechanical & Plumbing: Pinnacle Heating & Cooling

Solar: SunWatt Solar

Structural Engineer: Structures Workshop

A unique aspect of this project was the opportunity it provided to train local builders, designers, and subcontractors. Building Futures is a Providence-based construction pre-apprenticeship program for low-income community members. The project trained approximately 40 men and women on cutting-edge Passive House construction techniques, thus providing long-term industry benefits by familiarizing trainees with these advanced construction methods.

Similarly, several studios of architecture students at the Rhode Island School of Design were able to put their education into practice by designing a real-world project. This project offered students a hands-on opportunity to apply their design, innovation, and energy-responsible concepts to create zero net-energy homes.

FUNDING

Each home in the Sheridan Small Homes community will be sold to income-qualified buyers with a starting price point of about $140,000. Two of the homes will be reserved for families earning no more than 80% of the area median income (AMI), which equates to $52,400 for a household of two and $65,500 for a family of four. The other three homes are reserved for families earning less than 120% AMI, or $78,650 for a couple and $98,300 for a family of four. In order to maximize affordability and energy efficiency, the project sought opportunities to reduce initial up-front costs. Ways in which the project costs were reduced by tens of thousand of dollars include:

- **Engaging a RISD professor and architecture students for design services instead of a conventional design firm.**
- **Hiring Building Futures, which charges a much lower flat fee for construction services instead of a traditional builder.**
- **Leveraging and repurposing donated materials, including all rigid exterior insulation.**
- **Eliminating natural gas, which eliminated the need for permitting, trenching, and pipelines.**
- **Excluding basements avoided the cost of additional excavation, concrete, insulation, and labor.**
- **Focusing on insulation and airtightness allowed for downsizing the HVAC systems.**

SOURCES

RIHousing Construction Loan	$600,000
RIHousing Homeownership Investment Fund	$330,271
City of Providence HOME	$150,000
Zero Energy Ocean State	$250,000
Private Donors	$490,000
Total	**$1,820,271**

USES

General Conditions, Permitting	$39,000
Environmental Abatement	$10,000
Solar PV System	$85,000
Construction materials, labor, sitework	$1,357,018
Utilities	$22,000
Total Hard Costs (including contingency)	**$1,513,018**
Total Soft Costs (including contingency)	**$307,253**
Total Development Costs*	**$1,820,271**

*Construction costs are about 15% to 20% higher than typical to build these homes to zero-energy, Passive House standards.

Predevelopment

In 2018, the City of Providence Planning Department connected the community-based developer ONE Neighborhood Builders (ONE|NB) and RISD professor and architect Jonathan Knowles, who was leading an architecture studio that was designing net zero small homes. ONE|NB was seeking a small, sustainable house design for the infill lots that exist in Providence that most developers deem too small for a conventional house. Initially, ONE|NB had identified two 2,500-square-foot infill lots upon which they intended to build two houses. However, ONE|NB quickly changed this plan when it was able to acquire a plot of land that was three quarters of an acre, a size that allowed for the development of five small homes.

To understand how this innovative housing option would be perceived, ONE|NB organized a series of community meetings to gather input on the design. These efforts built community support and even resulted in interest from potential buyers from the neighborhood. The feedback provided real-world insights from potential homeowners about how they expected to use the space. Community input solidified a “great room” design concept — a floor plan that includes high ceilings and a connected living room and kitchen. Although the design team had considered smaller, efficiency-sized kitchen appliances, potential buyers conveyed the importance of having standard-sized appliances because they enjoy cooking and hosting larger family gatherings. Neighbors also expressed interest in porches and balconies to help connect indoor and outdoor spaces. They also provided key input on fixtures and siding.

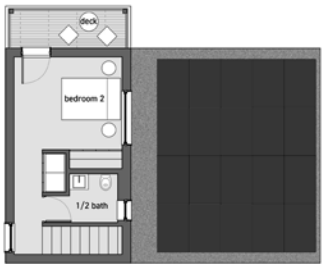
ONE|NB and Jonathan Knowles guided the design development, which was refined by several rounds of students in 2018 who participated in the studio. From the start, the design team committed to adhering to Passive House standards. Students were able to learn about energy modeling that maximized the homes’ energy performance and confirmed that the designs would achieve PHIUS+ 2018 Certification.

Originally, ONE Neighborhood Builders elected modular construction as a more efficient and economical means of construction. However, after several modular companies priced out the project, it became apparent that modular was not the right fit given the project's unique design — the atypical geometries would have warranted many customized elements. Therefore, ONE|NB decided to pursue stick built construction as the more cost-effective construction method. On-site construction also allowed for the energy consultant and design team to test and monitor the construction along the way.

Passive House & Energy-Efficient Strategies

FOUNDATION

The houses were designed with slab-on-grade foundations instead of full basements to reduce costs of excavating, concrete, and additional insulation. The shallow frost footings are comprised of expanded polystyrene (EPS) insulation board placed around the outside of the exterior wall footing, and vertically at the footing perimeter with all seams taped. There is also continuous R-40 under-slab insulation, which reduces winter heat transfer from ground contact. Combining exposed slab-on-grade floors with south-facing windows is a passive heating strategy. During winter months when the sun angle is low, it heats up the concrete floors, which serve as a thermal mass, storing heat and radiating back to the living space. This approach improves occupant comfort and reduces heating needs in the winter. In the summer, overhangs shade the windows and reduce solar heat gain.



UNIT A

UNIT B

A common misconception is that all Passive House certified buildings are also zero net-energy. This is not the case because Passive House standards do not require energy to be produced on site. The Sheridan Small Homes are built to Passive House standards and are zero net-energy. Due to the efficient construction and orientation, enough solar energy will be produced on-site to negate the amount of energy consumed by the occupants.

ENVELOPE & AIR TIGHTNESS

Heating and cooling are typically the largest energy loads in a building, so the design team focused on insulating and sealing the building envelope to allow for smaller heating, ventilation, and air conditioning (HVAC) systems. Passive House requires a super-insulated exterior with a continuous air barrier. The exterior wall assembly is R-45 with blown insulation in the 2x6 wall cavities and 4” of rigid polyiso on the exterior. For comparison, conventional wood-framed homes are only required to meet R-20. The airtight building envelope is achieved through a continuous air barrier that minimizes conditioned air leakage and water leakage, which also means less mold and mildew, thus creating a high level of air quality. Airtightness is tested with a blower door test. New homes built to Rhode Island’s 2015 code allows air leakage at 3-5 air changes per house (ACH), while a Passive House only allows ~1 ACH. The initial blower door test for Sheridan Small Homes measured 1.3 ACH, meaning that every hour about one and one-third times the volume of air in the home exchanges through leaks in the building.

WINDOWS

Windows are a critical part of the design since they deal with thermal transfer and air leakage potential. The team prioritized using highly energy-efficient and affordable windows that also provide plenty of natural light to minimize electric lighting needs. The team chose a triple-paned window with a U-value of 0.143 for minimal thermal transfer. The windows have tilt-turn capability, so occupants have flexible options to open their windows for natural ventilation. Conventional windows only have two layers of glass and can have a U-value of up to 0.35.

June: 9AM,1PM, 4PM

SOLAR ENERGY

Solar panels are becoming more affordable and, thus, more common to see on the roofs of buildings, either to produce electricity for the building to use or to sell electricity back to the grid.

The five Sheridan Small Homes are strategically arranged in a south-facing arc to maximize solar production. The above image shows a solar analysis conducted by the RISD students to determine the house orientation and roof pitch to maximize solar exposure. In total, the rooftops are equipped with 78 (320-watt) photovoltaic solar panels that are all connected as a single system. This development takes advantage of Rhode Island's Renewable Energy Growth program (REG Program) administered by National Grid, which allows the excess energy produced to be sold back to the grid.

The Sheridan Small Homes' owners all belong to a condominium association that ONE Neighborhood Builders manages. That condominium association owns the solar panels atop the homes. This system is expected to produce at least as much energy as these all-electric homes consume over the course of the year. The revenue generated when the condominium association sells the excess energy from each home back to the grid is then aggregated and equitably shared with each homeowner. That revenue is then used to offset each homeowner's monthly condominium fee. Because each home is designed to be airtight, individual homeowner's electricity costs are much less than in a less energy-efficient home.

HEATING & COOLING

A similar home may have needed a 12,000 British thermal unit (Btu) heating unit. The airtight construction of Sheridan Small Homes allowed for a single 9,000 Btu mini-split, ductless heating and cooling system to adequately serve the home and reduce first costs. A single mini-split duct is located in the two-story great room. An exchange transfer duct allows for conditioned air transfer between the first and second floors to ensure thermal comfort.

VENTILATION

A small 80 cubic feet per minute (CFM) energy recovery ventilator (ERV) is the only ventilation system. The ERV captures the energy contained in the exhaust of conditioned air (that would otherwise normally be expelled and wasted) and uses it to pretreat/precondition incoming outside air. It maximizes fresh air intake and minimizes the heating and cooling load that would be needed to treat the air without an ERV.

DOMESTIC HOT WATER

The design team considered various efficient water heating options, including tankless on-demand heaters and highly efficient heat pump water heaters. The on-demand system used excessive energy, and the heat pump water heater cost did not fit the budget. The team ultimately selected a space-saving 94% efficient 38-gallon standard electric resistance water heater. In Unit A, the water heater is located under the stairs. In Unit B, the hot water heater is located in an attic mechanical room.

LIGHTING AND APPLIANCES

All-LED lighting is predicted to use 30% to 50% less energy than the standards set by the Rhode Island building code. The refrigerators, dishwashers, washing machines, and clothes dryers are all ENERGY STAR rated appliances.

Construction

THIS AMBITIOUS DEVELOPMENT PROJECT PRESENTED MANY BENEFITS AS WELL AS UNFORESEEN CHALLENGES DURING THE CONSTRUCTION PROCESS.

Challenges

01. CHALLENGING SITE

The plot of land acquired for this project did not have any street frontage or utility easements, which made getting utility lines to each house a lengthy and costly process.

02. MAJOR LEARNING CURVE FOR ALL SUBCONTRACTORS

This was the first Passive House development for all of the subcontractors on the project, which meant that work sometimes had to be redone entirely due to failed mechanical testing. The building crew was also comprised of trainees who were learning how to build on the job.

03. HIGHER LEVEL OF INSPECTIONS AND TESTING

Passive House standards require additional inspections and testing at various stages of construction, which required more time and coordination of work to schedule. This includes inspecting all insulation, blower door testing, and testing of the energy recovery ventilators.

04. ATYPICAL DETAILING

Since the houses were designed by students and an architect embedded in academia, many construction details were atypical and difficult to build. The construction drawing set lacked sufficient detail and engineering, which resulted in an unanticipated design-build process during construction.

05. GLOBAL PANDEMIC IMPACTS

The global shutdown in March 2020 due to the COVID-19 pandemic meant that trainees were not allowed to work on-site for several months, and many supply-chain issues in the following months created long lead times for obtaining construction materials.






Benefits

01. HOMEOWNERSHIP

Low-income families have beautiful new, high-quality homes with low monthly utility bills, located with convenient access to mass transit, bike trails, parks, and neighborhood amenities.

02. PROVIDENCE CLIMATE GOALS

The City of Providence gained progress toward achieving its climate change goals, as well as additional affordable housing units. This site is also part of the City's RePower PVD district and increases housing density on a reclaimed brownfield.

03. TRAINING IN ENERGY-EFFICIENT CONSTRUCTION

Upcoming construction workforce trainees and trained professionals gained valuable hands-on experience in zero net-energy construction.

04. TRAINING IN ENERGY-EFFICIENT DESIGN

RISD students gained real-life experience applying design, innovation, and energy-responsible design concepts such as efficiency, solar, and on-site energy optimization, and other passive design strategies to design zero net-energy homes.

05. PROOF OF CONCEPT

The Sheridan Small Homes have proven to be very popular, which demonstrates the trend away from large homes and toward quality over quantity. With 750 square feet of living space, each home has 2 bedrooms, 1.5 bathrooms, and a balcony. All five homes sit on three-quarters of an acre — reminiscent of a time when more American families lived in compact, dense spaces and were not striving for ever-larger homes.

Lessons Learned

IN 2020, ONE|NB ESTABLISHED A GOAL OF DESIGNING A SIGNATURE HOME THAT COULD BE EASILY REPLICATED, EMPLOYING THE LESSONS LEARNED FROM DEVELOPING SHERIDAN SMALL HOMES. HALEY HARDWICK-WITMAN COMPLETED THE SCHEMATIC DESIGN OF THIS ECONOMICAL AND ZERO ENERGY-READY HOME, APPROPRIATELY NAMED THE WITMAN HOUSE.

SIMPLIFY THE DESIGN

Creating a more compact, regular shape is more energy-efficient to heat and cool as well as more economical and easier to construct.

MODULAR

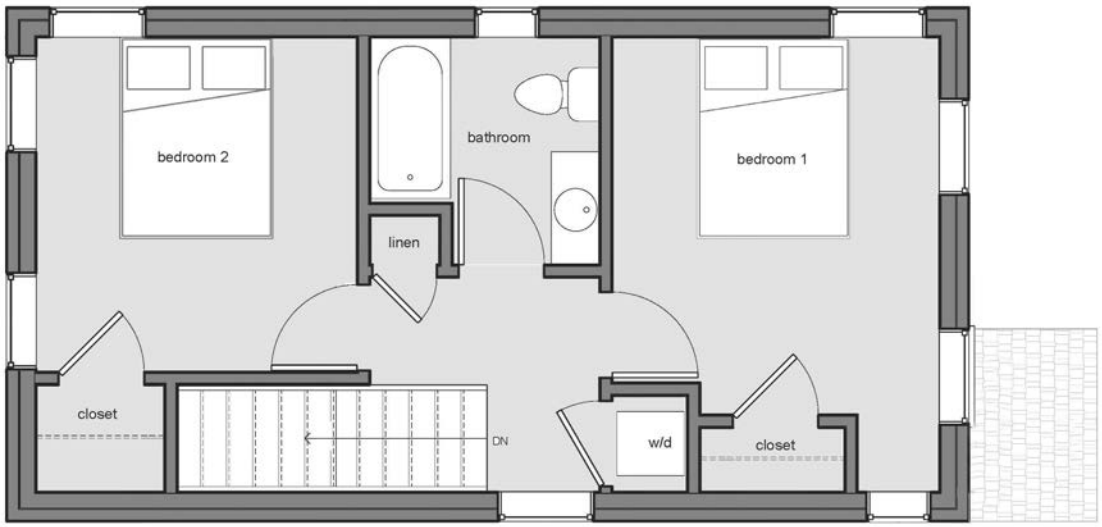
By using more standard detailing and simplifying the geometry, this project can be constructed through modular construction, which shortens the construction timeline.

CERTIFICATION

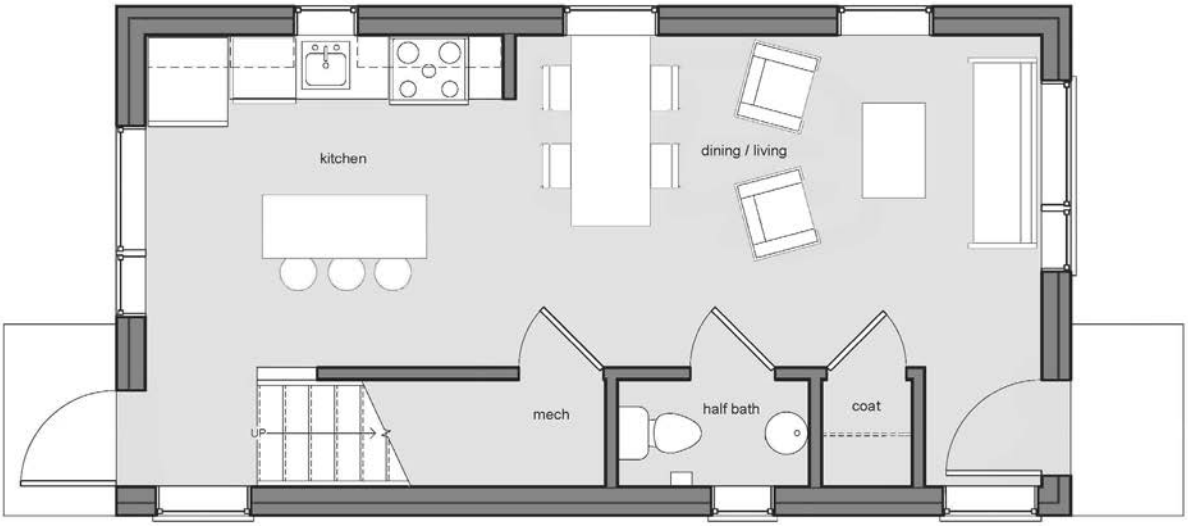
By constructing to high energy-efficiency standards, but not necessarily seeking certifications, such development can save money on fees while still meeting climate goals.

REBATES

It pays to research the various federal and state energy incentive programs that are available in the project's area to acquire rebates for achieving efficiency goals.



LEVEL TWO



LEVEL ONE

Glossary

Passive House: **These homes are built using Passive House principles, which means they have been built to strict energy-efficient standards administered by the Passive House Institute U.S. (PHIUS). The main principle is to create tight exterior walls and roofs so there is hardly any air leakage and incorporating lots of insulation so the conditioned air stays inside the building. www.phius.org**

Renewable Energy: **Refers to energy sources that will never run out, such as electricity generated by solar panels or wind turbines. These sources are also considered "clean energy" since they do not produce pollution. Non-renewable energy sources are fossil fuels, such as oil, natural gas, or coal, which also are major sources of pollution.**

Solar Power: **These houses have an interconnected system of 78 solar panels that generate electricity that is then sold back to the grid. The money generated from this electricity equally offsets the condominium maintenance fees for all homeowners.**

Zero Energy: **Also called "net zero," this means that it is estimated the solar panels on these houses will produce as much or more electricity than the occupants of the homes will consume each year.**

Electric Water Heater: Since the plumbing fixtures within the house are "low-flow," meaning water-efficient, the water heater is 20 gallons, which is on the smaller side. This water heater uses less electricity and takes up less space.

Energy Recovery Ventilator (ERV): This device is part of the mechanical system to ensure excellent air quality inside the house. It exchanges old, stale air from the inside with fresh, clean air from the outside.

Minisplit Heat Pump: This device is located on the high wall in the living room and provides heating and cooling for the entire house. It is not a ducted system so the conditioned air goes directly into heating or cooling the space.

Triple-PaneWindows: Windows are typically areas where there is a lot of air leakage and loss of conditioned air. In order to avoid this, these houses have windows with 3 panes of glass instead of the usual 2 panes.

STATE OF RHODE ISLAND
OFFICE OF ENERGY RESOURCES

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A perfect fit:

Owners of Sheridan Small Home enjoy that less is more

By Stephen Ide, ONE|NB Communications Manager

When Romario and Dr. Jhanev Allen Butler purchased their new home, it was the realization of a big dream for a small space. “Everything just kind of matched up to exactly what we wanted,” Romario said.

The couple had researched small homes. Their condo, one of five at Sheridan Small Homes, was just what the doctor ordered: efficient, 750 square feet, two bedrooms, 1.5 baths, and located along the Woonasquatucket River Greenway and a bike path.

Jhanev, who recently completed postdoctoral work in clinical psychology, said her vision aligned perfectly with the design and concept of these homes. “Something that I really have been committed to in the last few years is minimalist living, efficient living,” she said.

All five condominiums in the complex have solar panels generating electricity that is sold back to the electric grid, helping to offset the owners’ condo fees. In addition, the efficient construction of the homes helps reduce their utility costs.

Jhanev, originally from Boston, was a big believer in the small homes concept (she’s a fan of “Tiny House Nation” on Netflix), and the couple had hoped to find one near her family in Massachusetts. But most zoning laws don’t allow for small homes and Massachusetts was too expensive, she said. Their search took them as far south as Atlanta before they heard about Rhode Island and ONE Neighborhood Builders’ Sheridan Small Homes development.

“What’s so beautiful about ONE Neighborhood Builders is that they’re really trying to revitalize the community,” Jhanev said. “It was perfect because, as a postdoctoral resident, I don’t make enough money. … [We’re] dying in student debt at this point, you know what I mean? … We just met the qualifications for people who could afford this.”

Their shared experiences—from Romario’s life in Jamaica to Jhanev’s travel to other parts of the world where people live in more modest, efficient dwellings—shaped their view of what constitutes happiness. To them, efficient living, not wealth, defines happiness.

Romario continued: “Their [ONE|NB’s] goals really aligned with what we want for our generation and the next generation to come, where we have community, efficient living, not living above our means … a small enough home is enough. … We don’t need two living rooms, two dining rooms. It’s more so about family and community.”

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