NEW ECOLOGY
Community-Based Sustainable Development

# *2Life Opus*
# *Energy Narrative*

Winchester Street
Newton, MA
May 4, 2021


Submitted To:
City of Newton

15 COURT SQUARE, SUITE 420 | BOSTON, MA 02108 | P (617) 557-1700 F (617) 557-1770

In support of the City of Newton's Sustainable Development Design process, the project team would like to present an early stage energy narrative describing the design elements intended to minimize energy use, make use of renewable energy sources, and outline a transition towards net zero status in the future. The project team plans to build a highly efficient building envelope with the residential component of the envelope based on passive house principles as outlined by the Passive House Institute of the United States (PHIUS). The residential portion of the building designed to follow passive house principles accounts for approximately 70% of the exterior wall area. Key envelope features will include continuous insulation and minimized envelope air leakage, with continuous ventilation provided to all residences by means of energy recovery ventilation. In addition, heating and cooling systems will be electric and will utilize heat pump technology. The project team is also designing a solar-ready roof so that the project can enter into a solar power purchase agreement with a 3rd party solar provider. In the final section of this report, the project team outlines how the project can move closer to net zero status in the future.

### GREEN BUILDING RATING SYSTEMS

The project team plans to build an energy efficient and sustainable structure which will be LEED BD+C Multifamily Midrise v4 certifiable at the Gold level as well as certified under the ENERGY STAR Multifamily New Construction program. The project will also include PHIUS+ Core passive house design principles for the residential portion of the building as outlined above. Energy efficiency, high indoor air quality, and occupant health will be main focal points of this project.

## PROPOSED PROJECT DESIGN CHARACTERISTICS

### BUILDING ENVELOPE

The proposed building envelope will include features informed by passive house principles. Envelope characteristics will be further advanced during the design development phase.

| Component | Passive House - PHIUS+ CORE (2018) | Proposed Design |
|---|---|---|
| Roof | R-50ci | TBD- Design Development Phase |
| Podium Slab | R-10ci | TBD- Design Development Phase |
| Exterior Walls | R-12.6ci | TBD- Design Development Phase |
| Windows | U-0.14, SHGC: 0.30 | TBD- Design Development Phase |
| Air Tightness | 0.06CFM$_{50}$/SF envelope area | TBD- Design Development Phase |
| Window to Wall Ratio | 25% | TBD- Design Development Phase |

### ENVELOPE COMMISSIONING PROCESS

The project team plans to test and verify the unit air barrier air infiltration rates as required by LEED using bi-directional blower door testing both at construction midpoint and again after construction completion.



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The project team has targeted the LEED unit air tightness standard of 0.23 cfm50/sf of unit area in pursuit of the LEED point for *enhanced compartmentalization*. While MA Stretch Code does not have a whole-building airtightness criterion for buildings this size, the LEED unit criterion will drive improved whole-building airtightness performance and attention will be paid to detailing an air-tight envelope.

An inspection will be performed after framing and air-sealing are complete but before insulation is installed in order to identify any potential areas of thermal bridging and/or air infiltration. This inspection will be documented with site photos. Once completed, unit air sealing details will be tested with bi-directional unit blower door tests in order to confirm air tightness and to identify areas in need of follow up air sealing (as needed). At the end of construction, unit blower door tests will be repeated to confirm air-tightness, and units will be blower door tested for air infiltration rates per RESNET sampling protocols. In addition, inspection using a thermal imaging camera will be conducted to show compliance with thermal bridging and air sealing protocols.

# BUILDING MECHANICAL SYSTEMS

## SYSTEM DESCRIPTIONS

Space heating and cooling will be delivered by heat pumps, and energy recovery ventilation will be included for efficient ventilation.

| System | Passive House - PHIUS+ CORE (2018) System Description | Proposed Design Description |
|---|---|---|
| Space Heating and Cooling | Central VRF or individual air-source heat pumps | Space heating and cooling system selection is still being determined, with the team currently evaluating centralized VRF air-source heat pumps and individual air-source heat pumps |
| Ventilation | Energy Recovery Ventilation with fan energy at 1.0W/cfm | Energy recovery ventilators will be included as central systems, or alternatively as either semi-centralized floor-by-floor systems or individual unit systems, fan energy at 1.0 W/cfm |
| Domestic Hot Water | PHIUS passive house standards are technology agnostic, with an emphasis on efficiency and total energy use | Domestic Hot Water is planned to be a central gas-fired water heater plant (96% efficiency) with a recirculation loop; the project team is actively considering future conversion of the system to all-electric operation |
| Interior Lighting | LED | LED |
| Exterior Lighting | LED | LED |



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### SYSTEMS COMMISSIONING PROCESS

As part of the LEED certification process, the project will retain a licensed commissioning agent (CxA) who will develop a detailed commissioning plan based on the building specifications and systems. The CxA will develop a functional performance test sheet for each system to be commissioned, and will commission the following systems: Mechanical systems and equipment including Energy Recovery Ventilation (ERV) systems, common space exhaust fans, the central heating and cooling system and a sample of apartment distribution systems (as appropriate), and all direct digital controls. For lighting systems, all common space lighting control systems including occupancy sensors will be commissioned and sampled at the appropriate rate. For plumbing systems, the domestic hot water heating system including hot water heaters, storage tanks, circulating pumps, thermostatic mixing valves, and controls will be sampled at the appropriate rate.

### SOLAR READY ROOF ASSESSMENT

The project team is currently exploring the best path forward for the inclusion of solar photovoltaics on the roof of the building. Roof area available for solar will depend on final HVAC system design. A preliminary solar photovoltaic analysis by Petersen Engineering shows that the roof may be able to accommodate a system size of up to 146 kW. This preliminary design would produce an estimated 197,200 kWh of electricity annually, offsetting 23% of the annual expected electricity use of the building.

## NET ZERO SCENARIO TRANSITION

Below is a description of the technical framework by which the project can be transitioned to move towards net zero greenhouse gas emissions in the future, acknowledging that such a transition might not be economically or technically feasible at first construction. This table explains the future condition and the process of transitioning from the proposed design to the future condition.

| | **Net Zero Condition** | **Transition Process** |
|---|---|---|
| Building Envelope | The building envelope will be well insulated and have a low level of air infiltration which will be tested and verified at construction. | This system will be a zero (site) emissions system at installation. |
| HVAC Systems | The heating and cooling systems will be electric. In addition, energy recovery ventilation will be used to capture energy from the ventilation system. | This system will be a zero (site) emissions system at installation. |



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| | | |
|---|---|---|
| Domestic Hot Water | A central gas-fired hot water system will be included at construction. | At the end of the system lifetime, the project team expects the all-electric DHW system technology to have advanced sufficiently to allow for conversion of this system to all-electric. |
| Lighting | The project will use LED lighting throughout. The building energy model will factor in and measure Lighting Power Density as a calculation in overall building energy consumption. | The building and management team will include updated technology as it is available and will update systems at the end of the service life of the lighting systems. |
| Renewable Energy Systems | The project team is designing a solar ready roof so that the project can enter into a solar power purchase agreement with a 3rd party provider. System size will depend on available roof space and final design will be completed by the selected solar provider. | In order to become fully carbon neutral, this project will likely have to purchase renewable energy credits given the building footprint and limited roof area. |

The building as proposed uses electricity for heating and cooling and will be designed as a low energy building by utilizing passive house design principles. In addition, GHG emissions associated with electricity generation are expected to decrease over time as the mix of energy sources powering the grid moves away from fossil fuel-based sources, which may present future opportunities for decarbonization.



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