

DEEP ENERGY RETROFIT AT EVA WHITE APARTMENTS

WinnCompanies and Castle Square Tenants Organization



STATUS:
IN PROGRESS

BUILDING TYPE

- Deed restricted affordable housing
- Two multi-family buildings, adding up to 102 units
- Built in 1966
- 76,684 sq. ft. of Gross Floor Area (GFA)

PROJECT TEAM

- **Building Owner/Developer:** Winn Development and Castle Square Tenants Organization
- **Architect:** Reisen Design Associates
- **Contractor:** Keith Construction Inc.
- **MEP Engineer:** Petersen Engineering
- **Structural Engineer:** Odeh Engineers
- **Building Envelope Consultant:** Building Enclosure Associates
- **Envelope Prefabrication & Installation:** Sunrise Erectors



FUNDING SOURCES

- U.S. Department of Energy
- Mass Save
- Mass Housing Finance Authority
- Rental Assistance Demonstration (RAD) conversion low-income housing tax credits (LIHTC)

KEY RETROFIT COMPONENTS

EXTERIOR INSULATION

Walls

- Fully engineered cladding solution comprised of Kingspan insulated metal panels (R-29)
- Peerless triple-glazed windows (U-0.21)

Roof

- R-40 minimum polyisocyanurate insulation
- New roofing membrane

MECHANICALS

Heating, Cooling and Ventilation

- Central Mitsubishi Y- Series Variable Refrigerant Flow (VRF)
- Central Annexair Energy Recovery Ventilator (ERV)

Domestic Hot Water

- Central Mitsubishi QAHV CO₂-based air-to-water heat pump

HIGHLIGHTS

RETROFIT COST **\$16.1 million**

440 TREMONT STREET

67%

450 TREMONT STREET

48%

ANTICIPATED
ENERGY USE
REDUCTION

440 TREMONT STREET

32.2 *kbtu per sq. ft.*

450 TREMONT STREET

48.9 *kbtu per sq. ft.*

MODELED
ENERGY USE
INTENSITY
AFTER
RETROFIT

PRE-EXISTING CONDITIONS

Eva White Apartments is a concrete building with brick veneer that has historically featured single pane windows, uninsulated walls, a poorly insulated roof, and an exposed floor.

Pre-retrofit, the property was heated by central natural gas boilers with hydronic baseboard distribution and cooled by tenant-installed window air conditioning units.

During the winter, tenants were using electric space heaters in addition to the heat provided by the central gas fired boilers.

Domestic hot water has been provided by central, high-efficiency condensing water heaters and storage tanks.



LESSONS FROM THE FIELD

DECARBONIZATION AS THE NEW BUSINESS-AS-USUAL

At the outset of large building improvement projects like the one in progress at Eva White Apartments, WinnCompanies usually assesses the project’s capital needs and the building’s status, accounting for variables like deferred maintenance within residential units and at the building systems level. As many affordable housing developers, WinnCompanies often works around financing cycles to carry out renovations at trigger points such as refinancing or the expiration of an affordability term. The key is to ensure that **decarbonization is considered in this business-as-usual**.

WinnCompanies’ Vice President of Energy & Sustainability, **Christina McPike**’s goal has been to fit decarbonization, deep energy retrofits, and efficiency within the same phase of upgrades that affordable housing already works with:

“Every building eventually gets renovated, so it's about who is at the table advocating for what the renovation scope will be, asking what the buildings really need. That’s the genesis of these deep energy retrofits, really **looking at these older properties with significant capital needs and using that as a trigger point to do these retrofits**... It's the same consultants, the team doesn’t change, it’s just that instead of replacing boilers at Eva White Apartments, we are going to install a Variable Refrigerant Flow (VRF) system... We just want to achieve electrification responsibly and upgrade the ventilation with energy recovery.”

Once an opportunity to pursue retrofits is identified, the next step is finding financing for any additions to an existing rehabilitation or renovation project. The specific retrofit technologies and systems selected for a given project can often depend on the provisions of the secured financing sources. However, this is often not a linear process for affordable housing.

In this case, the Eva White Apartments Deep Energy Retrogit (DER) did not begin until December 2024, after five years of financing delays. A U.S. Department of Energy (DOE) grant eventually enabled WinnCompanies to work a DER into an already planned full-building renovation. Since DOE wanted to explore possibilities for prefabricated retrofit solutions, the project team set out to devise a “prefab, structural panel that acts as an air, thermal, and vapor barrier with the windows preinstalled that can be hung on the building.” However, this particular hanging panel solution was still very much in the research and development phase, and was not ready to be tested on a building as large and centrally located as Eva White Apartments. In the end, the team pivoted to using innovative retrofit products and systems that were mostly constructed “in the field” as opposed to fully prefabricated off-site.



BRINGING IN EXPERTS

Based on McPike’s experience with the development of the Eva White Apartments retrofit and many other multi-family affordable housing retrofit projects, it is always essential to know when to bring in additional experts or consultants to ensure a given component of a retrofit project is planned and implemented correctly. While some projects start out with the ideal team for the job, others build out the team along the way to ensure the best possible outcome from the retrofit. At Eva White, WinnCompanies brought in an additional building enclosure/envelope consultant, who provided specialized advice on the building skin, but generally the original project team did not change.

FIND A PROJECT CHAMPION

McPike believes that every project needs a champion who will speak up for the integration of decarbonization measures and explain why they are important to the building’s longevity. Like any construction or renovation project, retrofits require strategic approaches to financing and timeline planning, and it is important to have someone on the team whose responsibility is to keep the project on track.

CELEBRATE PROJECT MILESTONES

McPike also notes that it is important not only to celebrate the completion of a full retrofit, but also interim progress like securing funding sources or successfully installing an aspect of the renovation. She encourages building owners and project teams to lean into the sometimes unexpectedly iterative process of retrofitting buildings at the scale of those required to comply with BERDO and to be prepared to pivot from one strategy to another. Now, the work is to figure out replicable models for BERDO compliant whole-building retrofits that can be applied across building typologies.



CONNECTING RETROFITS TO RESIDENTS' LIVES

ENGAGING WITH TENANTS AND MINIMIZING DISRUPTIONS

McPike recognizes that when retrofitting affordable housing properties, **there is an equity component to every project**. “We want energy efficiency projects to happen in environmental justice communities in particular because we hope it will make those homes more comfortable and better places to live.” For example, at Eva White Apartments, “[residents] are going to get central air conditioning and they didn't have that before. That's really important.”

In this context, **clear and continuous communication about the impacts of a retrofit project is critical**. At the outset of the project, WinnCompanies conducted meetings with tenants to explain what the renovation and retrofit would include and hear feedback. They displayed mockups of the proposed in-unit improvements and provided high-level information about the new electrification or ventilation technology. “Most people think a lot about what their kitchen looks like, how warm the light fixtures are going to be, what the water pressure will be – this tends to be the main focus of resident engagement and feedback loops,” says McPike. In this case, the renovation included upgrading in-unit appliances, lighting, and cooktops to help reduce internal equipment loads in the building and improve residents’ quality of life.

Potential changes to utility bills need to be part of these conversations. As McPike reflected: “what I have been pretty vocal about is talking about operating costs and utility allowances. Eva White is master metered. It will always be master metered. Residents don't pay for the utilities there, but residents [at other properties] do pay their electric bills and they receive utility allowances for that. Notifying residents that their utility allowance is going to increase because their electric bill is going to increase and why is important.”

★ BEST PRACTICES TO DOCUMENT THE BENEFITS OF A PROJECT

Thanks to a U.S. DOE grant, WinnCompanies has been able to collect multi-year data on indoor air quality from a couple dozen apartments in Eva White Apartments.

McPike explained: “the plan is to monitor indoor air quality post-retrofit and compare the two. I think if you have an apartment with a gas furnace or gas boiler, it would be pretty interesting to monitor [air quality] pre- and post-electrification. If you're not combusting gas, monitoring humidity and particulate matter is interesting. Hopefully ventilation post retrofit is handling that better– you want to make sure that the retrofit hasn't made ventilation worse.”

THE RETROFIT APPROACH AT EVA WHITE APARTMENTS FEATURES AN INNOVATIVE PREFABRICATED ENVELOPE SYSTEM CONSISTING OF PRE-ASSEMBLED PANELS THAT ARE INSTALLED OVER A METAL FRAME (PICTURED BELOW). THIS UNIQUE DESIGN MINIMIZES DISRUPTIONS AND REDUCES CONSTRUCTION TIMELINES



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