



**University of Central Florida**

Attached Housing | April 5, 2022

## Fair Oaks Apartments Retrofit

### Project Summary

Right off Tampa Bay on the west coast of Florida, Saint Petersburg is a growing city with an aging housing stock. 80% of homes in the area were built before 1980. A 20-minute walk away from downtown and next to two bus routes and a bike path, Fair Oaks Apartments currently offers six 1 bed 1 bath apartments and two 2 bed 1 bath apartments in the Historic Uptown Neighborhood. The building serves the city's high percentage of singles renters, 59% of the population.

Our mission is to show that older, pre-existing, buildings can surpass the energy efficiency of modern buildings by retrofitting key aspects. Built in 1973, the retrofit of Fair Oaks Apartments will show St. Petersburg's aging housing market, that a net-zero retrofit can be more economical, environmentally friendly, and preserve the existing community

### Design Strategy

People, Planet, and Profit were the main design priorities for this project. To encourage connections between renters as well as the overall neighborhood, the overall landscape of the property will be redesigned to incorporate renter interests, such as community gardens and gathering spaces. Our goal was to help renters form a community within themselves and the wider neighborhood.

By reusing existing infrastructure, the overall environmental impact generated by the project is much lower than demolition and new construction. In addition, the energy consumption of the building will be reduced by improving insulation, updating appliances, redesigning mechanical systems, and adding solar.

Lastly, these changes can only be made if it makes economic sense. Throughout the design, we prioritized balancing total cost of the retrofit for the homeowner as well as the cost for the renter. By raising the rent to equal existing, non-retrofitted apartments of similar size, this apartment complex will be an affordable solution to the community's housing needs.



### Project Data

- **Location:** St. Petersburg, FL, USA
- **Climate Zone:** 2A (Hot and Humid)
- **Lot Size:** 0.18 Acre
- **Building Size:** 5000 ft<sup>2</sup> for 2 stories
- **Occupancy:** 8-10 (532.92 ft<sup>2</sup>/person)
- **Building age:** 49 years old (1973)
- **Renovation Cost:** \$348,300 or 70\$/ft<sup>2</sup>
- **Energy Performance:**
  - **HERS Score:**
    - 49 without Solar Panels
    - 2 with Solar Panels
  - **EUI:** 49 kBtu/sq ft year
- **Average Utility Cost:** cost before retrofit \$500/month (3,700 kWh/month), after retrofit \$40
- **Carbon Emissions:** 40-ton of CO<sub>2</sub>e/ft<sup>2</sup>/yr

### Technical Specifications

- **R-Values:**
  - Wall: EIFS R-20
  - Roof: R-45
  - Windows: U-0.2
- **HVAC:**
  - 20.1 SEER multi zone split system with ceiling cassette indoor unit (4x1.5 ton & 2x2 tons)
- **On-Site PV:**
  - 26 kW (72 \* 370-Watt panels producing 43,000 kW/year)
- **Geothermal Water Heaters:**
  - 2x2.5 ton 20.7 EER 2 stage vertical heat pumps (60,000 Btu or 17.5kW for 4 units)

### Partners

**Industry Partners** HKS, Prevost Stamper Inc.

## Project Highlights

**Architecture:** Throughout the retrofit process we prioritized preserving the existing architecture of the building. By adding covered parking, hurricane shutters, a tied down metal roof and a solar reflective painted exterior the building will be cooler for residents and hurricane ready. Additionally, the design is blended with aesthetic and functional enhancements, like matching shutters with exterior AC units covers.

**Engineering:** To achieve net-zero, the thermal envelope will be expanded to include an exterior insulation finishing system (EIFS) in conjunction with highly efficient insulated, impact-resistant windows. The roof will be replaced with a metal standing seam roof, including fill celluloid insulation. The HVAC systems will be upgraded to a 20.1 SEER rated ductless multi-zone split system. For water management, toilets, showerheads, and faucets were upgraded to WaterSense certified equipment to drastically reduce energy and water usage in the building while conserving the existing piping layout.

**Market Analysis:** The current rent for a 1-bedroom apartment is \$1,100 and \$1,200 for a 2-bedroom apartment. Since Fair Oaks Apartment's rent is already below market price for the St. Petersburg area. Rent will slightly increase to the market price, \$1,400 and \$1,500 to pay for the new changes and additions made in the complex while still staying within the recommended rent price of 30% of the median salary range.

**Durability and Resilience:** Buildings in Florida are at high risk of hurricane damage. Durability and safety were critical design parameters. Impact proof windows and shutters will protect residents. A standing seam metal roof was chosen for its durability, minimal maintenance, made with at least 50% recycled materials, and fully recyclable at its end of life. In addition, 25-year warranty mono-crystalline solar panels were chosen due to their efficiency and 95% of the material used can be recycled.

**Embodied Environmental Impact:** For this retrofit, the team focused on improving critical aspects of Fair Oaks Apartments to improve efficiency and reduced the need for major demolition and construction that generates large amounts of pollution. With the new additions, such as rainwater harvesting, efficient irrigation of native landscaping and other previously mentioned additions, the carbon emissions per unit, 3-4.3 tons, was drastically reduced from the U.S. average of 8.3-11.4 tons.

**Integrated Performance:** Convenient occupancy sensors, light dimmers, and smart thermostats provide comfort and help residents save energy. Exterior Insulation & Finish Systems (EIFS) will keep the building cool longer along with new efficient HVAC systems that will cool residents during the hot summer months.

**Occupant Experience:** The outdoor area has been transformed into a social community space with two covered outdoor sitting areas and multiple community garden plots. Bicycle parking and electric vehicle charging has also been installed to allow occupants the ability to freely travel the local community. To enhance the occupant's experience, each unit will be updated with Energy Star appliances and VOC free biodegradable wool carpeting. All lighting features will be converted to LEDs and occupancy sensors will be added for user convenience. In addition, windows will be replaced and properly shaded with Bahama shutters to maximize daylighting and let residents enjoy their garden views. Overall, the changes made will enhance the occupancy experience at Fair Oaks Apartments

**Comfort and Environmental Quality:** Advanced controls and innovative technologies were used to satisfy the resident's needs. An efficient HVAC system coupled with a solid thermal envelope will keep the users comfortable at around 75°F through heat exchange with the environment. Proper natural ventilation coupled with spot ventilation equipment in kitchens and bathrooms leads to higher air quality, making the occupants more comfortable and productive. In terms of acoustic comfort, new carpets and mechanical system selection and design will drastically reduce noise in all the units.

**Energy Performance:** With these renovations, excluding energy generation, the house has a HERS score of 49. The HERS score is reduced to 2 when adding 26 kWh of mono-crystalline solar panels and geothermal heat pumps are added. These systems produce 43,000 kWh electricity per year and provide hot water for half of the building. Overall, the building reached an EUI of 49 kBtu/ (sq ft \* yr).