Fair Oaks Apartments Retrofit

The Team: Sunshine Upgrade

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Durability and Resilience

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Engineering, Comfort environmental quality

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Building Envelope, Occupant Experience

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Market analysis,
Environmental impact

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Energy Performance, Irrigation Plan

Industry Partners:

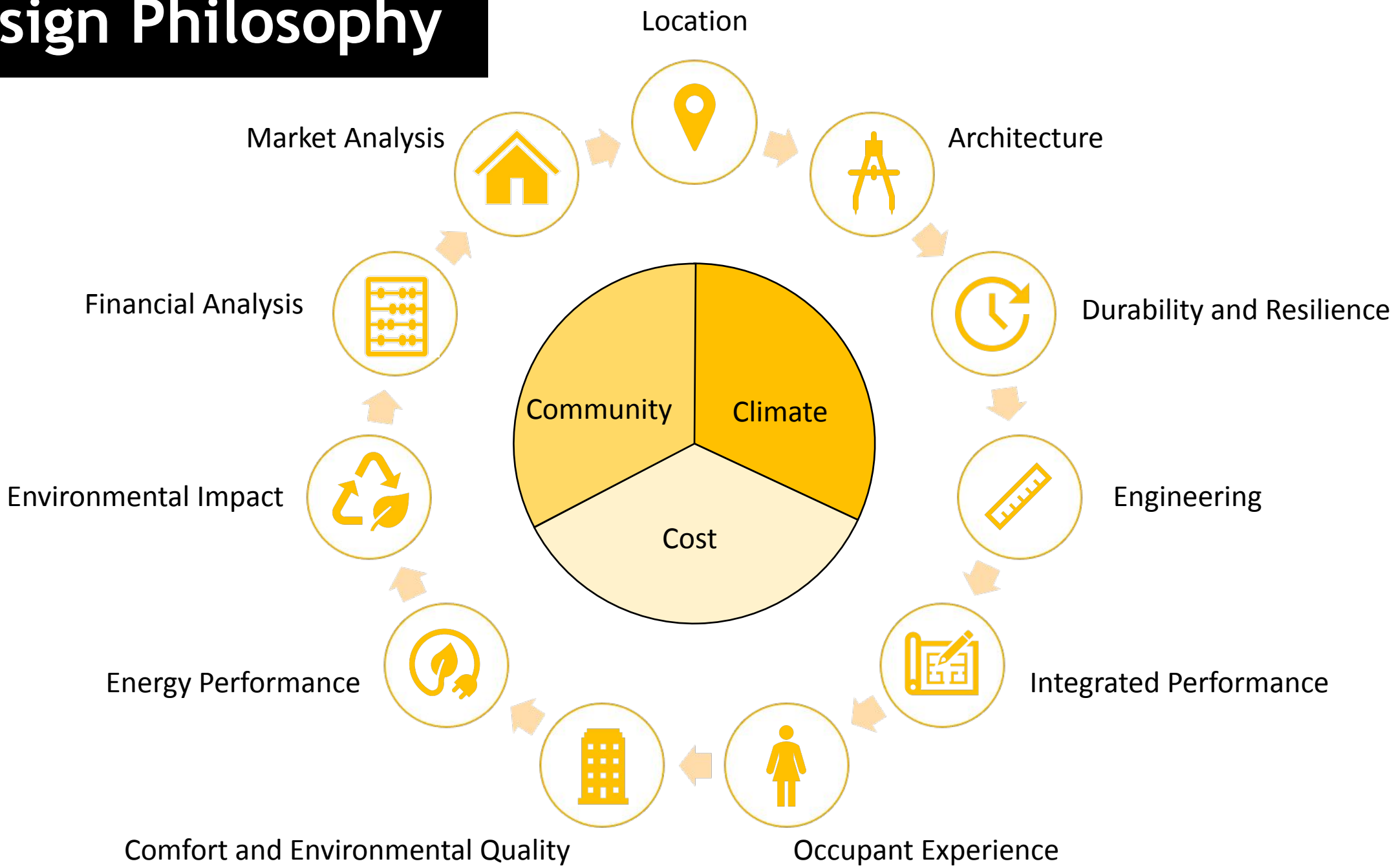
Prevost Stamper Inc.
designpsi.com

HKS

Faculty Advisor: Pr. Anatoly Parahovnik

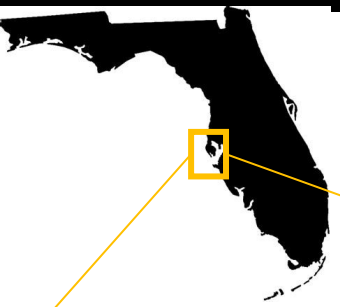
Homeowner: Caroline Cziesla

Design Philosophy

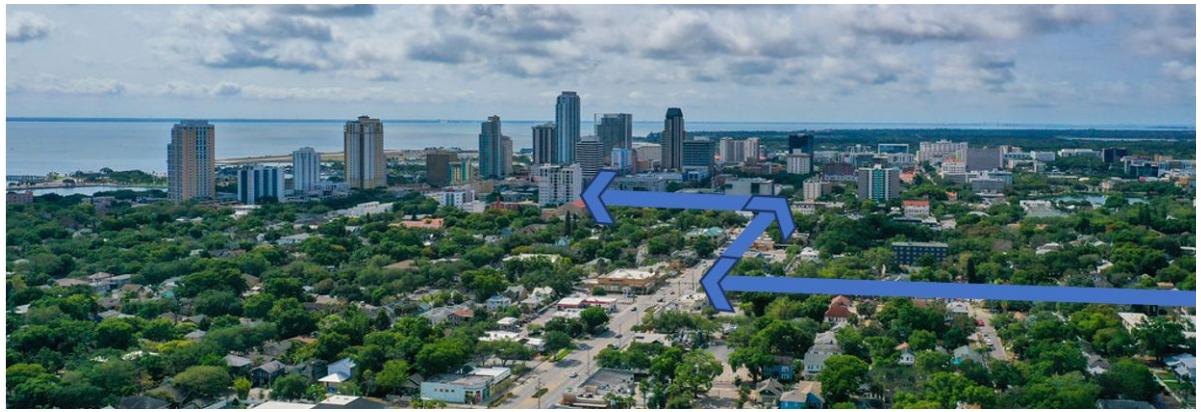


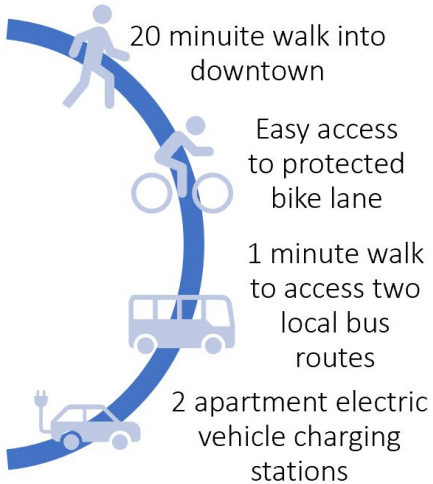
Location: Saint Petersburg, Florida, USA

Climate



- **Population:** 265,358
- **City Density:** 4,332/sq mile
- **Growth Since 2010:** 9.5%





Climate Zone: 2A Hot & Humid

- **Average High/Low Temperature:** 84°F / 62°F
- **Average Wind Speed:** 10.7-6.4 mph Annually
- **Average Rainfall:** 6.4 in (August) - 1.7in (November) extreme seasonal variation
- **Daylight:** 13 hrs 54 mins (June)/10 hr 23 mins (December)

Historic Uptown Neighborhood

80% of homes in the area were built before 1980

Demonstrate economical energy efficient retrofits for older homes

- Preserve existing
  - Building
  - Neighborhood and community
  - Environment (no damage caused by demolishing/construction)

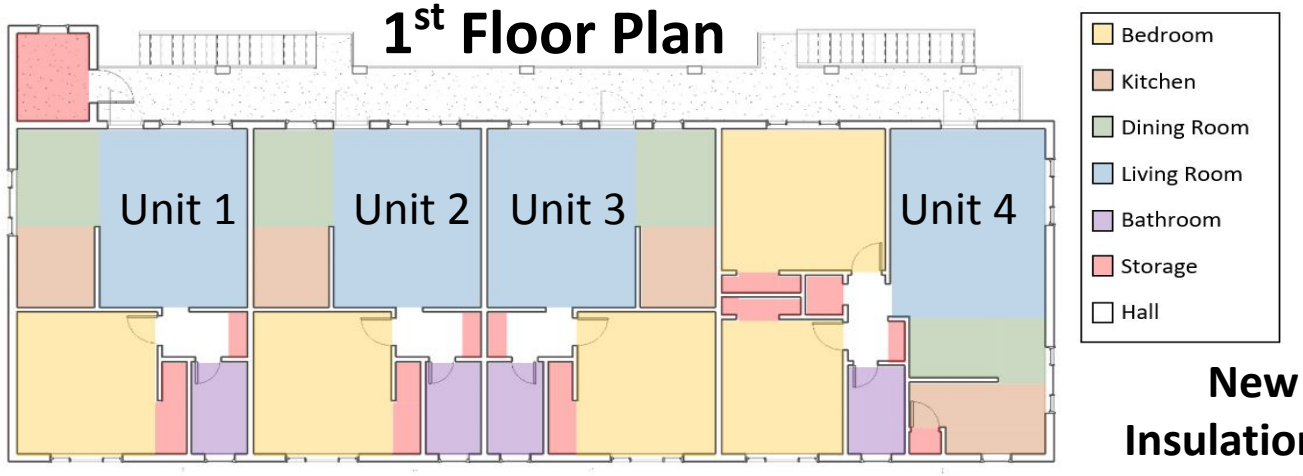
Architecture

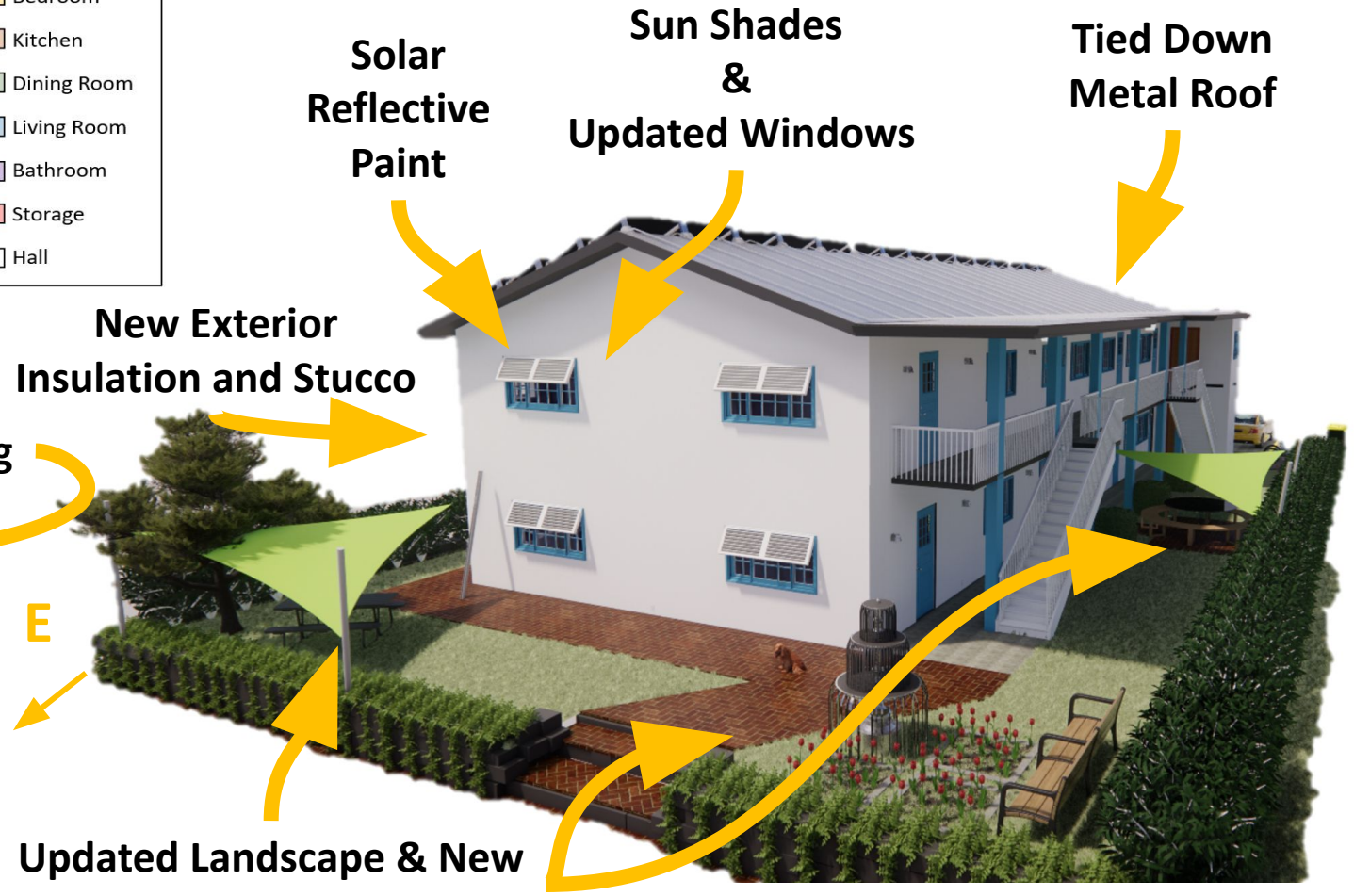
Community

Fair Oaks Apartments

Lot Size:	Building Size:	8 Units:	Occupancy:	Building age:
0.18 Acre	5000 ft^2; 2 stories	Six (1 Bed 1 Bath), Two (2 Bed 1 Bath)	8-10 (532.92 ft^2/person)	49 years old (1973)

1st Floor Plan



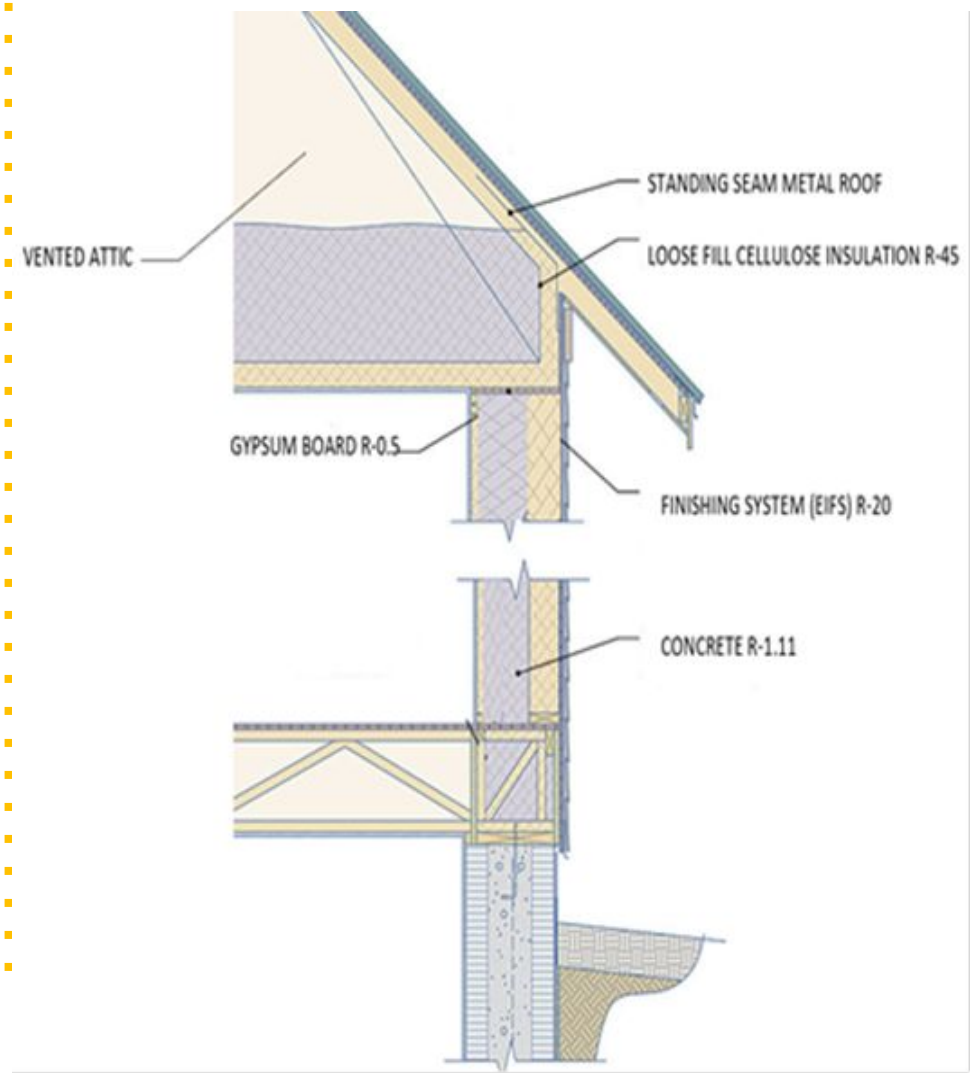


Engineering

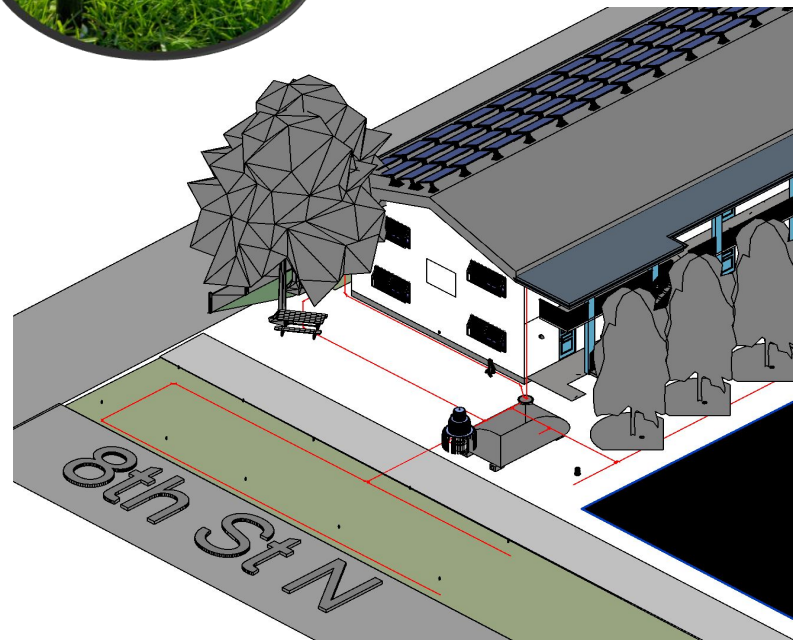
Cost

HVAC: multi- zone mini split

Building Envelope



Rainwater Harvest System and high-tech Irrigation



Durability and Resilience

Climate

Standing seam metal roof

Walls consist of Exterior insulation with stucco and masonry blocks

Updated impact-resistant windows along with Sun Shades

Integrated Performance

Community

- Multi-zone mini split HVAC
- Wireless programmable thermostat & motion detection sensor
- Exterior Insulation & Finishing System (EIFS) R-20

- Onsite photovoltaic energy generation
- Electric car charging
- Rainwater harvesting for irrigation
- Geothermal water heating

Occupant Experience

Community

- LED Lighting with integrated occupancy sensors
- WaterSense faucets, toilets, and showerheads
- New appliances are 40% to 50% more energy efficient

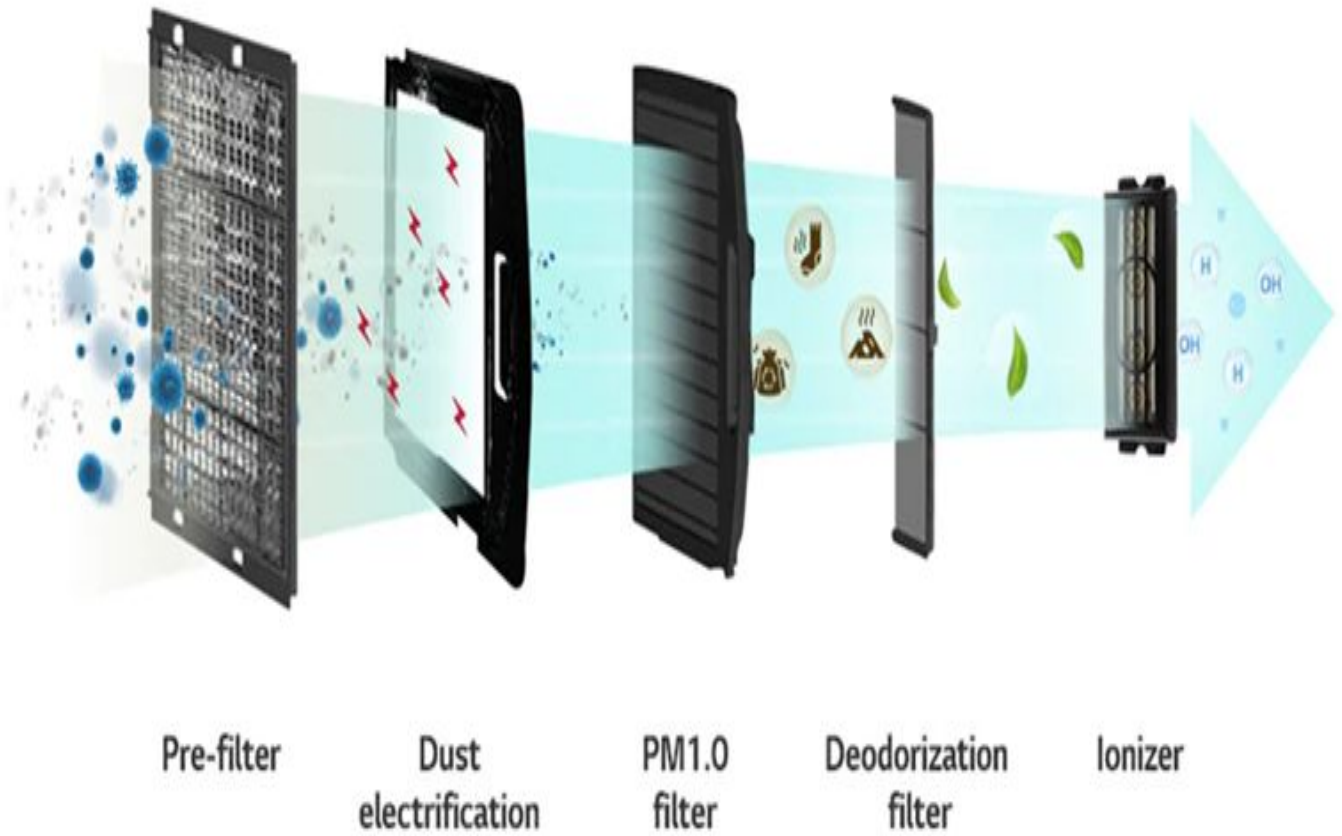
- Community garden
- Picnic areas with shade and grill
- Communal bikes

- Ample daylight from windows
- New carpeting
- Natural air flow

Comfort and Environmental Quality

Community

Air Purification kit 5-STEP filtration



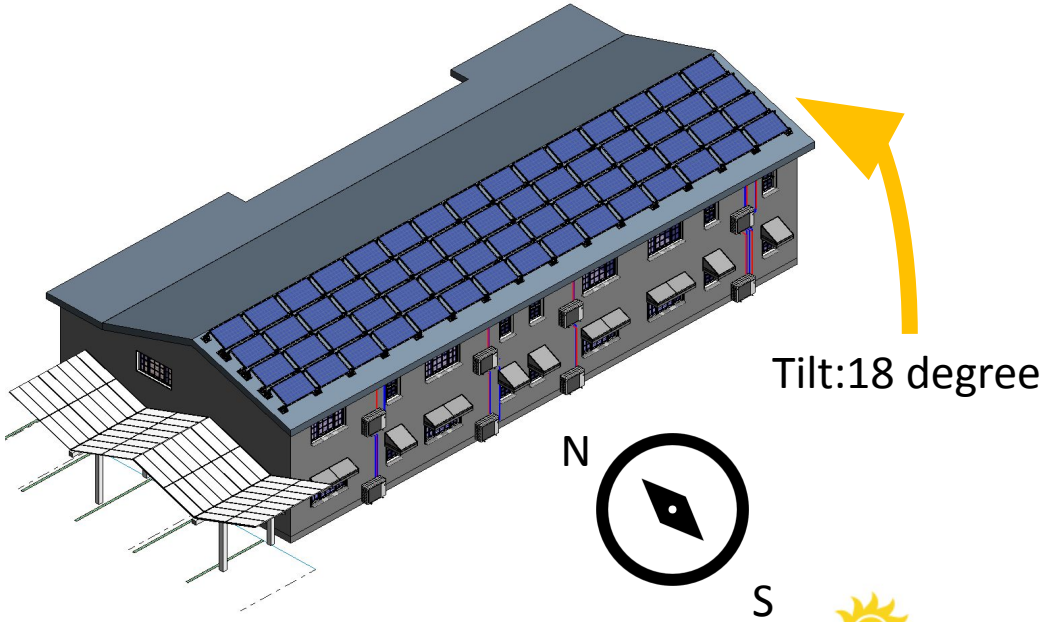
Building Ventilation and Spot Ventilation Strategies

- Variable speeds of 50-80-110 CFM
- Smart flow technology

Energy Performance

Climate

26 kW Mono-Crystalline Solar Panels

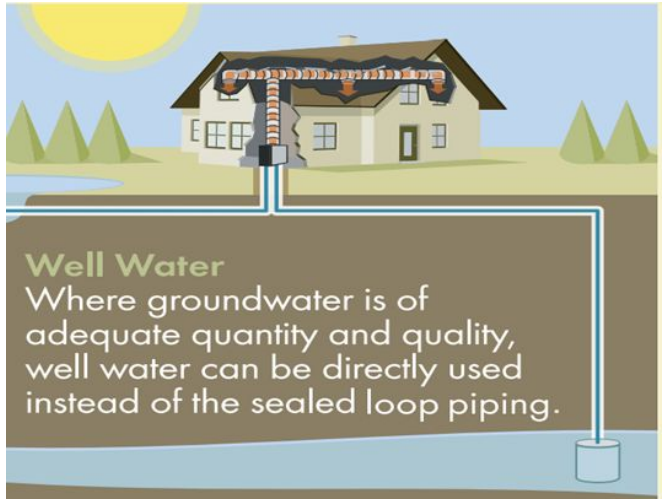


Occupancy Sensor Switch

LED Saves 80%

High Solar Reflectivity from Metal Roof

5 Ton Geothermal Heat Pump (Open loop, Vertical System)



HERS Score

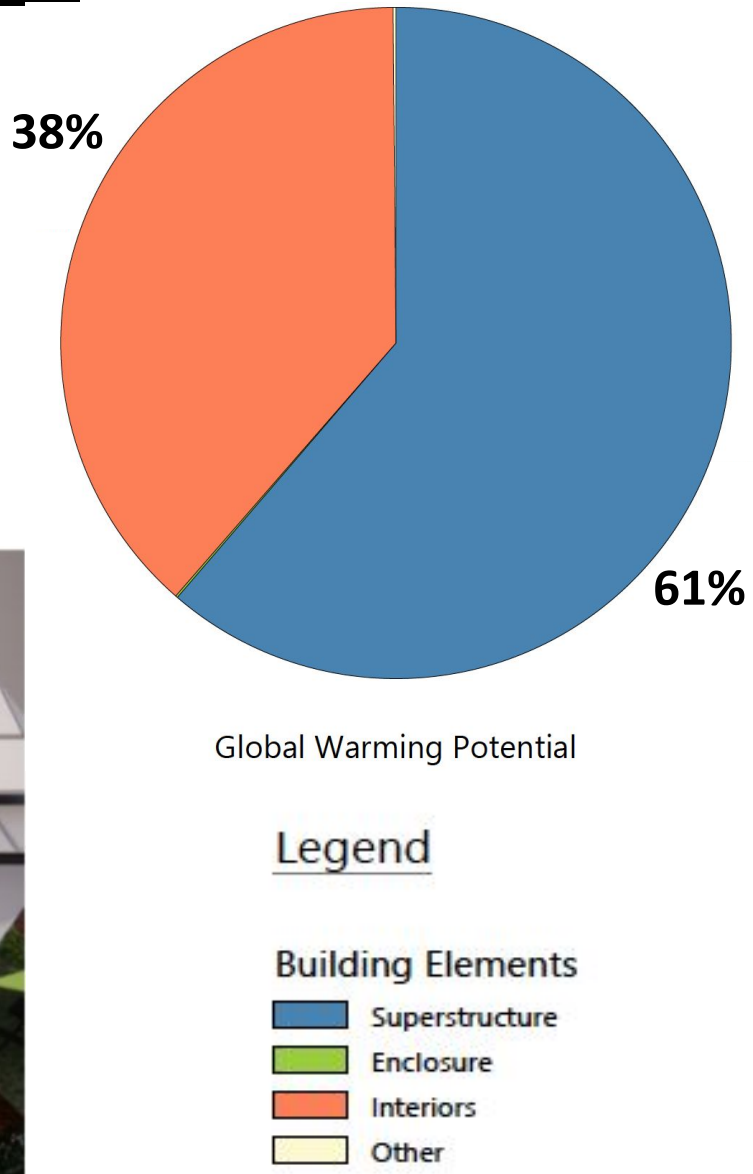
100	~49	~2
Standard house built in 2006	Retrofitted **without** renewable energy	**EUI: 49 kBtu/ (sq ft*yr)** Retrofitted **with** renewable energy

Embodied Environmental Impact

Climate

Carbon emissions for the building calculated at

40-ton of $CO_2e/ft^2/yr$



Financial Analysis

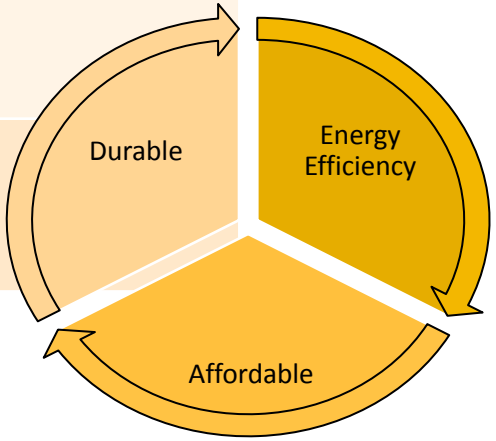
Cost

Based on U.S. and Local Market

System	Net Cost for 8 Units
Solar System after 26% FL solar tax incentive (labor and convertor costs included) x72 LG 370 W solar panels	$44,000
New Multi split AC system (D wall mounted)(labor cost included) x8	$35,000
Metal roof (labor included) x1	$40,000
Bahama Shutter x10	$7,500
Insulation Roof (material & installation cost)	$2,500
Insulation Exterior (material & installation cost)	$56,300
Windows x24	$48,000
Updated plumbing	$5,600
Ventilation system	$5,500
Water heater (installation included) x2	$4,600
Biodegradable carpet	$40,000

System	Net Cost for 8 Units
Washer (Insignia) x1	$750
Hybrid heat pump Dryer (Whirlpool) x1	$1,750
Energy efficient refrigerator (Beko) x8	$8,800
Resistance heating stoves (Frigidaire) x8	$6,800
LED lightening x160	$220
Occupancy sensors switch x38	$750
High-tech irrigation system x1	$20,000
Rainwater harvest 1500-gallon tank x1	$1,400
Geothermal 2.5 Ton water heat pumps (after 26% Fl tax incentive)	$15,000

Total = $348,300

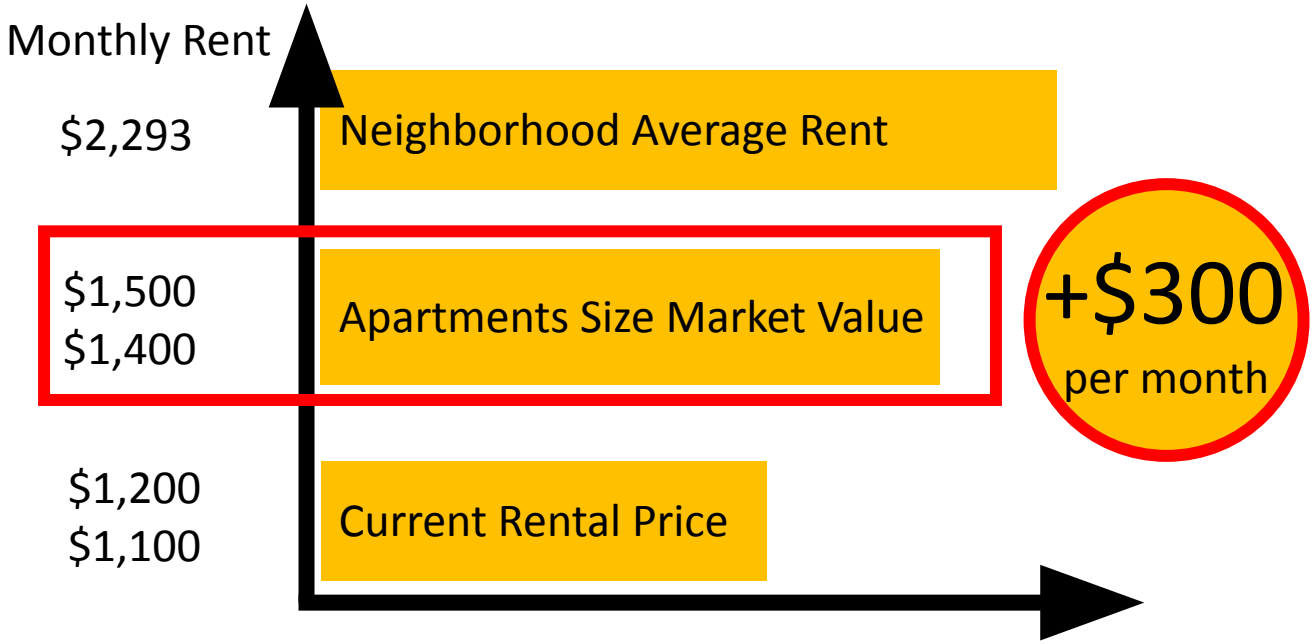


Market Analysis

Cost

Homeowner

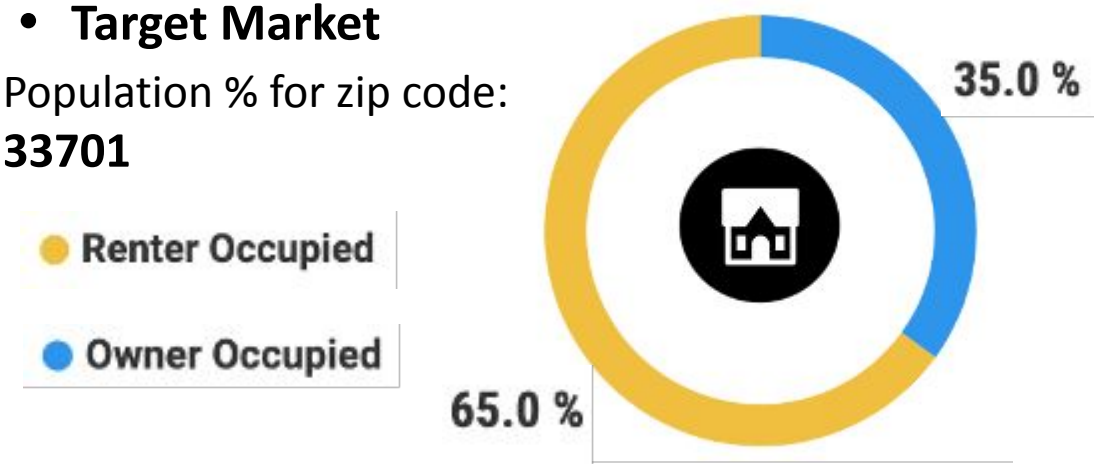
- Fix current profit margin at current rent
- Raise rent to market value
- Fund retrofit through profit increase



Renter

- **Target Market**

Population % for zip code:
33701



- Rent prices have increased 12% since 2017
- **Keep rent affordable and not higher than unrenovated units of equal size**

Annual Profit Increase

$29,000 (Rent) + $5,500 (Solar savings) = **$34,500**

Current ROI for $348,300 cost = 10 years

- Solar premium 4% increase in house value


UCF
Thank you for your time!