SOLAR DECATHLON 2022
PROJECT XERO | BSU ATTACHED HOUSING
TYLER RENSCHE
CHARLIE DAVIS
ZEELYN STUTZ
DILLON REDDING
Project Intro

Englewood CDC Goals

- Liveability
  - Unit sizes perfect for families up to 5
- Opportunity
  - ADA accessible 1st floors maximizing visitability
- Vitality
  - Direct access to bike path on New York St.
- Education
  - Deeply integrated community spaces throughout complex

Studio Xero Response

- I block from blue line transit route
- Attached 24/7 work and collaboration space

Percent of Englewood population with some high school education: 52%
Mean travel time to work every day: 0:24
Near east side current population: 40k
Median annual income of Englewood community member: 23K

Near east side current population: 23k
Median annual income of Englewood community member: 40k
Englewood CDC is currently developing a 40 residential unit rent to own housing program in the surrounding neighborhood.

*This indicates a specific note or condition related to the project.*
ARCHITECTURE

STUDIO XERO | BSU | ATTACHED HOUSING
After researching unit sizing, divide buildable area into potential units.

Scale 3D massing of site buildable area.

Angle frontal facades for sightlines & distinction between public/private.

Subtract roof pitch with consideration towards PV collection & uniqueness.

Divide units to allow for interstitial courtyards & increase daylighting in units.

Unify separate buildings with continuous rainscreen, façade.
ARCHITECTURE
OCCUPANT EXPERIENCE

STUDIO XERO | BSU | ATTACHED HOUSING
OCCUPANT EXPERIENCE
OCCUPANT EXPERIENCE

STUDIO XERO | BSU | ATTACHED HOUSING
DURABILITY & RESILIENCE
INTEGRATED PERFORMANCE

STUDIO XERO | BSU | ATTACHED HOUSING

STALE INDOOR AIR TO OUTSIDE

WARM AIR RISES TO LOW PRESSURE APERATURE

COOL AIR BEGINS TO HEAT AND FIND LOW PRESSURE AREA

OPERABLE CASEMENT WINDOWS
INTEGRATED PERFORMANCE

STUDIO XERO | BSU | ATTACHED HOUSING

PLUMBING WALL

SIMPLE ACCESS TO FIXTURES, DRAINAGE, AND VENT STACK

RETURN STALE AIR

SUPPLY FRESH AIR

HEAT PUMP

CONDENSER

ERV

WATER
HEATER

SUNNY + HEATING + COOLING
## ENERGY PERFORMANCE

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>UNIT 1</th>
<th>UNIT 2</th>
<th>UNIT 3</th>
<th>UNIT 4</th>
<th>UNIT 5</th>
<th>UNIT 6</th>
<th>CO-WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panasonic Evervolt</td>
<td>32 PANELS</td>
<td>40 PANELS</td>
<td>32 PANELS</td>
<td>32 PANELS</td>
<td>32 PANELS</td>
<td>40 PANELS</td>
<td>80 PANELS</td>
</tr>
<tr>
<td>Tesla Power Wall 11</td>
<td>1 BATT</td>
<td>1 BATT</td>
<td>1 BATT</td>
<td>1 BATT</td>
<td>1 BATT</td>
<td>1 BATT</td>
<td>3 BATT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT</th>
<th>SQFT</th>
<th>EUI</th>
<th>HERS</th>
<th>PV ARRAY YIELD (kwh/YEAR)</th>
<th>EUI – POST PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1200</td>
<td>33.66</td>
<td>34</td>
<td>17700</td>
<td>-7.3</td>
</tr>
<tr>
<td>2</td>
<td>1300</td>
<td>21.52</td>
<td>33</td>
<td>11100</td>
<td>-6.3</td>
</tr>
<tr>
<td>3</td>
<td>1350</td>
<td>22.13</td>
<td>33</td>
<td>11100</td>
<td>-6.8</td>
</tr>
<tr>
<td>4</td>
<td>1600</td>
<td>20.77</td>
<td>33</td>
<td>11000</td>
<td>-8.4</td>
</tr>
<tr>
<td>5</td>
<td>1800</td>
<td>19.9</td>
<td>33</td>
<td>11000</td>
<td>-9</td>
</tr>
<tr>
<td>6</td>
<td>2000</td>
<td>34.5</td>
<td>35</td>
<td>17700</td>
<td>-6.72</td>
</tr>
<tr>
<td>CO-WORK</td>
<td>6633</td>
<td>25.6</td>
<td>36</td>
<td>63720</td>
<td>-1.3</td>
</tr>
</tbody>
</table>

EUI BASELINE GOAL: 25

EUI AFTER ONLY PASSIVE DESIGN INTERVENTIONS: 26

EUI AFTER PHOTOVOLTAICS: -6
**Framing Factor \([F = \frac{A_s}{A_t}]\)**

As = 11.52 \(in^2\)

Ai = 168.48 \(in^2\)

At = 180 \(in^2\)

\[
11.52/180 = .064 = 6.4\%
\]

9.4[typ.] – 6.4[t-stud] = 3.0

3.0/9.4 = 32% savings

**Heat Resistance \([R = \frac{T_2 - T_1}{Q}]\)**

- Interior air film \(R = .68\)
- 5/8” gypsum bo. \(R = .06\)
- 8” t-stud w/ blown cellulose insulation \(R = .28\)
- 3/4” plywood \(R = .06\)
- 2” rigid poly-iso insulation \(R = .14\)
- 2” air gap \(R = .2\)
- 1” plywood \(R = .12\)
- Exterior air film \(R = .17\)

Total = \(R = 45.25\)

**Exterior Wall Plan Detail**

Exterior Wall Section Detail

R-values and U-factors were determined by (or influenced by) the PHIUS Core Prescriptive requirements
Heat Resistance \( [R = \frac{T2-T1}{Q}] \)

- Interior air film \( R = 0.68 \)
- \( \frac{1}{2} \)" wood flooring \( R = 0.6 \)
- 1" plywood \( R = 0.8 \)
- 8" rigid poly-iso insulation \( R = 26 \)

Total = \( R = 28.08 \)

Concrete Reduction

- Typ. strip footing \( 273 \) cf
- Typ. Foundation wall \( 3,276 \) cf
- Shallow foundation wall \( 1,274 \) cf

Total Foundation & Concrete Savings = \( 2,275 \) cf OR 64%

- Typ. concrete slab \( 6,649 \) cf
- Concrete free slab \( 0 \) cf

Total Slab Concrete Savings = \( 6,649 \) CF

Overall Concrete Savings = \( 8,924 \) cf OR 88%

R-values and U-factors were determined by (or influenced by) the PHIUS Core Prescriptive requirements.