



**BALL STATE
UNIVERSITY**

Attached Housing | April 5, 2022

Project Xero

Project Summary

The Project Xero attached housing proposal suggests that we rethink the idea of attached housing as we see it in the architecture of today by speaking to a community-centric planning strategy that offers density, efficiency, and diversity of space. Working with Englewood Community Development Corporation helped Studio Xero understand the current gentrification problem enveloping the near east side community of Englewood, IN, and set forth the Livability, Opportunity, Vitality, and Education community goals for which the Project Xero proposal utilizes to help give back to the rapidly growing area.

Design Strategy

Designing an attached housing complex that speaks to the lower income families within Englewood where the median family income falls around 23k, has required the use of highly efficient and highly integrated passive and active building systems to minimize operational costs, strong consideration of user programming, and careful weighing of decisions on construction materials based on best practices in sustainability. For passive systems Studio Xero has taken advantage of air pressure and aperture placement to help facilitate stack ventilation, while high efficiency, air-to-air electric heat pumps powered by rooftop solar arrays carry the active system load. These systems help achieve the livability community goal by ensuring maximum year-round comfort at low cost. The concept behind user programming touches on other community goals by including both indoor and outdoor community spaces for social opportunity and further enhanced livability, and a 24/7 workspace to fuel educational success. Finally, vitality was achieved through the use of durable, eco-friendly material choices which include reclaimed wood, recycled rigid insulation, fly ash concrete, and recycled aluminum for rainscreen and roofing.



Project Data

- **Location:** Indianapolis, IN, USA
- **Climate Zone:** 6A
- **Lot Size:** 30,000 ft²
- **Building Size:** 14,600 ft², 3 story max
- **Occupancy:** R-1 = 48, MU-1 = 70
- **Construction Cost:** \$200/ft²
- **Energy Performance:** 40 HERS rating
- **Average Utility Cost:** \$60/month

Technical Specifications

R-Values

- Wall: R-41
- Slab: R-25
- Roof: R-80
- Windows: R-7.1

HVAC

- Air source heat pump w/ ERV

On-Site PV

- 77 kW

Partners

US Dept. of Energy
Englewood CDC



Project Highlights

MARKET ANALYSIS: Studio Xero was able to keep estimated construction costs to as little as \$190/ft² by carefully choosing materials and through the concept of disguised repetition, which involves the design of easily constructable dwelling units, all with similar floor plans and base module specs, while ranging from 1,200 to 2,600 sf and maintaining a sense of architectural uniqueness from unit to unit.

ENGINEERING: Utilizing high performance and sustainable components in the exterior envelope [built to exceed 2015 IECC levels with Energy Star fenestration], Urban Pocket reduces heating and cooling loads on air-to-air heat pump systems allowing us to minimize energy usage and yielding a higher SEER score. Electrical sensors paired with an ERV assisted stack ventilation system that provides fresh air cycling and minimized LED lighting helps manage occupant use of active systems.

RESILIENCE & DURABILITY: Longevity and performance were key factors used in establishing project materiality. Reclaimed wood with durability enhancing finishes were picked for both interior and exterior use, while anodized aluminum panels make up the project rainscreen, and a fly ash concrete slab with increased strength showcase the increased resilience and durability of materials.

INTEGRATED PERFORMANCE: Designing in a climate with 5,699 HDD and 1,055 CDD led to the use of the stack effect which gives each floor of each unit within Urban Pocket the ability to efficiently exchange used air with fresh air, ultimately resulting in a healthier, more cost-effective building environment. The energy gained through the use of a 40 Kw rooftop solar array is used to support the electrical heat pump while water collection is also celebrated through the use of collection tanks, that minimize water load.

ENERGY PERFORMANCE: To determine energy performance, Studio Xero has utilized integrated energy analysis software to design apertures, shading devices, PV systems, and the overall spatial layout, in order to reduce heating and cooling loads/costs. The total project energy output should bring the project to net zero upon completion and will pay back the PV system cost within 10 years.

EMBODIED ENVIRONMENTAL IMPACT: Sourcing 80% of all building materials within a 100 mi. radius from the project site awards the project team 2 LEED points in sustainability. Advanced framing techniques cut down lumber use by 30% while improving structural integrity, and low carbon material consideration is showcased through the use of fly ash concrete, reclaimed wood, recycled poly-iso, and loose fill cellulose.

COMFORT AND ENVIRONMENTAL QUALITY: Electric air-to-air heat pumps with COP of 4.68 efficiently heat and cool all units while maintaining a low environmental impact. Inside the project, the use of low-VOC products, smart switches, smart thermostats, and plumbing/electric system sensors create efficient comfort that results in positive environmental quality.

OCCUPANT EXPERIENCE: By creating 6 unique units in shape and size but equal in experience of daylighting, electrical lighting, air quality, and thermal control, Studio Xero positively encourages the integration of multiple family typologies within one community, fueling communication and socialization from different perspectives.