

University Of Missouri Columbia

Mixed Use Multi-Family | December 5, 2023



LightHAUS

Project Summary

LightHAUS is a sustainable multi-family housing complex designed for international college students and early-career educators in Columbia, Missouri's lively North Village Arts District. Our goal is to provide affordable and dynamic living options while demonstrating environmental responsibility by transforming a former brownfield site into a thriving cultural hub. Ideally situated within walking distance of the University of Missouri, Stephens College, and Columbia College, our community caters to a diverse student population who are often priced out of affordable housing.

To achieve beyond net-positive performance, our building maximizes passive strategies and incorporates active strategies when necessary to optimize energy efficiency and occupant experience. The site integrates rooftop solar arrays and agri-voltaic gardens. To reduce personal vehicle dependency, residents and visitors are connected to community amenities and major transportation hubs via the adjacent bus station. Additionally, the site is within walking distance of schools, libraries, museums, government buildings, grocery stores, banks, entertainment venues, nature trails, parks, and restaurants. Our on-site market serves as a convenient space for residents to sell crops grown on-site, buy globally sourced food, and purchase essentials.

Design Summary

The building is oriented on the site to maximize the roof area for PV panels, provide opportunities for natural ventilation, and incorporate natural daylighting. Community engagement, wellness and education are important for the project, so we included an eco-gym, international food market, and learning center. Passive strategies will be used in partially unconditioned spaces to limit energy use. There will be centralized laundry, and a resilient core with battery backups for severe weather and grid interactivity.



Project Data

- **Location:** Columbia, Missouri, USA
- **Climate Zone:** 4A
- **Lot Size:** 2.1 acres
- **Building Size:** 179,483 ft²; 7 of stories
- **Occupancy:** 463 people
- **Construction Cost:** 47M/\$271 ft²
- **Energy Performance:**
 - 40.6 kBtu/Ft2/yr without renewable energy source
 - -10.04 kBtu/ft2/yr with renewable energy source
- **Average Utility Cost:** \$0.89/ kWh/month
- **Annual Carbon Emissions:** 263 ton CO₂e/ft²/yr

Technical Specifications

R-Values

- | | |
|------------------|-----------------------------|
| ▪ Wall: 20.5 | ▪ Roof: 50 |
| ▪ Foundation: 20 | ▪ Windows:
U-value: 0.17 |
| | R-value: 5.88 |

HVAC

- Key systems
- VRF System, Agri-Voltaic gardens, Rainwater Collection System, backups for severe weather + grid interactivity

On-Site PV

- 1,087 Rooftop PV panels, 468.51 kWp
- 17,037 SF Agri-Voltaic, 108.83 kWp

Partners



Project Highlights

1. **Architecture**

This design elevates the existing brownfield site by creating a community of affordable housing for international students, a multicultural market and a learning center. The project incorporates ADA-accessible features, agri-voltaic solar arrays above community gardens, light wells, green walls, and a rooftop solar array. Each apartment unit has a balcony for outdoor engagement, which also facilitates cross-ventilation and daylighting.

2. **Engineering**

Through advanced technologies the project uses efficient plumbing and HVAC systems, such as the HVRF system. There are semi conditioned spaces along with passive strategies being used. The project also incorporates greywater recycling and Energy Star-rated tankless water heaters.

3. **Envelope**

The wall construction and penetrations are strategically insulated for the 4A and 3A climate zone. Structural components are confined to the interior conditioned space. Continuous insulation is used on the perimeter of the foundation wall and incorporated up through the walls and into the roof cavities, fully enveloping the building preventing energy loss and thermal bridging.

4. **Efficiency**

The projected EUI of the building is 32, with the implementation of passive water strategies such as the agri-voltaic gardens, rainwater, and grey water collection systems. The atrium is designed to manage the flow of heat throughout the building. In addition to that energy star appliances are used in every unit.

5. **Grid-Interactivity**

The building is designed for complete off-grid functionality, yet it will maintain connections to the City of Columbia's utilities — water, electricity, and sewage — as a secondary, emergency provision. This approach ensures uninterrupted service and enhances resilience, balancing self-sufficiency with practical contingency planning.

6. **Lifecycle**

To ensure the building's longevity, metal framing and self-sustaining materials requiring minimal maintenance will be employed. Recyclable materials will be used wherever possible, offering the potential for future reuse, thus embodying a commitment to durability, environmental responsibility, and lowering the carbon footprint.

7. **Health**

This project is a paradigm of sustainable living, utilizing low-carbon, energy-efficient materials, and Energy Star-rated appliances. Green walls, a key feature, will enhance air quality along with an ERV system. The building's insulation is designed to minimize external noise. A comprehensive app will control lighting, indicate to residents when to open their windows, and other systems.

8. **Market**

The project will set a precedent for the City of Columbia for affordable low-income housing. Tax incentives, local grants, and sponsorships will assist in acquiring initial investments and reduce operational and maintenance costs. This project will be a model for future brownfield site rehabilitation in mixed-use developments.

9. **Community**

This project fosters community, drawing from diverse backgrounds. It will host a range of events designed to unite building residents and connect them with the broader community. For security measures, officers and swipe card access will ensure a safe, inclusive community environment.