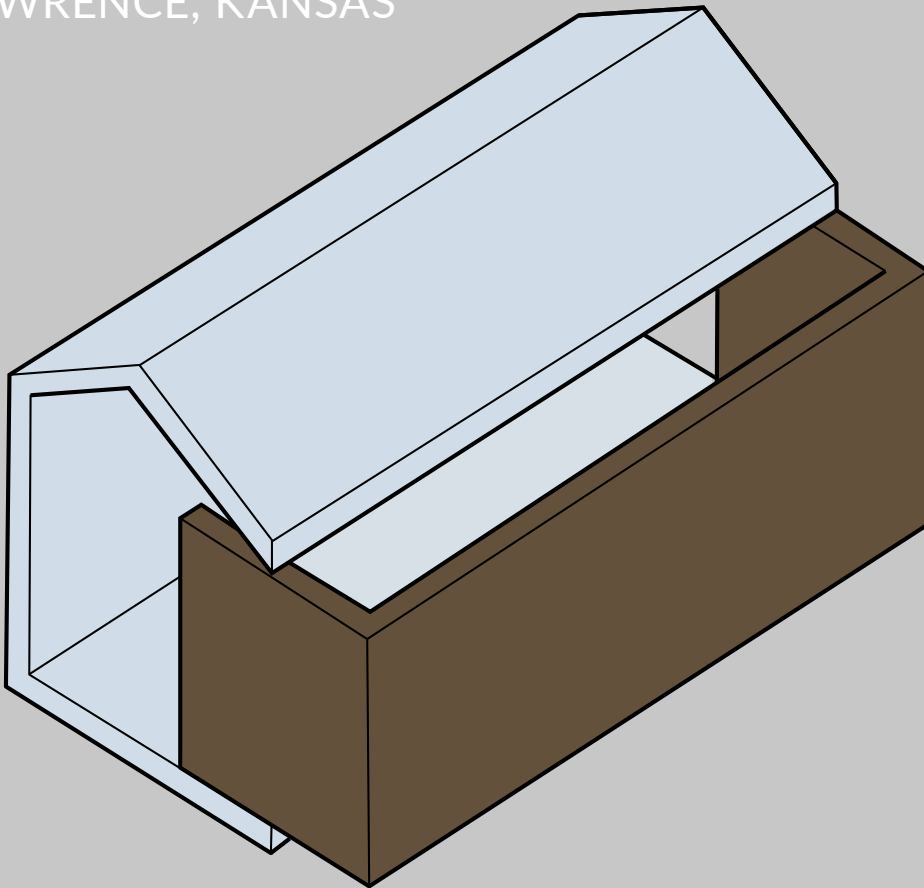


EMBODIED
ENVIRONMENTAL
IMPACT
JURY DOCUMENTATION

Dirt Works Studio

H  HAVEN
STUDIO

LAWRENCE, KANSAS



EMBODIED ENVIRONMENTAL IMPACT



Haven Studio, rendering of the southeast corner showing the main entrance

Design Decisions and Conclusions

Within the design approach, the team was cautious to use reclaimed, recycled, and bio-based materials whenever possible. The Baltic birch plywood cabinet faces and the bulkhead cladding reclaimed wood from previous built projects within the KU Designbuild Center. Baltic birch plywood is largely imported from Russia and is currently a “conflict material” due to the ongoing war in Ukraine. The team was able to find enough reclaimed Baltic birch to complete the cabinet wall without financially supporting Russia. This approach also reduced the waste that would be present from ordering, shipping, and cutting new material, and saved money in the constrained budget. The maple ceiling slats in both the hallway and bathroom were also found as excess/waste material from a past project. This is just one of many examples that demonstrate the beauty in resourcefulness. The structure was fabricated in-house which allowed the team to take advantage of using leftover pieces from previous projects to fabricate the wall system. The floor, walls and ceiling all contain cellulose insulation. This insulation is created out of recycled fibers and paper products and provides an insulative value of R-20. The countertops also reflect the team’s mindfulness of recycled materials. The countertops in the kitchen and bathroom as well as the backsplash, door thresholds, and the

shower ceiling are finished with Richlite, a recycled paper-based material that is hardened in a resin.

In line with reclaimed and recycled materials, the team prioritized using bio-based materials. The team’s goals included eliminating synthetic materials wherever possible. The materials are deliberately chosen to provide better air quality than typical construction. Many materials used to build houses contain chemicals that will off-gas, releasing toxins into the air and the home. Wood contains fewer chemicals than other, more processed materials. Since Haven Studio is airtight, it is even more important for the health of the occupants to reduce airborne toxins whenever possible. Due to this decision, our home can maintain good indoor air quality with few air changes per hour, therefore functioning more efficiently. Wood is also a carbon sink and does not release the carbon it stores back into the environment.

As the team aimed to minimize the carbon footprint of our home, the materials were sourced as locally as possible to limit the environmental impact associated with transportation. The thermally modified ash rainscreen mounted on the concealed Grad-clip system was chosen for both its aesthetic and environmental benefits. The ash slats have been harvested from trees infested by the emerald ash borer. The invasive

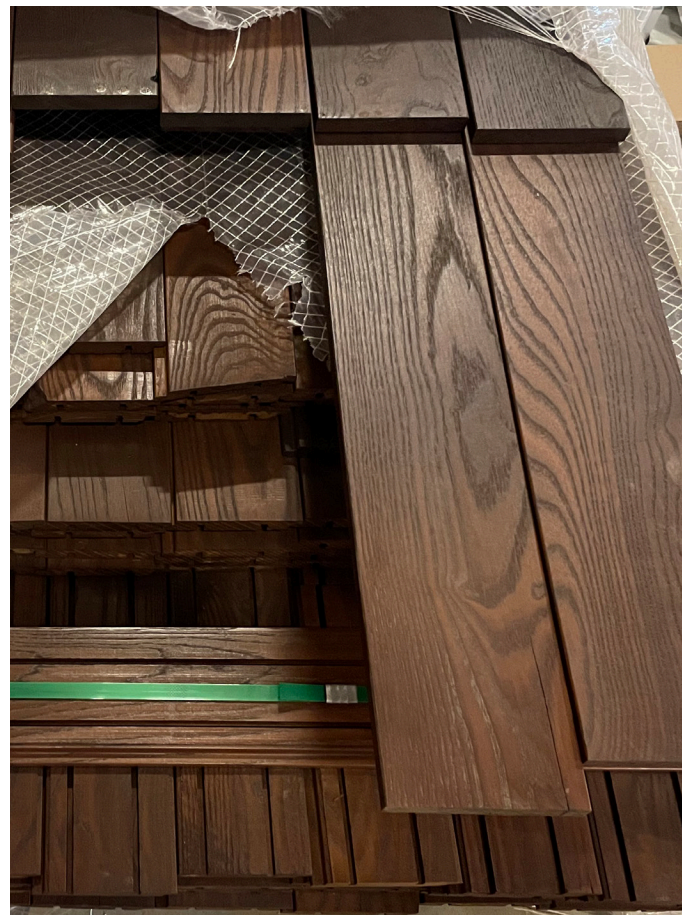
species has plagued much of the states on the eastern half of the United States. The species bores ash trees which cause the trees to die. When the trees die, the carbon that they sequestered is released back into the atmosphere. There is a ready supply of this wood as the dead ash trees are being cut down to make way for new growth. By using this wood in the rainscreen, the house uses readily available and local wood and sequesters this carbon in the building. The wood was sourced from Wood Haven, a local sustainable wood supplier. Wood Haven offers thermal modification of their ash. This is a process in which wood pieces are heated to high temperatures to improve the wood's properties without chemicals. Thermally modified wood is more durable, less susceptible to warping, and does not require any additional finishing. Haven Studio's exterior walls use Build SMART's prefabricated system. Build SMART works to encourage high-performance buildings by fabricating precise wall panels that can be easily assembled on the job site with great accuracy. Build SMART's fabrication space and headquarters are local, located directly across the street from our project, so the transportation impact is low. The close proximity even allowed the team to request that the walls not be packaged for transport, as is typical, further reducing material use. The prefabricated system reduces onsite construction time, which reduces carbon emissions. This local partnership, and many others like it, reduce our carbon footprint by shortening the transport of materials. Build SMART ensures the high efficiency of their panel system by using a high-efficiency liquid-applied

flashing from their sister company, Prosoco, also located right down the street from the project. Using a liquid application technique, all punctures in the building envelope were protected more effectively than traditional waterproofing techniques. This also allows for an uninterrupted building envelope which minimizes air leakage and improves the energy efficiency of the house.

The future of Haven Studio has lots of potential as it will continue to serve students on the University of Kansas campus. The home, however, was designed to be able to be moved to another site (pier foundation and narrow form). With consideration of circularity, mechanical fasteners were often chosen over construction adhesives to allow for dismantling and disaggregating the building as needed.



Haven Studio, photo of reclaimed Baltic Birch and Richlite in kitchen.



Haven Studio, photo of thermally modified ash rainscreen material.



Haven Studio, photograph of TimberHP Insulation and EcoCell Cellulose Insulation.

Life Cycle Assessment

The house uses several reclaimed materials that benefit the building's life cycle. The Baltic birch plywood used in the cabinetry wall was reclaimed from decommissioned furniture at the KU Designbuild Center. The Baltic birch plywood was cut to the size and shape needed for the cabinetry wall. In addition to reclamation of materials, the team chose recycled materials whenever possible. The cellulose insulation in the house was recycled from fibers and paper products. The Richlite countertops, backsplashes, door thresholds, and shower ceiling were made from recycled paper. Recycling material uses energy to modify the material forms but typically does not use as much energy and resources as the production of new materials do. By using these recycled and repurposed building materials, the house minimizes energy use and consequently greenhouse gas emissions.

In a comparable way, rather than throwing away leftover materials from previous projects, those materials were kept and are now being used in Haven Studio. The maple wood panels on the ceiling, and the steel structure of the window wall were both fabricated with this leftover material. Reusing this material instead of throwing it away and buying new materials once again minimized the energy it took to construct the house, including the embodied energy in the manufacturing, construction, and transportation of new material.

The materials the team chose for this project are extremely durable, meaning over the life cycle of the building they will not need to be replaced frequently. The thermally-modified ash rainscreen and the standing seam metal roof are two of the materials that will be most susceptible to abuse as they are exposed to the elements. However, both material choices are known to be long-lasting, minimizing the need for replacement. This also reduces energy use and greenhouse gas emissions as more material is not produced for replacement.

The team was invested in the idea of designing a building that passively embraced sustainability. One way of ensuring this was by having a flexible interior. Haven Studio, a model for transitional housing demonstrates the significance of having spaces that can be adaptable based on the day and occupant. This flexibility minimizes the amount of work in rearranging the space to accommodate the various needs of the occupants. Designing flexible spaces also allows the size of the house to be reduced. Smaller spaces require less energy to condition which in turn minimizes greenhouse gas emissions.

The house's use of Build SMART wall panels and Prosocco's liquid applied flashing prevents conditioned air from escaping the building envelope. Consequently, the demand on the mechanical system is minimized, which saves energy. Energy efficient appliances also make a significant difference in the long-term energy use of the house.

Embodied Environmental Impact

Throughout the build process, the team considered how our design and material decisions would generate embodied carbon. Aiming to keep the embodied environmental impact low, we sourced many of our materials locally such as our Build SMART exterior wall panels and Wood Haven rainscreen. Sourcing materials from local distributors minimizes transportation distances which reduces the carbon emissions and embodied environmental impact of the materials.

The team also used a combination of prefabrication and onsite construction. The prefabrication of many of the building components minimized the on-site construction time and reduced the energy needed on site. This included the floor structure, exterior walls, cabinetry, and the steel window wall frame. All other construction was done on-site throughout the construction process.

The design prioritizes the use of bio-based materials such as wood which are often more sustainable than synthetic construction materials and finishes.

Innovation

Haven Studio is designed for easy disassembly if needed. Prefabrication construction meant the house was built in a modular way; the entire floor structure was lifted into place and the panelized walls were erected and fastened together. The building elements were fastened with mechanical fasteners rather than adhesives to allow for eventual disassembly. The limited material palette also allows for easier reclamation.



Haven Studio, photo showing the quad-pane windows supported by the steel frame made from reclaimed materials.