

CASE STUDY
Star Lofts



Mass timber/light-frame
hybrid optimizes affordable
housing design

Cutler Development met carbon, cost, and community goals when they demolished an old gas station and built a carbon-friendly hybrid mass timber building, creating much needed workforce housing for Iowa's capital city of Des Moines. Star Lofts, named after the Star gas station that sat on the site for years, reflects the big aspirations of this small developer in their quest to build residential and commercial projects that improve neighborhoods, society, and the environment.

Using what they learned on [Junction Lofts](#), a mass timber project in nearby West Des Moines, Molly and Scott Cutler, Partners at Cutler Development, kept the project both sustainable and financially viable by combining mass timber with light-frame wood construction. The hybrid design, slated to achieve Zero Carbon Certification™ with the International Living Future Institute (ILFI), highlights the carbon advantages of building with wood as well as the benefits of blending different construction methodologies and using materials where they make the most sense.



Hybrid Design and Creative Value Engineering Provide Cost Savings

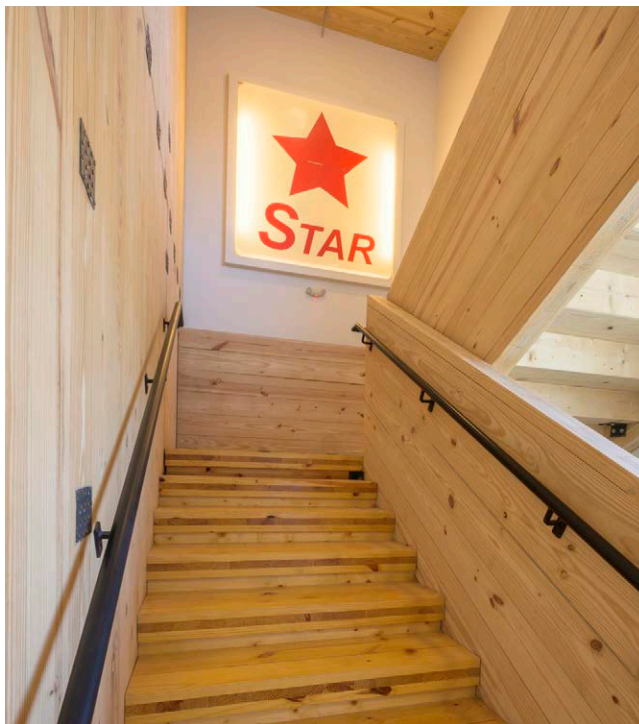
The three-story project features commercial space on the ground floor with 20 residential units above: three studios, 14 one-bedroom units, and three two-bedroom units. The building was framed using a hybrid system of 3-ply cross-laminated timber (CLT) decking, glue-laminated timber (glulam) columns and beams, dimension lumber walls, and CLT stairs and elevator cores.

It's not unusual for initial designs to come back as too expensive, and that's what happened with Star Lofts. "It took a couple iterations to land on a design that was cost effective," said Scott. "Our shift to a hybrid design was pivotal in terms of making this budget work. Mass timber brought efficiencies in terms of schedule and sequencing; we also benefitted in that we didn't have to cover it with drywall. The light-frame lumber added value in other ways and was easy for crews to frame and insulate."

The team made additional value engineering decisions to keep the project as affordable as possible. They made the lumber-framed partition and interior walls of the residential units load bearing, which helped eliminate the need for columns on the upper stories, and chose traditional insulation for the stud cavities. They specified industrial appearance for the mass timber elements and used the CLT panel cutoffs for the stair treads. They were also surprised to find that the CLT elevator shaft saved money compared with a CMU option.

Prefabrication Tradeoffs

While the Cutlers say they'd like to do more prefabrication of the CLT panels on future projects, they did very little for Star Lofts. Their structural design allowed for field cuts through each slab to accommodate mechanical, electrical, and plumbing (MEP) systems, because, because doing so was less expensive and gave their mechanical subcontractors more flexibility on site.



PROJECT DETAILS



Star Lofts

LOCATION: Des Moines, Iowa

STORIES: Three

SIZE: 22,770 square feet

CONSTRUCTION TYPE: V-B

COMPLETED: Fall 2024

PROJECT TEAM

DEVELOPER/OWNER: Cutler Development and Anawim Housing

ARCHITECT: ID8 Architects

STRUCTURAL ENGINEER: KPFF

GENERAL CONTRACTOR: Cutler Construction

MASS TIMBER INSTALLER: Hildreth Construction Services

CLT MANUFACTURER: Sterling Structural

GLULAM MANUFACTURER: Timberlab (previously American Laminators)

ACOUSTIC ASSEMBLIES: Rothoblaas

Connect with the
Star Lofts project team at
www.woodworksinnovationnetwork.org/projects/star-lofts



"Our decision to skip additional prefabrication and allow field cuts to the CLT panels actually broadened the number of subcontractors we could work with, since MEP installation didn't require coordination before the panels arrived," said Molly. "Flexibility in scheduling and subcontractor pricing helped keep this project affordable. If ours was a bigger project, or if our MEP subs had the time and technology to plan their runs months in advance, prefabricated openings would have made more sense. While we think there is value in that approach, it just didn't fit our scale this time."

There was one exception. The Cutlers had learned from Junction Lofts that it's easier to prefabricate vent shaft holes on first-level panels to accommodate a potential ground floor restaurant. So, they designed cuts for two shafts, one on each end of the building, giving them the opportunity to offer restaurant space on both ends.



Zero Carbon-Certified Workforce Housing

Cutler Development collaborated with Anawim Housing, one of Iowa's largest providers of permanent supportive housing, and designed the project for families making up to 80 percent of the area median income (AMI). "Like so many cities, Des Moines is struggling with a lack of affordable housing," said Molly. "That's one of the things we're trying to do with this project—bridge the housing gap while not contributing to carbon emissions in the construction industry."

Star Lofts is on track to be the nation's first zero carbon-certified workforce housing project accredited by ILFI. The program has two primary requirements:

1. 100 percent of the building's operational energy use must be offset via new onsite or offsite renewable energy.
2. 100 percent of the embodied carbon emission impacts associated with the materials and construction of the building must be offset.

"There are also requirements to reduce the embodied carbon by 10 percent versus a comparable building, and to reduce operational carbon by 25 percent compared with the current Iowa energy code," Molly added. "The operational carbon reduction was the hardest part for our team, but both are important because other certifying agencies don't have

these requirements. That's why we pursued ILFI's certification; we thought it was a more sustainable certification."

Mass timber added notable value with the embodied carbon requirement, but the Cutlers also used reduced-carbon concrete, and left both the mass timber and concrete exposed to the interior, avoiding the use of carbon-intensive finish materials.

"Our Tally model showed an anticipated 28 percent reduction in embodied carbon from these choices," said Molly. "That number grew to 70 percent when we factored in the biogenic characteristics of mass timber and the carbon sequestered in the material itself. High-efficiency MEP systems will also result in an anticipated 28 percent reduction in operational energy. We even accounted for a lower percentage of air leakage due to tighter mass timber system fit."

The Cutlers saved the gas station signage and featured it prominently in the building's interior. They also installed a plaque to help educate residents and visitors, telling them about the transformation of the land and how mass timber played such a big role in making the building carbon neutral. Molly said, "We thought this was such a cool transformation, taking a dilapidated gas station and turning it into what we hope will be Iowa's first zero carbon-certified building through the ILFI program."

Full Circle Moment

The Cutlers met their cost and sustainability goals by using both mass timber and dimension lumber framing in a straightforward hybrid configuration that was easy to source, frame, and install.

“With Star Lofts, we wanted to address the significant need for affordable housing while also reducing the carbon impact of building that housing,” said Scott. “This hybrid mass timber system gave us the unique opportunity to address both societal challenges.”

Interestingly, Molly spent nearly a decade as an engineer in the petrochemical industry before she joined Scott at Cutler Development in 2021. “Sustainability has been front of mind my entire career,” she said. “Mass timber was key in our ability to meet the Zero Carbon Certification requirements. As a chemical engineer, being able to work with my husband to transform an old gas station into a zero-carbon building is really a full circle moment.”

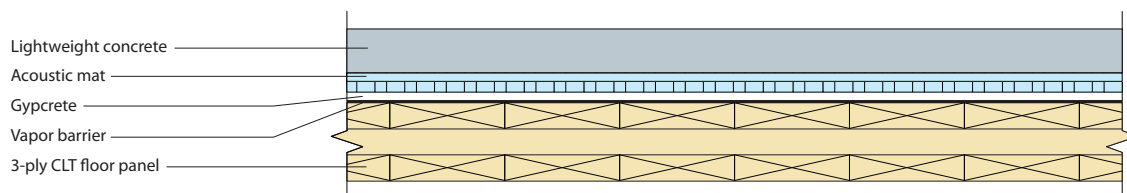


A Quiet First for Floor Design

Cutler Development wanted to provide the best possible living experience for tenants, which meant they needed to manage acoustics. Star Lofts features a first-of-its-kind flooring assembly that achieves a 55 STC/50 IIC rating while leaving the top layer as exposed concrete.

“It’s a design innovation that we’re really proud of,” said Scott. “But full credit goes to our general contractor, Cutler Construction, run by my brother Peter, for coming up with the concept. The 3-ply CLT allowed us to make the project pencil financially, but when we moved from a 5-ply to 3-ply panel, we lost the mass we needed for acoustics. We wanted to leave those concrete decks exposed to provide the finished floor surface. So, by adding the gypcrete and a sound mat, which is made using recycled materials, it gave us the true mass-spring-mass assembly we needed. The assembly meets code requirements, and the manufacturer tested it to make sure it met our acoustic goals.”

Cutler Construction crews also installed a self-adhesive strip for perimeter separation to attenuate impact sound under the lumber-framed walls.



Maximizing the Benefits of a Mass Timber/Light-Frame Wood Hybrid Design

The Cutlers wanted to combine the sustainability benefits of mass timber floor and roof panels with the economic advantages of light-frame bearing walls, and the hybrid approach took advantage of each. Mass timber allowed them to leave the glulam columns and beams and CLT ceiling panels exposed, which saved money by eliminating the need for additional interior finishes. The traditional wood-frame walls allowed them to easily run MEP from floor to floor while also meeting fire-resistance and acoustical design requirements for a quality structure. For more information, see WoodWorks' expert tip: [Hybrid Design: Mass Timber Floor and Roof Panels Over Light-Frame Wood Walls.](#)

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Star Lofts



Volume of wood products used:
20,650 cubic feet



U.S. & Canadian forests grow this much wood in:
2 minutes



Carbon stored in the wood:
505 metric tons of CO₂



Avoided greenhouse gas emissions:
513 metric tons of CO₂



TOTAL POTENTIAL CARBON BENEFIT:
1,018 metric tons of CO₂

EQUIVALENT TO:



215 cars off the road for a year



Energy to operate 108 homes for a year

Source: US EPA

Estimated by the Wood Carbon Calculator for Buildings, based on research by Sarthre, R. and J. O'Connor, 2010, *A Synthesis of Research on Wood Products and Greenhouse Gas Impacts*, FPLInnovations. Note: CO₂ on this chart refers to CO₂ equivalent.

Reducing Carbon Impact

The use of wood lowers a building's carbon impact in two ways. Wood continues to store carbon sequestered by the trees while they were growing, keeping it out of the atmosphere for the lifetime of the building—longer if the wood is reclaimed at the end of the building's service life and re-used. Meanwhile, the regenerating forest continues the cycle of carbon absorption. Wood products also require less energy to produce than other building materials, and most of that comes from renewable biomass (e.g., bark and sawdust) instead of fossil fuels. Substituting wood for fossil fuel-intensive materials is a way to avoid greenhouse gas emissions and reduce embodied carbon.

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