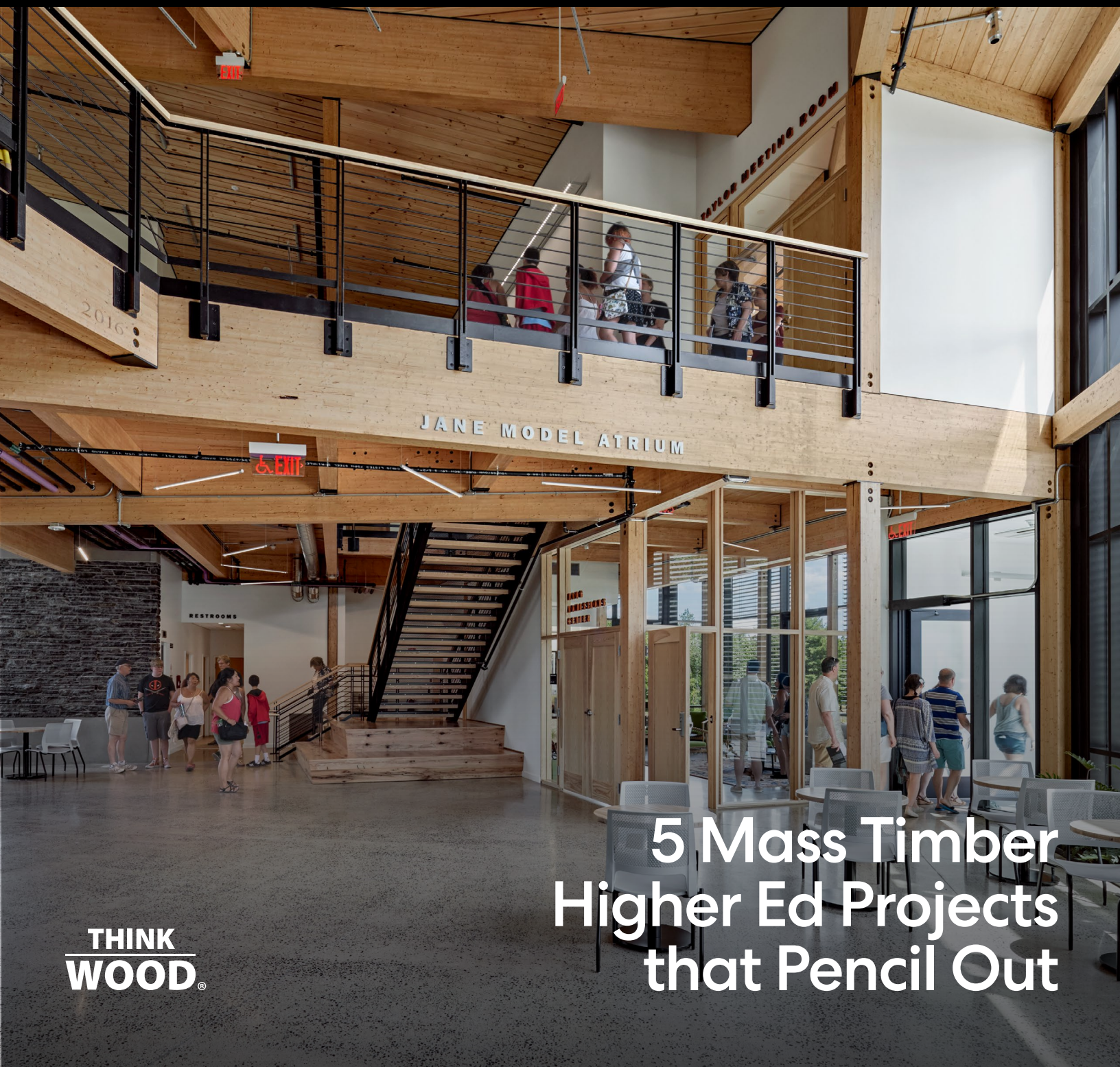
Education

Mass Timber



5 Mass Timber Higher Ed Projects that Pencil Out

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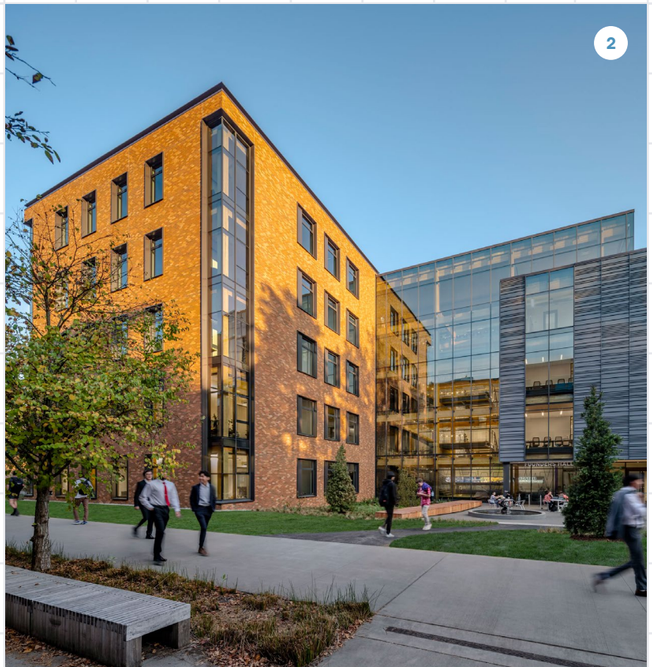
Tree-conomically sound projects.

Be they classrooms, labs, dining facilities, or rec centers, the physical structures on college and university campuses have a huge impact on how students learn. Mass timber can help create sustainable spaces that contribute to occupant wellness—key ingredients in the recipe for academic success. In fact, Seattle–based architecture firm Mithun released a report that says the use of mass timber in schools can help cut embodied carbon, boost student and staff comfort, and reduce construction timelines (getting students in classrooms faster and saving on site costs) by up to 25%.

The following five projects are just a few examples of the cutting-edge facilities that are cropping up on campuses around the country and that showcase how mass timber is helping to solve the equation for achieving sustainable and successful learning environments for their students.



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What's inside?

1 Tony and Libba Rane Culinary Science Center

Project Details

Project Name: Hey Day Market

Location: Auburn, Alabama

Architect: Cooper Carry

General Contractor: Bailey-Harris Construction

Structural Engineer: Britt, Peters and Associates Inc.

Timber Products: CLT, Glulam

Size: 142,000 sq. ft. (Culinary Science Center), 9,200 ft² (Hey Day Market)

Rendering Credit: Cooper Carry

Auburn University dishes out sustainable southern hospitality

At Auburn University, hospitality is both a curriculum and a culture. The ethos of hospitality permeates the Auburn, Alabama, university, and its School of Hospitality Management reflects that southern value as it educates the industry's future leaders.

So when the design team at Cooper Carry came together to plan the school's new interdisciplinary Tony and Libba Rane Culinary Science Center, projecting a welcoming face to the community was a priority.

The design showcases the center's mass timber food hall, dubbed the Hey Day Market, as a campus destination with plenty of visibility from the street level, says Brian Campa, principal and design director at Cooper Carry, the architect-of-record for the $110 million-dollar project.

"As all the traffic on the main street in Auburn goes by, they have glimpses into the courtyard and all the exciting stuff happening within the food hall," Campa says. "This was an intentional change in the design—a decision we made to break up the program and connect it to the wider community. This transformed it from an introverted closed-off solid building into more of an extroverted opening, welcoming environment. I think that was a big pivotal moment in how the project was envisioned."


LAUREL
TONY & LIBBA RANE CULINARY SCIENCE CENTER

A World Class Hospitality Experience Promotes Community Engagement, Transparency, and Teamwork

Designed to be a first-of-its-kind teaching facility, the new culinary science center brings together a wide range of different building types in a way that's unusual for an academic facility, Campa says. "A lot of different studios and expertise at Cooper Carry came together—education, hospitality, commercial retail, mass timber—to make this project a reality," he says.

The 142,000-square-foot multi-building complex pairs the Hey Day Market with interactive food laboratories and teaching spaces, a hotel and spa,, a premier restaurant featuring a rotating chef in residence, a wine appreciation lab, and a rooftop terrace for special events. A microbrewery and tasting room and café and coffee roastery are in the works and are set to be added in 2023.

Campa says the center is part of a bigger idea, promoting new ways of learning, encouraging all of these functions—hospitality management, culinary arts, restaurant operations, hotel and spa—to truly collaborate. Along with serving as a cutting-edge educational facility, the center caters to the wider Auburn community and its visitors to deliver a five-star hospitality experience.

"To create a supportive design, you put all the exciting back-of-house stuff on display," Campa says. "The teaching food labs have glass walls, the kitchen and restaurant operations are visible—designed to be front and center, giving a peek behind the scenes." The facility's design promotes transparency and teamwork in an industry that can sometimes be a harsh, demanding environment, he says.

At the same time, the food hall will offer budding chefs and local entrepreneurs an opportunity to operate as part of a thriving food hall experience. The university expects it to become a vibrant addition to Auburn's culinary scene and a favorite gathering place for students, family and friends—and community members—on the city's South College Street. Its opening day in the summer of 2022 attracted hundreds of students, faculty, staff and residents of the historic college town.

Food Market Showcases Eco-Friendly Mass Timber for the Masses

The design team's choice to use mass timber for the food hall helps to create a warm, welcoming aesthetic that reflects the facility's hospitable spirit while supporting its demands for flexible open space. Mass timber complements the design guidelines of the university, giving a nod to historic, turn-of-the-20th-century post-and-beam warehouses while still achieving an equally clean, crisp and modern look. The food hall's mass timber components include glued-laminated timber (glulam) columns and beams supporting five-inch cross-laminated timber (CLT) roof slabs, all fabricated from locally sourced southern pine.

"Auburn takes a lot of pride in our image and character on campus," says Mary Melissa Taddeo, campus architect at Auburn University. "There's a lot of red brick, a lot of limestone on campus. This facility definitely fits the bill there, and the addition of the mass timber component is pretty new to us—but nonetheless integrates seamlessly and really adds warmth and character."

There was some initial hesitation to use mass timber on this project and a perception that it might drive up costs, according to Chrissy Perez, senior associate at Cooper Carry and project architect for the culinary center. But those fears were allayed.

"When we were in the middle of design, every time we had a deliverable, the project manager would go back and check his budget, to make sure that we were staying on track. A couple of times we considered whether it would be faster and cheaper to go with steel," Perez says. "But after conversations with our structural engineer and a few iterations on what that building would look like as a steel structure, we did find that changing to a traditional steel building was significantly more expensive and more difficult to build than the mass timber."

Along with cost savings, the Cooper Carry design team cited a number of benefits realized through the use of mass timber.

The 10,000-square-foot food hall's mass timber construction played an important role in giving the project a natural warmth while helping to cut the overall carbon footprint of the project.

Faster, quieter, and more efficient assembly meant the food hall's mass timber structure was constructed in just a few weeks, using just-in-time delivery—an advantage given the space-limited, street-facing urban site.

The long-span mass timber design offers significant flexibility and versatility, reducing the number of columns and affording an open spacious footprint. Within the food hall, individual vendors are housed in mobile substructures that can expand, contract or be reconfigured as needed, with equipment that can easily connect to exposed HVAC, exhaust and other industrial cooking systems.

By using mass timber, the project team was able to eliminate a lot of fireproofing when compared to an equivalent steel structure. "In a fire, the glulam and CLT chars on the outside while retaining strength, slowing combustion and allowing time to evacuate," Campa says.

Town and Gown: A Communal Feast with Local Culture and Flavor

Overall, the project served and continues to serve as a demonstration of the innovation, speed of construction and environmental benefits of mass timber—with the design team hosting several tours for students attending the University's School of Architecture, Planning and Landscape Architecture. And beyond this project, Auburn University has made a commitment to further the use of locally produced mass timber products—its College of Forestry, Wildlife and Environment, in partnership with several other academic colleges and administrative offices, recently hosted the first cross-laminated timber conference in the southern U.S.

But more than just a showpiece, the Hey Day Market is intended to be an incubator for both students and local entrepreneurs, further connecting the facility's mission to the City of Auburn.

"We are looking to really support local entrepreneurs and students looking to test food and beverage business models while drawing in the community. There's a financial commitment upfront from each vendor and a portion of their proceeds each month comes back to the university as well. We think the flexible design of the stalls, the use of long-spanning, column-free mass timber really supports the project's goals," Taddeo says. ■

2 Founders Hall

Project Details

Location: Seattle, Washington

Architect: LMN Architects

Owner: University of Washington

Engineer: Magnusson Klemencic Associates

Design-Build Contractors: Hoffman Construction

Timber Products: CLT, Glulam

Size: 85,000 sq. ft.

Photo Credit: LMN Architects

University of Washington's Founders Hall is a model of sustainable design.

With the climate crisis weighing heavy on the minds of college students, post-secondary institutions are increasingly looking for ways to lower the carbon emissions of their campuses while also supporting student and faculty well-being. And for good reason—a growing body of research suggests students may choose their alma mater with climate action in mind.

"We're seeing a real difference in students emphasizing values and not just compensation packages," said Frank Hodge, Dean at University of Washington's Michael G. Foster School of Business. "We want our newest building to signal what our values are when it comes to environmentally-conscious design."

That's the key driver behind the construction of Founders Hall—an 85,000 square-foot, five-story mix of classrooms and flexible gathering spaces built with regionally sourced cross-laminated timber (CLT). The building is designed to achieve a 76% reduction in energy consumption over the first 60 years of its life—making it one of the greenest buildings on the UW campus. It will also be the first building on the UW campus to be constructed of CLT, according to Hodge.

Did you know? Founders Hall is located on the traditional lands of the Coast Salish Peoples—land which touches the shared waters of all tribes and bands with the Suquamish, Tulip, and Muckleshoot Nations.

> "We are focused on doing well by doing good—our decision to go with a mass timber structure was a pivotal choice—one that reflected our growing commitment to decarbonization, biophilic design, climate action, and honoring the native land on which this facility is built."
>
> —Frank Hodge, Dean | University of Washington's Michael G. Foster School of Business

A Flexible Biophilic Hub Fosters Campus Engagement

Upon entering the light-filled atrium of Founders Hall, visitors are greeted by a dramatic mass timber feature staircase. The building houses circulation, pre-function spaces, and two-tiered classrooms that can be set for 65 to 135 students along with 28 team and interview rooms, four executive conference rooms, a diversity lounge, a student commons with an outdoor terrace, and a rooftop event space.

Complemented by a natural landscape of terraces, evergreen plantings, greenery, and rain gardens, the new Founders Hall greatly expands the Foster School of Business' capacity while improving the connection to the heart of central campus and the historic northeast edge, dubbed Denny Yard.

"We wanted visitors to walk into a space that feels like you're just transitioning into a different type of wooded area, not stepping into a stark office-like building sealed off from nature—so mass timber played a key role in the building's biophilic design, making Founders Hall feel like it's a part of the natural environment and surrounding greenery," said Hodge.

For Hodge, Founders Hall reflects the highly social character of business in the new century and aspires to be a sustainable building that will inspire future generations of business leaders.

Its central location, wooded setting, and circulatory role make the building a kind of mass timber jewel amidst the surrounding masonry buildings and landscape—a calming nature-inspired hub for the top-ranking Seattle-based business school. A generous use of natural lighting and the ability to draw natural ventilation into the facility further enhances occupants' connection to nature.

Realizing the Full Benefits of Mass Timber

The facility's design makes the most of its exposed mass timber structural design using a unique approach: combining two distinct building types.

"From a kind of a nerdy code perspective, there are actually two building types at play here that combine to create one larger building. There's the mass timber building which encloses the concrete portion that contains the very large classrooms. This made it so that the entire building outside of that classroom block can be expressed as beautifully warm exposed mass timber, while still meeting fire and building code requirements," explained Kjell Anderson director of sustainable design at LMN Architects, the design firm for the project.

A spacious vestibule facilitates entrance, and vertical circulation frames the two program areas: one portion for public-facing teams and one for more private offices and meetings. Active learning, collaboration and event spaces are positioned at the south edge of the site to engage the distinctive qualities of the surrounding landscape.

The impressive double-height lobby and spacious floor plan envelops occupants with the visible warmth of wood by way of CLT post, beams, and decking. For the exterior, textured metal cladding frames the ample floor-to-ceiling glazing and gives passersby views into the exposed mass timber interior—expressed within the facade through distinctive reveal panels.

A Model of Low Carbon Sustainable Design

The project is a model for sustainable design at the UW and is embracing the university's green building standards, which aim to reduce carbon emissions by over 90%. As an integrated element in both the interior and exterior expression, the building's generous use of timber demonstrates the Seattle business community's ongoing history with Northwest wood products and reduces the building's embodied carbon by 58%. The project targets LEED New Construction Goldcertification.

"This facility reflects the growing importance of decarbonization of buildings at the university and in the Pacific Northwest as a region. Along with the carbon-storing benefits of mass timber, Founders Hall will greatly reduce its carbon emissions as it will use clean electricity instead of being connected to the UW's steam system, which relies on burning fossil fuels," said Anderson.

He adds that the building is a great example of how a mass timber design can concurrently meet social, business, and environmental goals. Along with its inspiring design, the facility represents long-term cost savings and an 83% reduction in operational carbon—a result of improved envelope performance, an efficient mechanical system, and the users' commitment to leverage operable windows and ceiling fans in lieu of energy-intensive air conditioning.

For Hodge there was no doubt this building should showcase mass timber, and he credits the project's success to genuine collaboration between an experienced architectural and consultant team.

"LMN Architects and supporting trades have been true partners in designing Founders Hall. Our decision to go with a mass timber structure was a monumental shift in how we typically build on campus. The design team excelled at incorporating all of our ideas to celebrate the use of wood in the project and created a very open, inviting, beautiful, and highly functional design." ■

3 Andy Quattlebaum Outdoor Education Center

Project Details

Project Name: Andy Quattlebaum Outdoor Education Center

Location: Seneca, South Carolina

Architect: Cooper Carry

General Contractor: Sherman Construction

Structural Engineer: Britt, Peters and Associates Inc.

Timber Products: CLT, Glulam

Size: 16,000 sq. ft.

Photo Credit: Jonathan Hillyer

A mass timber recreation center becomes university's 'finest front porch.'

For centuries, collegiate landscapes have been defined by their architecture, whether the stoic gothic revival buildings of the 1800s, or minimal, glassy designs of the mid-20th century. Today, academic institutions are ushering in a new class of energy-efficient, mass timber structures, combined with active design concepts that put student needs first.

Active design places a primary focus on people, specifically promoting physical, mental and social wellness among users of a space. In a collegiate setting, active design — often deployed through campus recreation centers — helps students learn to make healthy choices and cope with stress, while also creating primary social destinations and recruiting tools for universities. For South Carolina's Clemson University, the Andy Quattlebaum Outdoor Education Center serves exactly this purpose.

First-of-its-Kind Destination

Created as a destination to bring students together and facilitate outdoor recreation, the Andy Quattlebaum Outdoor Education Center emphasizes wellness, relaxation and inclusive experiences that promote physical, mental and emotional health.

The REI-inspired, 16,000-square-foot-facility sits purposely on Clemson's lake-front recreation complex, taking full advantage of its waterfront access, surrounding natural landscape and commanding views of the historic campus. Inside, the center features social space, rooms for activities such as yoga, rowing and aerobics, and two dedicated, multi-use classroom spaces for trip planning and experiential learning. Additional amenities include a boathouse and equipment rental.

This project also represents Clemson's first mass timber facility, and uses southern yellow pine cross-laminated timber, locally sourced and manufactured in nearby Dothan, Alabama. CLT floors, roof, and shear walls are left exposed throughout the building, adding visual warmth that speaks to the function of the facility, while also emphasizing its biophilic role in promoting wellness for Clemson students. The structural framing includes glue-laminated beams and steel columns.

"We were able to fine tune the design of mass timber to really take advantage of the CLT planks, maximize the spans, reduce the number of framing members, and eliminate the ceiling finishes since we were going to leave it open, exposed and beautiful," said Brian Campa, principal with Cooper Carry, the project's architect. "All of those things in play allowed us to create a beautiful aesthetic using a more cost effective approach with mass timber vs. steel."

The structure's expansive roof overhangs provide ample shade for the large patio below, as well as a second-level deck that are popular destinations for students, who are often seen lounging outside, even while attending virtual classes online.

"The goal was to make a student destination on campus, said Chris Fiocchi, senior director, Campus Recreation at Clemson University. "We wanted an opportunity to educate people on both what it means to work with mass timber on a university campus, while also demonstrating the real mission of campus recreation programs. We accomplished both."

Sustainable Potential

The center was designed primarily to promote student wellness, but its use of wood also reflects Clemson's focus on achieving a sustainable, net-zero footprint. According to Campa, creating a mass timber structure that embodies carbon and is crafted from locally sourced materials helps achieve this goal.

In addition to carbon-storing timber construction, the facility is designed to run on minimal heating and cooling loads. Its expansive glass facade allows natural daylighting along with sensor-controlled lighting, large-scale fans to help reduce cooling loads and passive cooling for boat storage spaces. With the installation of photovoltaic materials on both roofs, the facility will produce enough energy to offset its needs.

The construction process itself also proved sustainable, requiring only one dumpster during the mass timber installation. "It was the cleanest, prettiest building site," remarked Patricia Layton, director of the Wood Utilization + Design Institute at Clemson University. "These buildings are so beautiful and inspiring, and it's tough to accomplish that with steel and concrete.".

"While mass timber continues to gain traction in the construction industry, there is significant untapped potential for creative ways to apply the building material. The ability to impact our environment in a positive way is inspiring."

—Brian Campa, Principal | Cooper Carry Architect

Model Student

In addition to biophilic benefits and sustainability attributes, the decision to build with mass timber was championed by Clemson's Wood Utilization + Design Institute for its educational impact.

The Institute, led by Layton, aims to find new markets and growth opportunities for South Carolina's $21 billion forest products industry by providing education and training, research and development, and direct marketing opportunities for Clemson students to explore wood-based building solutions. When Layton heard about the University's plans for an outdoor education center, she knew new mass timber was the perfect fit: "It's an opportunity to help our broad student body — not just the forestry and architecture students — appreciate this building type."

Since its completion, Layton has shared that the center now serves as a national model for recreation and leisure space, as well as wood-building techniques. It is a showplace for visiting architects, and serves as a student research facility for mass timber construction, including active moisture and vibration testing. Public tours of the center have inspired the construction of new mass timber structures in Mississippi, Columbia University, Auburn University, and even private residences in Florida.

"As we help these universities grow into this building system, it gives confidence to other universities to follow and see the benefits, both in the sustainable sense but also cost effectiveness," added Campa.

"This will change the way we build, the way we work and the way we help our students enjoy nature."

—Patricia Layton, Director | Wood Utilization + Design Institute, Clemson University

The project was completed in spring 2020, and students continued to use the facility during the COVID-19 pandemic. The project received Green Globes certification for environmentally friendly construction and was awarded a 2021 U.S. Wood Design Award for regional excellence.

"I consider this Clemson's finest front porch," said Layton. "It will be a place visited by millions in the years to come, and prospective students will choose to come to Clemson because this building is here." ■

4 UMass Amherst Design Building

Project Details

Project Name: UMass Amherst Design Building

Location: Amherst, Massachusetts

Architect: Leers Weinzapfel Associates

Construction Manager: Suffolk

Structural Engineer: Equilibrium Consulting Inc., Simpson Gumpertz & Heger

Timber Products: CLT, Glulam

Size: 87,000 sq. ft.

Photo Credit: Albert Vecerka/Esto

UMass Amherst showcases the latest sustainable design practices and a model for integrating campus landscape and architecture.

With a glulam frame and floor slabs of composite, exposed cross-laminated timber (CLT), the Design Building is a demonstration of leading-edge timber engineering; a concept informed by the school's current research in building technology.

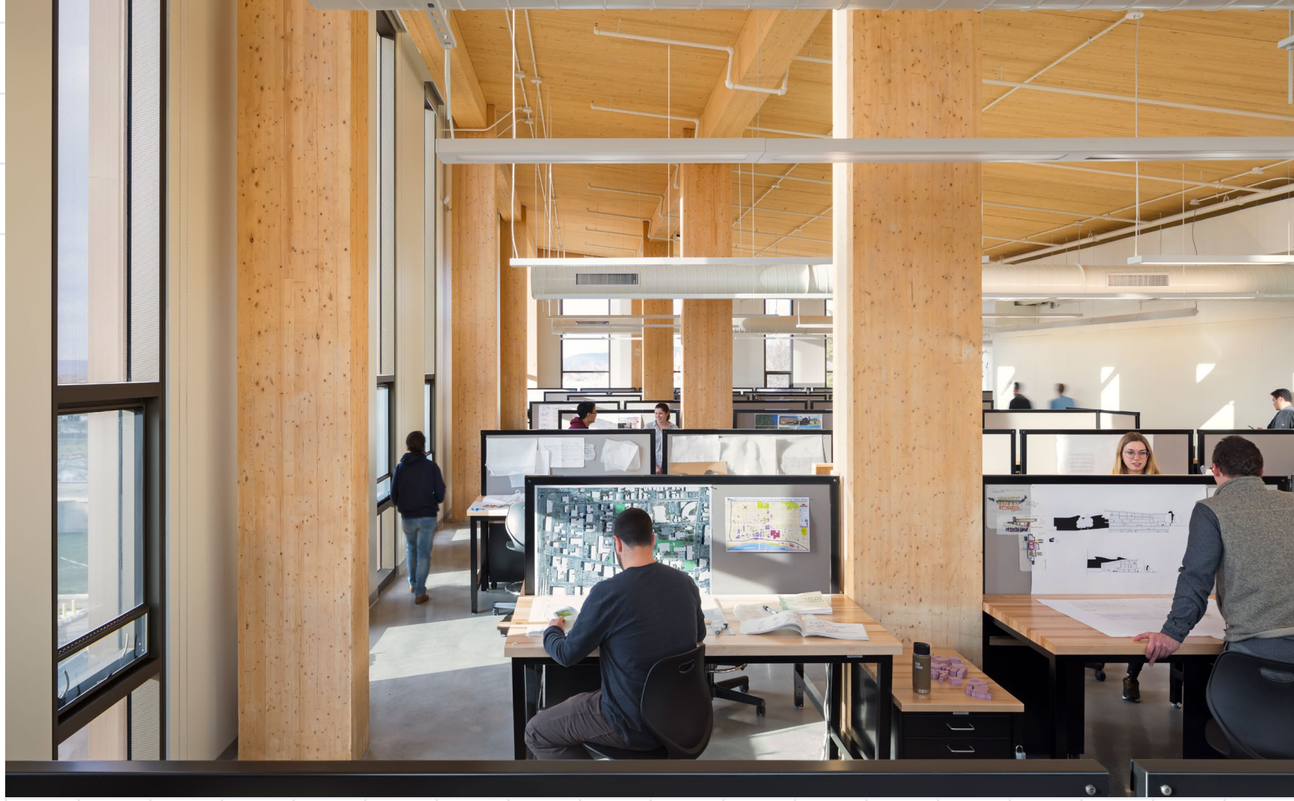
The design team chose mass timber over steel to remove 2,600 metric tons of carbon from the atmosphere.

The interdisciplinary building is home to three academic units: architecture; building and construction technology; and landscape architecture and regional planning. It intentionally features exposed structural elements and service systems for teaching, while its Trimble Technology Lab provides advanced tools for design research and development. The building's multi-disciplinary program, organized around an interior courtyard of exposed timber and an exterior landscaped courtyard and outdoor classroom, will foster collaboration across the disciplines.

At the upper level, the building has a roof garden, which is supported by a long-span wood-steel truss system (a "zipper" truss) that is exposed in the atrium below. Other sustainable features include LED lighting, motion sensors, ample daylighting, electro-tinting glass, heat-recovery systems, bioswales, rain gardens, low-flow faucets and public transportation access.

Intended to demonstrate the latest sustainable design practices and serve as a model for the integration of campus landscape and architecture, the new four-story Design Building at the University of Massachusetts Amherst is the largest cross-laminated timber (CLT) academic building in the U.S. and one of the first institutional buildings in the Northeast to use a mass timber structure and was completed in January 2017.

The 87,000-square-foot facility is the most advanced CLT building in the U.S. and saves the equivalent of over 2,300 metric tons of carbon when compared to a traditional energy-intensive steel and concrete building. The university's Building and Construction Technology program developed some of the CLT technology and has been testing native Massachusetts species for CLT suitability with support from a National Science Foundation grant. The building was designed by Boston architectural firm Leers Weinzapfel Associates and construction was managed by Suffolk of Boston.



Life Cycle Assessment

At the conceptual stage of the Design Building project, WoodWorks undertook a preliminary life cycle assessment (LCA) to demonstrate the significant environmental benefits associated with the wood option being considered. Once the decision was made to use wood, WoodWorks provided ongoing technical assistance and support related to the complete LCA of the final design undertaken by the U.S. Forest Service Forest Products Laboratory in cooperation with the Athena Sustainable Materials Institute. It is the first LCA to examine the impact of cross-laminated timber on a North American project. ■

5 The R.W. Kern Center at Hampshire College

Project Details

Project Name: The R.W. Kern Center at Hampshire College

Location: Amherst, Massachusetts

Architect: Bruner/Cott & Associates

Owner: Hampshire College

Engineer: Foley Buhl Roberts & Associates

Contractors: Wright Builders

Timber Products: Glulam

Size: 17,000 sq. ft.

Photo Credit: Robert Benson Vecerka/Esto

Mass timber makes for minimal footprint at Massachusetts' Hampshire College.

The two-story, 17,000-square-foot mass timber R.W. Kern Center at Hampshire College in Amherst, Massachusetts, featuring a half-dozen wood species, and a mostly column-free glulam structure, minimizes its carbon footprint as a truly net-zero building (water, energy and waste) certified by the International Living Future Institute (ILFI), earning the distinction of the largest Living Certified higher-education project in the world.

As the gateway to campus, the Kern Center, constructed of mass timber, is prominently sited on Hampshire's campus and serves as a welcome center for staff, students, and their families.

The central floor-to-ceiling glass pavilion maintains a connection to the outdoors and serves as a hub of campus activity with a common area, community living room, and café on the ground floor and gallery above.

Two stone-clad wings house admissions and financial aid offices and classrooms with views of the amphitheater, rainwater harvesting reservoirs, solar farm, and wildflower meadow. Selected from over 40 entries as part of a design competition, Bruner/Cott & Associates rerouted a campus drive, replaced it with a wildflower meadow, and created a human-centered landscape with the Kern Center as the new heart of the campus. Using local stone and wood, the building emphasizes the importance of the relationship between indoors, and the plaza and landscaping around the building encourages people to enjoy being outside and around the building, not just inside it.

Wood Use

The design team selected wood as a primary building material for its carbon-locking, sustainable benefits, while limiting their use of more energy intensive materials, such as concrete and steel. Featuring the use of six different wood species—black spruce for the glulam; ash and birch for the doors; salvaged red oak for the flooring and monumental stair; pine for the ceiling; and cedar for the exterior—importance was placed upon an economic and efficient use of such materials.

For example, instead of uniformly sized beams, the design team worked with Montreal-based glulam supplier Nordic Structures, local fabricator Bensonwood, and Newton, Massachusetts-based structural engineering firm Foley Buhl Roberts & Associates to determine the most economical size of each wood member. Sourcing materials locally was also a significant priority, so much so that the café's small, round tables were crafted from two mature pin oaks that were felled on campus.

Driven by the Living Building Challenge's (LBC's) preference for transparency, much of the wood and building systems are left exposed—the mass timber structure visible to its occupants and wrapped by a veil of glass. Minimal connectors and fasters, often tucked neatly away through careful detailing, give the wood structure the appearance of high quality, fine furniture. In the second-floor classroom, for instance, 5-inch by 12-inch glulam beams neatly join an equivalent-sized rim beam and a 5-inch-square post. A 5-inch-wide steel base plate is sandwiched between the end of the beam and the face of the rim beam, with knife plates centered in both the posts and beam, secured by just two lag screws and two bolts.

Environmental Impact

Certified as a Living Building by the International Living Future Institute (ILFI), the net-zero facility joins just 16 other Living Buildings certified to date. To attain Living Building status, projects must document one year's worth of post-occupancy performance data to prove they are in fact net-zero water and net-zero energy, as well as net-zero waste. The Kern Center uses composting toilets, collects rainwater, treats its own graywater, and generates its own energy via a 118-kilowatt, roof-mounted photovoltaic panels.

With a solar canopy to generate electricity, the rainwater harvesting system for net-zero water, and exposed walls in the mechanical rooms, the building itself serves as a learning and teaching laboratory. Daily tours and signage give students and visitors the opportunity to participate in collecting and analyzing data regarding green building practices. New classes are built around the teaching opportunities the living building makes available. ■

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