



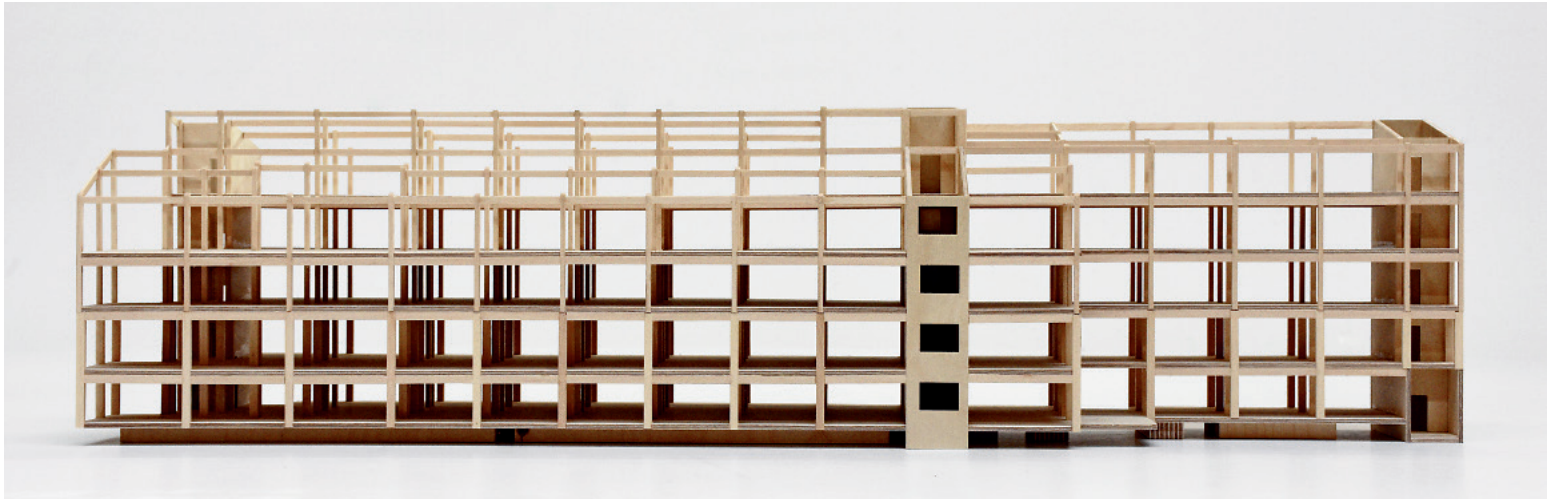
Soto (Cavender) Building. Photo by Dror Baldinger, FAIA. Courtesy Lake|Flato.

How Much Carbon

Does your Building Embody?

Allyn West

One hot afternoon, Todd Wascher watched wood panels as large as rooms hang from cranes high in the San Antonio sky. He'd never seen anything like it. Not in Texas. "It was new to all of us," he said. He's right. To build The Soto, a six-story mid-rise office building with 25,000 square feet of commercial space designed by Lake|Flato with BOKA Powell as architect of record, pine trees were harvested from a sustainably managed forest in western Canada; milled into lumber that was glued and nailed together; and then machine cut into the interlocking panels, beams, and columns Wascher saw swing into place. Mass timber, it's called. Conventionally, big buildings like The Soto are constructed out of steel-reinforced concrete. It's cheap. There's a well-greased supply chain. Builders know what to do with it. But Hixon Properties, the developer, wanted something unconventional. "Developers are always trying to find the next thing," said Wascher, who joined Lake|Flato in 2005. To compete for tenants in a crowded market, Wascher said, the developer wanted to tell a new story.



Hanszen College structural model. Courtesy Barkow Leibinger.



Hanszen College rendering. Courtesy Barkow Leibinger.



901 East Sixth. Photos by Casey Dunn. Courtesy Thoughtbarn.

This story is largely about carbon dioxide. It's one that should have been told decades ago. Starting in the 1960s, Houston-based oil and gas giants like ExxonMobil kept their science about the consequences of burning fossil fuels to themselves.¹ In the 2000s, BP devised the concept of a "carbon footprint," creating more confusion about responsibility and shaming environmentally conscious consumers into comparing plastic straws with pipelines, flights to see family with flaring.

Now, it's 2022. Last year, the 1,400 scientists who contributed to the United Nations Intergovernmental Panel on Climate Change issued a "code red for humanity" that we must act to prevent temperatures from rising more than they have already.² Even if we do, people younger than forty are likely to lead an "unprecedented life," other research found, with more exposure to extreme droughts, wildfires, and floods than their own grandparents.³ This is especially relevant to Texans, who have already experienced the catastrophic harm of storms aggravated by a warming atmosphere. In 2017, Hurricane Harvey's rain was made thirty-eight times worse. Hurricane Ida, in 2021, rapidly picked up speed and strength from the bathwater-like Gulf of Mexico as it approached Louisiana.

These, too, are stories about carbon dioxide. To avoid the worst harms, the IPCC reports calls for the immediate reduction of carbon emissions to "net zero" by 2030, with serious cuts in other warming emissions, like methane, which pours out of wells in the Permian Basin.

Architecture can't prevent more climate change all on its own. But one study has found that the use of mass timber cut the amount of carbon generated by new construction by over 30 percent.⁴ "We've got a good handle on it," said Heather Holdridge, Lake|Flato's Director of Design Performance. Reducing emissions from new buildings, she said, is "all about the structure."

The Life Cycle of Buildings

Steel-reinforced concrete made the urban growth of the 20th century possible. It allowed architectural and structural innovation with lower construction costs, giving rise to skyscrapers and stadiums, the Hoover Dam—and Houston, too.

But, as the IPCC reports warn, the amount of carbon required to continue to build that way is one of the many threats we face in the coming centuries. Buildings—including the concrete, steel, and other materials they're made of and the energy they use—are responsible for about 40 percent of the emissions warming the atmosphere and oceans, endangering everything from our food supply to our children's health. (Only transportation is worse.) In the US, buildings consume about 40 percent of our energy, much of which still comes from burning fossil fuels. (Texas, though, leads the way in wind energy.)

Besides the emissions, producing all the concrete and steel to make new buildings fills up landfills, depletes sand and other natural resources, and pollutes our water and air—especially in communities that are historically Black, Hispanic, and lower-wealth, where racist practices and policies from redlining to zoning have made it that much more likely for concrete batching plants and the diesel-fueled trucks that haul their products to operate.

"It's overwhelmingly, abundantly clear we have a crisis," said Ryan Yaden, associate partner at Lake|Flato, who works with Wascher and Holdridge. "We're starting to focus our energy on what we can do right now to have significant impacts."

Contending with this crisis has been changing the practice of architecture since at least the 1980s, when the Kansas City-based architect Bob Berkebile first pushed the American Institute of Architects to form the Committee on the Environment (COTE), which led in time to the formation of the US Green Building Council and the introduction of Leadership in Energy and Environmental Design (LEED).

It's clear now that LEED doesn't go far enough, Holdridge said. The new Apple Park in suburban Cupertino was stamped LEED Platinum before it opened; CEO Tim Cook once called it the "greenest building in the world."⁵ But it's encircled by 11,000 parking spots—nearly one for each of the 12,000 workers. "The energy performance of new buildings," Holdridge said, citing a decade-old study, is "dwarfed by single-use vehicles."

What's a better way? With The Soto, Holdridge explained, the use of mass timber offset emissions, even those from trucking the product all the way from Canada to San Antonio. As Kate Simonen, who teaches architecture at the University of Washington and directs the Carbon Leadership Forum, said, "We need to think about the life cycle of buildings."

This kind of thinking deals with what experts like her and Holdridge call "embodied carbon." It includes not only the operational emissions but the manufacturing ones, too: the products of powering steel mills and cement kilns. "There's a lot of energy that goes into making these materials. We don't always appreciate that investment," Simonen said. "It's not that the materials themselves or the energy that went into them is bad, it's that we don't value them. We should be thinking of these materials themselves as precious resources that have already been spent."

The Gardener's Mentality

The Soto, which opened in the summer of 2019, is the first multi-story example of a building in Texas to be realized with mass timber. (A bank in Fredericksburg was technically the first mass timber building in the state.) The Soto started going up during the summer when Albert Pope and Jesús Vassallo—Gus Sessions Wortham Professor and Associate Professor at Rice Architecture, respectively—were part of team awarded a federal grant to support the construction of a new wing of Hanszen College, a dormitory at Rice University, using mass timber. Designed by Berlin- and New York-based architects Barkow Leibinger with Kirksey Architecture, that wing is now under construction using cross-laminated timber panels made from southern yellow pine.

As early as 2014, Pope was lecturing in Houston about climate change and mass timber. He and Vassallo collaborated on a proposal for a dense housing block structured with mass timber in Detroit surrounded by groves of trees that would pull carbon out of the atmosphere while growing into building materials. This research was presented at the Venice Biennale in 2016. That same year, the Rice School of Architecture and Rice Design Alliance lecture series focused on mass timber.

Before The Soto, Lake|Flato had used mass timber as the primary structural component in the expanded conservation wing of the Museum of Fine Arts, Houston. The Sarah Campbell Blaffer Foundation Center for Conservation is an elegant wood box set atop one of the campus' concrete parking garages. Instead of the typical cross-laminated timber (CLT), which stacks and glues layers of wood set at right angles to each other, this project used dowel-laminated timber, which threads larger pieces of wood together on hardwood dowels.

Including The Soto, Lake|Flato has worked on seven mass timber projects, four of which are in Texas, including the Hotel Magdalena in Austin. Meanwhile, a mass timber building has gone up on the campus of San Jacinto College in Pasadena, and another is planned for Stephen F. Austin University in Nacogdoches, both designed by Kirksey Architecture. Hybrid systems are possible, too: Thoughtbarn's 901 East Sixth, completed in Austin in 2019 with Delineate Studio, uses CLT floor panels with steel columns.

As of December 2021, there are 603 mass timber projects underway in the US, with 700 in design.⁶ Under the 2021 International Building Codes, Yaden explains, buildings that are "eighteen or twenty stories" will become possible, which could encourage even



MFAH Sarah Campbell Blaffer Foundation Center for Conservation. Photos by Peter Molick. Courtesy Lake|Flato.

more development. Local jurisdictions set building codes. Last year, New York City Council approved CLT buildings up to eighty-five feet high through the adoption of this new code. Austin recently transitioned to the 2021 document also. Meanwhile, Houston is working to update from the 2012 code to the 2015 version.

Mass timber encourages all involved parties to think about their parts in this new story. “With mass timber, in particular,” Vassallo explained, “I think it helps align the need to move from extraction capitalism to a more sustainable, full-cycle approach to the economy and everything that we do, shepherding the land and the resources, almost more like the mentality of a gardener.”

Mass timber has other benefits, too. It’s been shown to reduce the amount of construction traffic, which is better for air and noise pollution around job sites, and reduce construction time and costs, which is better for developers’ bottom lines. And, like a potted pothos on top of a file cabinet, the wood can activate our biophilic responses, performing the miracle of making us happier at work.

In Texas, the timber industry is older than the state itself. Before there even was a Houston, felled trees were floated down Buffalo Bayou to a steam-powered sawmill in Harrisburg, and John Wayne Kirby made his fortune chopping down hundreds of thousands of acres of East Texas piney woods. This history makes Blake Hudson, A.L. O’Quinn Chair in Environmental Law at the University of Houston, excited about the potential to develop mass timber as a strong state industry, connecting rural economies to those of cities and building an entirely new supply chain. But it gives him pause, too.

“It’s complicated,” he said. Hudson grew up in Alabama and saw the loss of land to paved-over sprawl and poor forestry management. “Will mass timber be a boon? If done properly, we could get a lot of bang for our buck, both economically to keep forests forested and keep our buildings more sustainable overall,” he said.

Yaden, who grew up in heavily forested Oregon, took this same cautiously optimistic approach. Without proper oversight, he said, mass timber could become a commodity that worsens deforestation. But with commitments to manage forests responsibly, he said, “There’s nothing that should be holding us back.”

We’re on Deadline

What’s actually holding us back are, of course, policy decisions. Those, Rives Taylor explained, come from a city’s priorities and capabilities. Taylor, a co-leader and principal at Gensler and lecturer at Rice Architecture, serves on the City of Houston’s building optimization work group, which is one of six implementing the Climate Action Plan approved by City Council and quietly released on Earth Day 2020, in the chaotic early midst of the coronavirus pandemic.

For Taylor, sustainability is a combination of four considerations he said have animated his work since 2008’s Paris Agreement—the treaty Trump mocked and pulled out of and Biden rejoined. One is materiality, like mass timber, he said. But Houston has prioritized others. Most of the city’s climate emissions come from transportation; about 48 percent can be attributed to residents who drive themselves to and from work—99 percent of us—in addition to the region’s busy port and freight operations.⁷ Taylor said the city’s focus has been first on mobility and energy, how land is used, and how buildings are powered.

Lara Cottingham, who was the City’s Chief Sustainability Officer during the design and publication of the Climate Action Plan, asked: “What are the things we can do to reduce emissions as fast as possible and as much as possible?”

Taylor said he anticipates mass timber becoming an increasingly important consideration in the next decade or two, once the arguably more pressing climate actions of transitioning the electricity grid to renewable sources like solar and wind and building less car-dependent infrastructure have been completed.

In other words, if a city like Houston builds with mass timber, it fails if it keeps those buildings powered with coal and natural gas and continues to encourage residents primarily to drive between them using their own gasoline-fueled cars.

The interconnectedness of the way we build the environment and how we’re changing the climate led Simonen to ask even broader questions. “The greenest building is one we’ve already built,” she said. “Do you reuse an existing building? Do you build a smaller building? Do you build a building at all?”

Pope has shared a similar long view and focuses on existential urgencies. When we look back fifty years from now, could we say that we built what we needed to build?

Along with other shifts, the growing number of mass timber buildings going up in Texas suggests we have begun to do so. These buildings offer exciting prospects not only for their aesthetic and constructive advantages, but also because they help us think critically about our relationship to the environment we’ve built—and how both must change. The science says healthier ones are due ASAP.

Notes

1 Maxine Joselow, “Exxon Mobil’s Messaging Shifted Blame for Warming to Consumers,” *Scientific American*, May 15, 2021, <https://www.scientificamerican.com/article/exxon-mobils-messaging-shifted-blame-for-warming-to-consumers/>.

2 United Nations, “Secretary-General Calls Latest IPCC Climate Report ‘Code Red for Humanity,’ Stressing ‘Irrefutable’ Evidence of Human Influence,” SG/SM/20847, August 9, 2021, <https://www.un.org/press/en/2021/sgsm20847.doc.htm>

3 Denise Chow, “Triple Jeopardy: Children Face Dark Future of Climate Disasters,” NBC News, September 27, 2021, <https://www.nbcnews.com/science/environment/triple-jeopardy-children-face-dark-future-climate-disasters-rcna2304>.

4 Adam B. Robertson, Frank C.F. Lam, and Raymond J. Cole, “A Comparative Cradle-to-Gate Life Cycle Assessment of Mid-Rise Office Building Construction Alternatives: Laminated Timber or Reinforced Concrete,” *Buildings* 2 (2012): 245–70, <https://doi.org/10.3390/buildings2030245>.

5 Carl Franzen, “Apple CEO Tim Cook Says New Spaceship Campus Will Be ‘Greenest Building on the Planet,’” *The Verge*, September 22, 2014, <https://www.theverge.com/2014/9/22/6829127/tim-cook-says-apple-spaceship-campus-will-be-greenest-on-planet>.

6 “Building Trends: Mass Timber,” WoodWorks, accessed March 4, 2022, <https://www.woodworks.org/publications-media/building-trends-mass-timber/>.

7 Andy Olin, “Are Houston and Other Cities ‘Trying to Have Their Cake and Eat It, too,’” *Urban Edge*, Kinder Institute for Urban Research, January 24, 2020, <https://kinder.rice.edu/urbanedge/2020/01/24/houston-and-cities-struggle-with-sprawl-traffic-emissions>.