Origine | Photography: Stephane Groleau

Timber Trends on Track to Change Architecture in 2020

What is the Future of the Built Environment?

There are several major trends driving architecture in 2020, and the impact they will have on mass timber and light-frame wood construction is unfolding now. What does a more sustainable city look like in the years to come, and how can low-carbon building materials, like timber, help address climate change and make our rapidly growing urban centers healthier?

Think Wood spoke to some of the leading designers, developers, and timber experts to learn how wood factors into architecture and design trends for the future. We surveyed architects across the country to get their take on wood construction and design.[1] Here are six trends to watch when it comes to the future of timber and the built environment.

1: Evolving Building Codes

Mass Timber Stands Tall

With recent changes in the 2021 International Building Code—and a quest to find more sustainable ways to build taller—we are seeing a rise in the number of taller mass timber buildings popping up across North America. Experts in timber construction see these code changes as the beginning and believe that further testing and research could see timber buildings reach even taller heights in the years to come. As one expert put it, they are hopeful that more opportunities for mass timber will open up as the regulatory environment keeps pace with the engineering innovations and architectural ingenuity we are seeing with wood.

Case in point, mass timber experts and juggernaut Perkins & Will are proposing a 40-story timber tower, that if built, would be the tallest of its kind in the world. This project is positioned to advance the industry by altering market perceptions of building taller with wood. Perkins & Will have put the performance and environmental implications of construction at the forefront of design. Not only will Earth Tower be a zero-emissions building, the completed project will demonstrate what is possible as building codes evolve, restoring local biodiversity, creating connections to the environment, and improving livability in tall, urban buildings.[2]

Timber Trends Higher | Perkins & Will's conceptual design of Canada Earth Tower contemplates a timber skyscraper 40 floors high. (Photo courtesy of Delta Group and Perkins & Will)

2: Prefabrication and Modular Technologies

Putting the Pieces Together

Off-site, prefabricated, and modular construction continues to grow in popularity for their ability to save time and money, and the industry is continuing to find that timber offers several advantages when it comes to this factory-made approach to assembling a building like a kit of parts.[3]

Investments made by early adopters are beginning to demonstrate what is possible and help prove out the business case for these advancements. Big players, like Google-backed Sidewalk Labs, are betting on this promising trend.[4] Self-described as an urban innovation organization, it proposes to dramatically improve city living through technological solutions and an entirely timber neighborhood built from locally-sourced wood products, touting benefits such as a reduced carbon footprint, flexible modular design, and improved affordability.[5]

> **Sidewalk Labs is proposing to build an $80 million timber factory and supply chain that would support the construction of these wood buildings. The company says the factory would take a modular approach, manufacturing prefabricated building pieces that could then be assembled together to erect buildings onsite. They say it would reduce building time by 35 percent compared to more traditional building methods, and provide a boost for the regional timber industry.[6]**

In the decade to come, look for timber-based designs to take prefabrication and modular construction to new levels through advancements in automation, robotics, and just-in-time manufacturing.[7]

Timber City | Google-backed Sidewalk Labs is proposing a $1.3 billion master plan to be constructed entirely with prefabricated mass timber and is set to turn a portion of Toronto's industrial waterfront into a smart, digitally connected city prototype. In this particular view, Snøhetta contemplates a mass-timber housing development arranged in a semi-circle raised up by stilts and looking down on a public plaza. (Photo courtesy of Snøhetta)

3: Innovative Business Models

Making the Pieces Pencil Out

The increased adoption of prefabricated and modular construction are inspiring new business models that underpin and make cutting-edge technologies viable and cost-effective.

Innovation in business models is also driving deeper levels of integration and more multidisciplinary firms. Industry disrupter Katerra recently acquired an interest in a number of design firms specializing in mass timber. Wood and prefabricated design have become differentiators across industry sectors, including real estate developers, integrated design-build firms, and manufacturers bundling product offerings in new ways.

Developers are also seeing that mass timber can be a differentiator and a new business model. Hines, a privately owned global real estate investment, development, and management firm, has launched a series of mass timber office buildings with the moniker T3 (Timber, Transit, and Technology).

When the seven-story T3 Minneapolis was completed in late 2016, it was the tallest wood building in the United States. Since then, Hines has completed a second T3-branded property in Atlanta, and other projects are in the works in Nashville, Denver, and Austin, and two are planned for Toronto. This scalable, cost-effective building model is positioning the industry for positive change.

Winning with Wood | Hines' T3 series of timber offices is a winning formula that could replace the also-ran templated office complex of the past. (Photo by Ema Peter and courtesy MGA | Michael Green Architecture and DLR Group)

4: New Design Tools

The Timber Tool Kit

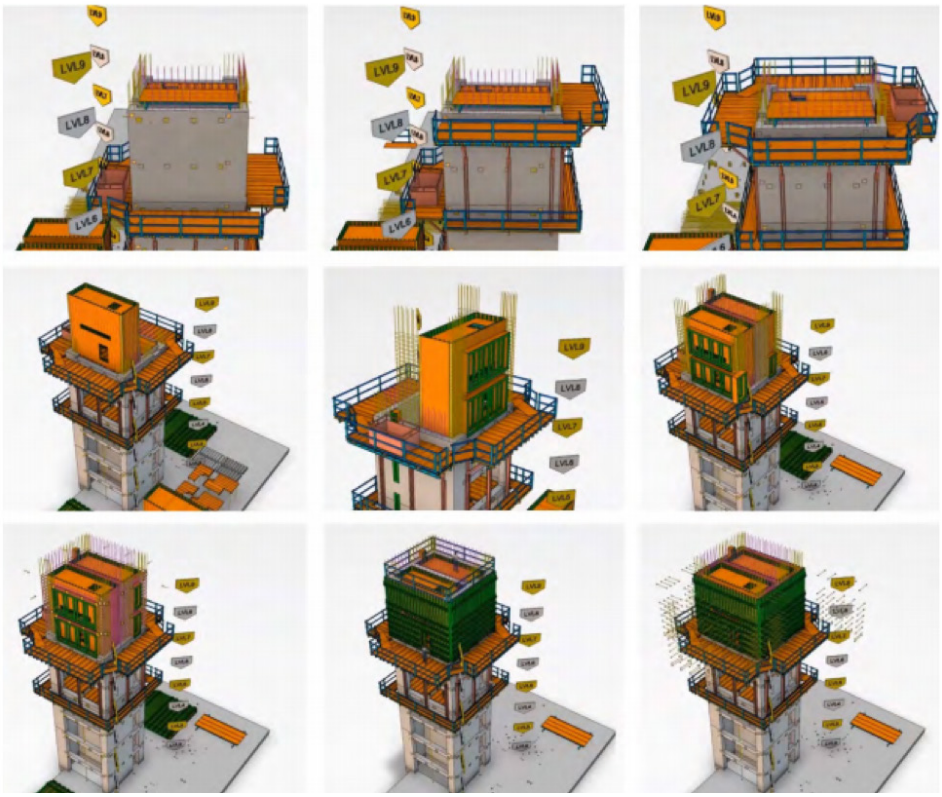
Innovations in digital design tools, such as building information modeling (BIM), Design for Manufacturing and Assembly (DfMA), 3D rendering software, and augmented virtual reality (AVR), are opening up new possibilities for timber construction and design.

Companies like Katerra use a real-time data processing application and the Internet of Things to achieve "deep integration and newfound efficiencies."[8] Integrated design and fabrication companies are seeing buildings designed in software like Revit, a 3D modeling application. The files can then be converted to a format for computer numerical control (CNC) machines in the factory.

Mass timber projects may be challenged on a local level by construction codes that can lead to the development of specific site regulations and the proposal of alternative solutions. In these situations, BIM enables authorities and code consultants to visualize the project and proposed solutions clearly while advancing the approval process.[9]

A novel approach of the precedent-setting 18-story tall timber Brock Commons Tallwood House was the intensive use of virtual design and construction (VDC) tools and methods. VDC is a subset of BIM primarily focused on the 3D geometric representation of a facility to support analysis for design and construction and can be particularly helpful for large scale mass timber projects.[10]

BIM can also help the installer and manufacturer to coordinate the delivery of the structural elements. For Brock Commons, BIM was used to plan out the delivery and unloading cycles for the timber elements. This exercise helps to avoid misplacement of elements and plan just-in-time delivery conditions for construction sites where space is limited, and elements cannot be stored onsite.[11]



Timber Tools | Corrected sequence for formwork installation enabled through 3D simulation. (Photos courtesy of CadMakers)

5: Net Zero Targets and Embodied Energy

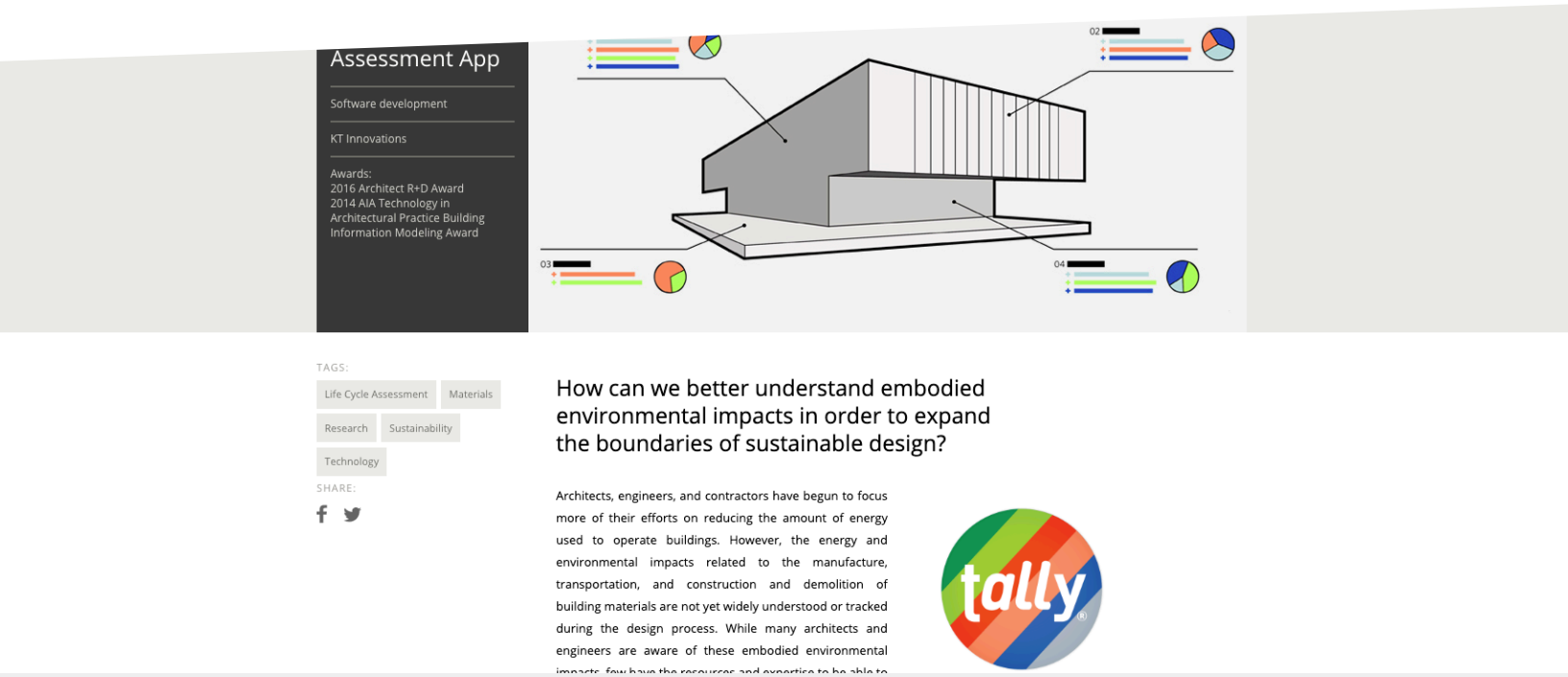
Low Carbon Timber-Built Cities

There is increasing interest by cities and governments to use more low carbon building materials, such as timber, rammed earth, and fly ash, as part of a climate change mitigation strategy and to address the growing concern about embodied energy.[12]

Architects see their profession center stage to the demands of the climate crisis and a call for low carbon construction.[13] The building and design sector responded with carbon calculation tools, including the Athena Impact Estimator and the Tally Life Cycle Assessment App.

> **"The best thing to do is to use common sense," says Thomas Robinson, the founding principal of Portland, Oregon-based LEVER Architecture, a firm that has specialized in mass timber (and now mass plywood) construction. "Use what you have on hand, a material sourced regionally and coming from a sustainably managed forest."[14]**

Some jurisdictions, such as the city of Vancouver, have launched climate change action plans that specifically encourage low carbon material choices. The city that adopted the goal of becoming the greenest city in the world by 2020 is now aiming for the embodied emissions in new buildings and construction projects to be reduced by 40 percent by 2030 compared to a 2018 baseline and is looking for ways to remove regulatory barriers to mass timber construction.[15]



Carbon Crunch | The Tally Life Cycle Assessment App helps architects and designers gain a complete picture of the environmental impacts associated with a building during the design and planning process, when the data can influence important design decisions.

6: Biophilic Design

Putting Nature to Work

More and more, science is confirming common sense and the emerging concept of biophilia: that being exposed to nature and natural, organic materials not only calms our mind, but it can also contribute to an improved sense of health and well-being.

Stress Test: Is Wood Good for Your Health?

There is a growing body of research that suggests building with wood may be good for our health and well-being. While it's in the early days and more research is needed, the results are intriguing.

- In four different independent studies, the presence of wood was found to have an immediate effect of lowering sympathetic nervous response, akin to reducing stress and anxiety.[16]
- A study of stress levels in students found long-term exposure to wood interiors was correlated with an activation of the parasympathetic nervous system, which acts to reduce overall stress levels and promote healing.[17]
- A range of independent studies found that participants self-report a preference for wood interiors and believe that it promotes health and well-being.[18]

Connecting Education and Environment

Among the first adopters of biophilic design are architects focusing on educational facilities. Projects like Quebec's École Au Millénaire and the R.W. Kern Center at Hampshire College in Amherst, Massachusetts, are raising the architectural bar while forging connections between building occupants and the natural environment.

Connecticut's Common Ground High School was the nation's first building to use cross-laminated timber (CLT) as a "stressed-skin" assembly. Using local black spruce for several structural and design elements, a team of five assembled the building's frame in just four weeks. Today, staff and students couldn't be happier with the new building, and they're reaping additional biophilic benefits. Says co-designer Alan Organschi of Gray Organschi Architecture, "the students at Common Ground tell me the air feels really fresh, just like being outside."

Biophilic Brands | The 180 students of Common Ground High School do more than study urban farming and sustainability. They live it each day in a building that's now a national model of the biophilic benefits of green school construction. (Photo courtesy David Sundberg/Esto)

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