

SCALING MASS TIMBER CONSTRUCTION



Rob Jowett

A new design for a supertall mass timber building is meant to demonstrate the potential of the new construction method and to showcase other ways of improving the sustainability and environmental features of buildings.

DIALOG has released a design for a 105-storey mass timber building. The design is conceptual and not yet associated with a specific development project. It was not designed for specific uses, but could be adapted for residential, office, and other uses depending on the needs of an eventual developer. The building would be also carbon-neutral. The building was designed in collaboration with **EllisDon** and **RWDL**.

“The pitch is us putting our ideas down on paper... to address the challenges we felt were not being met,” DIALOG principal **Craig Applegath**. “In the world of mass timber... there seems to be a race on to get the tallest all-wood building... and the purpose of it seems to be [to get] as big as possible with all wood. And yet, there’s no such thing as all wood, because you’re going to have to have concrete foundations, and you [will] have

to have steel connectors for the wood.”

Applegath says the building was designed to showcase the potential of mass timber in improving both building sustainability and overall design. He says the design is meant to be flexible so that a potential development partner would be able to adjust elements of the design, such as the height and floorplate, to suit it to a particular site. In particular,

Applegath says DIALOG wanted to demonstrate that most of the limitations for mass timber buildings are in existing zoning and building code regulations rather than limits of the technology itself.

“This is a prototype, meaning it could be built tomorrow. All the technology that we’re using is not in the future—it’s right now, here, now... proven technology to get to that zero carbon. In fact, it sort of pushes

back against this notion that you can’t have tall buildings and be zero carbon,” says Applegath. “We can’t wait for a developer to come to us. We’ve got to put something out there in the market that someone will say, ‘Okay, let’s try that.’”

Applegath says one of the main reasons for designing the building was to find ways to make mass timber economically viable. He says in most cases, mass timber is more expensive per square metre to build with than concrete and steel, owing mainly to the novelty of the method and the limited supply of mass timber construction materials available in Canada. He describes the majority of mass timber projects as being mainly vanity projects meant to showcase the technology and promote it to the end user, whereas with this project DIALOG seeks to find the ways to scale mass timber construction to make it viable for high-rise buildings.

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Renderings of DIALOG’s 105-storey mass timber building prototype which was designed to demonstrate the potential of mass timber construction and to explore the possibility of creating commercially viable carbon neutral supertall buildings.

SOURCE / ARCHITECT: DIALOG

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Applegath says one of the greatest challenges in mass timber construction that DIALOG is seeking to overcome is its viability for commercial use. He says that while most commercial floor plates have spans of around 12 metres from the building core to the outer wall, cross-laminated timber can only span around nine metres due to its limited ability to support the weight above it, meaning additional beams and columns would be needed for larger spaces. To overcome this, DIALOG has developed a

proprietary hybrid timber floor panel system which uses steel rods to add tensile strength to the pre-fabricated cross-laminated timber panels used for the building's walls, meaning the wall can support additional weight. DIALOG is currently testing this technology in partnership with the **University of British Columbia**.

Globally, buildings and construction are responsible for over 39 per cent of carbon emissions, most of which come from concrete and steel production as well as

building operation. The carbon capturing ability of wood itself is a major contributor to the environmental sustainability of the building. The photosynthesis process requires carbon in order to grow trees, meaning wood construction removes carbon from the atmosphere and holds it within the building. A building constructed to the exact specifications of DIALOG's pitch would store more than 36,000 tons of carbon.

"The operations of the building, the heating of the building, the lighting of the building, the mechanical system of the building, the elevators, all the things that use power that would ordinarily generate carbon because of their use, are going to be

operating in a way that are zero carbon," says Applegath. "[We] have a highly insulated building envelope so that you're not losing... heat energy in the winter, and you're not gaining heat into the building in the summer. And we're using a double skin building envelope for that."

Applegath says that there are several elements to the building that will increase sustainability and improve energy performance beyond the mass timber. The south, east, and west façades would include integrated photovoltaics developed by **Morgan Solar** that would be able to supply power for the building, and the building would include batteries to store power collected during off-peak hours. Supplemental energy could be supplied by a natural gas district energy system.

The building design also includes algae bioreactors invented by the Markham-based company **Pond Tech**. The 1,500-cubic metre reactors use carbon emissions to grow algae, which can then be used for human or animal food, biofuel, and other products, meaning the building can passively generate a secondary income source. The reactors would be able to absorb all excess emissions, guaranteeing a carbon-neutral building.

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Rendering of a ground floor interior space that could be designed as a lobby in a supertall mass timber building.

SOURCE / ARCHITECT: DIALOG



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Around two tonnes of carbon dioxide emissions produce one tonne of algae, and the only other by-product is oxygen.

“Algae is something that you probably already use a couple times already today without realizing it. There’s a compound called carrageenan which is used in toothpaste... there is algae sold at health food stores, [and] there’s different algae extracts,” Pond Tech project development vice president **Peter Howard** told *NRU*.

“The trick is ... at any given place where you can put your bioreactors, trying to match up the amount of available new with a buyer or group of buyers who want to buy roughly [the amount of algae a building produces].”

The algae could even be used as a fuel for the building itself, though would come with diminishing rate of return, as the power that can be generated from it produces less carbon than what is needed to grow

the algae. Applegath says that between the photovoltaic panels in the façade and the bioreactors, the building has the potential to generate so much power it can be sold back to the grid.

Applegath says the most significant barrier to widespread mass timber construction is in the supply chain. Canada has a very small capacity to produce cross-laminated timber and other necessary materials, and most of the prefabricated beams and panels used here are imported from Austria. He says the supply chain in Canada is currently being expanded and once mass timber materials can be locally and sustainably produced, it will greatly reduce

the overall cost of constructing the buildings.

“I think we’ll find as wood becomes more acceptable that we’ll start to see it in taller and taller buildings,” says Applegath. “So, what we’ve come along and said is, ‘Well, we’ve got the technology to make the buildings, let’s just work on making everyone feel comfortable and safe with it.’ Because we certainly know that you can do it safely. The question is simply: What will a city or region accept?” 🌱

CALL FOR MEMBERS DESIGN REVIEW PANEL



The City of Hamilton is seeking nine design professionals to serve as volunteer members of the Design Review Panel (DRP). The City is looking for urban designers, architects, landscape architects, planners, heritage professionals and green technologies specialists. The Panel provides expert and impartial design advice to City Planning staff on urban design matters.

DRP members will serve on a voluntary basis for a four-year term starting in January 2021. The DRP will meet for half a day, once per month or as necessary. Potential candidates must have a minimum of 10 years of relevant professional experience and must be registered members in good standing in their respective professional associations.

All nine seats on the Panel are available.

Hamilton continues to experience significant revitalization across the City. As our built environment evolves, we want to ensure high quality design and we look to our DRP as an essential aspect of the development process.

Interested candidates should submit their CV, a cover letter summarizing their qualifications and experience, and a brief explanation as to why they are interested in Hamilton’s Design Review Panel, by

Friday, October 16th 2020 by 4:30 pm.

Submissions should be sent via email with the subject heading ‘Design Review Panel’ to: Anita Fabac, Manager of Development Planning, Heritage and Design Anita.Fabac@hamilton.ca

Selected candidates may be contacted to arrange an interview with City staff.

The City of Hamilton is committed to ensuring that its Committees and Local Boards reflect the diverse nature of the City of Hamilton’s population, including women, persons with disabilities, First Nations, Métis and Inuit peoples, members of racialised communities / visible minorities and encourages all residents to consider this opportunity.

Please visit our website for more information: www.Hamilton.ca/DRP

Sajecki Planning

Sajecki Planning is an urban and regional planning firm based in Toronto and Mississauga.

We are seeking an **Urban Planner** to join our growing team.

The Role: Urban planners work on a wide variety of projects in the private and public sector. They are expected to work collaboratively with multidisciplinary teams to advance complex projects such as land use and growth management studies and planning and development applications. The successful candidate will be a diligent and self-motivated individual that is curious about how planning decisions impact our vibrant city and region.

Responsibilities

- Preparation and coordination of planning applications and municipal planning documents
- Interpreting legislation, regulations, and policies
- Project management of planning and urban design projects
- Engaging regularly with clients
- Preparation of proposals in response to RFQs and RFPs

Qualifications

- Master’s degree in planning and a minimum of three years of local planning experience
- Membership in OPPI or eligibility to become a member
- Understanding of planning and development process in Ontario
- Urban Design experience with CAD modelling, Photoshop, and Illustrator an asset

For a detailed job description, and to apply, visit: www.sajeckiplanning.com