
TO: CITY MANAGER **DATE:** 2020 February 05

FROM: DIRECTOR PLANNING AND BUILDING **FILE:** 41500 20

**SUBJECT: FIVE AND SIX-STOREY WOOD FRAME BUILDINGS AND MASS
TIMBER CONSTRUCTION**

PURPOSE: To provide Council with information and recommendations regarding five and six-storey wood frame buildings and mass timber construction.

RECOMMENDATIONS:

1. **THAT** Council endorse the proposed approach regarding five and six-storey wood frame buildings and mass timber construction, as discussed in Section 4.0 of this report.
2. **THAT** a copy of this report be forwarded to: the Province of British Columbia's Building and Safety Standards Branch, Office of Housing and Construction Standards, Ministry of Municipal Affairs and Housing, P.O. Box 9844, Stn. Provincial Government, Victoria, BC, V8W 9T2; the Architectural Institute of BC, #100 – 440 Cambie Street, Vancouver, BC, V6B 2N5; and Engineers and Geoscientists BC, #200 – 4010 Regent Street, Burnaby, BC, V5C 6N2.

REPORT**1.0 INTRODUCTION**

On 2019 February 11, Council adopted a motion that staff prepare a report regarding the feasibility of increasing the height of wood-frame buildings beyond four storeys. The purpose of this report is to provide information on wood construction (for both five and six-storey wood frame buildings and for mass timber buildings), outline the Province's recent early adoption of mass timber construction provisions for select local governments, discuss issues related to mass timber construction, and recommend a proposed approach for the City of Burnaby regarding mass timber construction.

2.0 POLICY

The subject approach aligns with the following goals and sub-goals of the Corporate Strategic Plan:

A Safe Community

- Emergency preparedness - Enhance plans, procedures, and services so that we are better prepared to respond to emergencies and are able to maintain City services.
- Emergency services - Provide responsive emergency services.

A Connected Community

- Partnership - Work collaboratively with businesses, educational institutions, associations, other communities, and governments.

A Thriving Organization

- Organizational culture - Ensure that our core values are reflected in our policies, programs, and service delivery.
- Reliable services, technology, and information - Protect the integrity and security of City information, services, and assets.

3.0 BACKGROUND

On 2009 January 08, the Province enacted new provisions in the British Columbia Building Code (BCBC) to increase the allowable height of wood-frame residential buildings from four to six storeys. The Province indicated at the time that the code changes would lower building and housing costs, as well as support the forestry sector, by allowing higher wood-frame buildings.

Effective 2019 December 12, the BCBC was further amended to introduce mass timber construction as a construction category for buildings up to 12 storeys in height for those local governments (including authorities such as the University of British Columbia) that agreed to be early adopters of mass timber construction. Similar to the amendments to the BCBC adopted in 2009 permitting wood-frame construction up to six storeys, the Province's recent update to the BCBC was driven by a desire to further support the forestry sector. This new initiative is also being promoted as a cost-effective low-carbon building solution supporting the government's CleanBC goal of making every building more energy-efficient, while creating more jobs and economic opportunities for people, businesses and communities throughout the province.

4.0 DISCUSSION

4.1 Six-storey Wood-frame Buildings

On 2009 March 23, Council received a report from staff on the six-storey wood-frame residential buildings outlining the concerns of the new code provisions including: lack of research on seismic design; fire risks to occupants; firefighting; building envelope; material shrinkage; qualification of design professionals, contractors and trades; and education and training for those involved in design and construction.

Council adopted the recommendation in the report that rezoning applications for the development of five or six-storey wood-frame buildings only proceed after concerns outlined in the report had been satisfactorily addressed. Since that time, rezoning applicants have been required to provide a submission by a qualified professional to the Chief Building Inspector adequately addressing the concerns raised.

The subsequent publication of the Engineers and Geoscientists BC's Technical and Practice Bulletin on five and six-storey wood-frame residential buildings provided the industry with direction addressing many of the technical concerns raised in the staff report. In the ensuing ten years of industry practice the understanding of, and expertise in, the construction of five and six-storey wood-frame buildings has been developed significantly. There have been relatively few applications for wood-frame residential buildings of five or six storeys in Burnaby and, for those that have been approved, staff concerns were adequately addressed. Given the foregoing, it is recommended that the provision of a professional submission addressing technical code issues in five and six-storey wood-frame buildings no longer be a rezoning requirement.

4.2 Mass Timber Construction

Mass timber is a category of engineered wood product that enables the construction of taller wood buildings. Mass timber products typically involve multiple layers of wood; examples include glue-laminated timber, cross-laminated timber (CLT), dowel-laminated timber, and nail-laminated timber. Encapsulated Mass Timber Construction (EMTC) is a mass timber product that is enclosed by a fire-resistant material such as drywall to delay the ignition and combustion of the timber elements when exposed to fire.

EMTC differs from traditional wood-frame in that the mass of the timber elements afford wood charring, which given the char rate, for a period of time insulates the core of wood structural members, and thus maintains a measure of structural integrity. In addition, the encapsulation delays ignition. Both mechanisms contribute to additional structural fire-resistance. The draft National Building Code (NBC) notes that "it is intended that the fire safety requirements and specific design restrictions presented in this set of proposed changes will sufficiently limit the probability of risk of unacceptable loss in buildings using EMTC."

Until its recent amendment, the BCBC did not permit outright wood construction, including mass timber construction, for buildings over six storeys. However, for a few developments, such as the Brock Commons residential building at the University of British Columbia (18 storeys) and the Wood Innovation and Design Centre in Prince George (six storeys plus a ground floor mezzanine and a rooftop mechanical penthouse), the Province issued special exemptions under Site Specific Regulations (SSRs) for mass timber buildings. SSRs have been administered by the Province with input from the applicants and local governments, with the SSR replacing the BCBC for that particular project.

With recent changes in the Building Code, the Province has transitioned from issuing SSRs, to the early adoption of the mass timber construction provisions for interested local governments. SSRs are therefore no longer offered for mass timber construction.

To date, there have been no buildings over six storeys constructed of mass timber in Burnaby, although a few developers have expressed interest in this building technology for new office/industrial buildings in areas designated for Business Centre use.

4.3 Changes to the BCBC

On 2019 March 13, the Province announced that interested local governments would be invited to be early adopters of mass timber construction for buildings up to 12 storeys in height. This announcement was in anticipation of the publication of the 2020 National Building Code (NBC), which is expected to allow mass timber construction up to 12 storeys in height. The Province will likely incorporate this amendment for Province-wide use in the next edition of the BCBC, which is anticipated to be adopted in 2022.

In the interim, the Province has obtained permission from the National Research Council to use the mass timber construction provisions from the proposed 2020 NBC through a Jurisdiction-Specific Regulation (JSR). Early adoption of this construction method requires local governments to “opt in” and commit to share their learning experience. The Province’s JSR will replace the SSR approach discussed above. Amending the BCBC to include EMTC for specific local governments is also a different approach to the “regulation” approach that had been previously used by the Province to modify code provisions for specific local authorities (e.g., in 2011, the Solar Hot Water Ready Regulation was developed as a separate document from the BCBC and is applicable only in those communities that, subject to Provincial approval, adopted the regulation).

Following the press announcement, the Province’s Ministry of Municipal Affairs and Housing sent packages to local governments on 2019 March 18 inviting them to express interest in the early adoption initiative for mass timber construction by 2019 April 05. Direction on whether a positive Council resolution was forthcoming was requested by the end of August, in order to be considered a participating local government. Staff felt that there was insufficient time and information provided to recommend that the City opt in as an early adopter by 2019 August.

Ultimately, the Province’s invitation resulted in 13 local authorities (12 local governments plus the board of governors of the University of British Columbia) choosing to be early adopters. The BCBC was amended in December 2019 to enable those 13 local authorities to permit construction of mass timber buildings up to 12 storeys in height within their jurisdictions.

Specifically, the new EMTC measures are prescribed Building Code provisions for those specific local authorities. The EMTC measures are not applicable to any other local governments at this time. Notwithstanding, local governments that did not opt into the BCBC’s new EMTC provisions by 2019 August continue to be eligible for inclusion in this initiative, provided that:

- there is Council support for the initiative;
- the Planning, Building, and Fire Departments support participation;
- the lead Building official holds a Level 3 Certification from the Building Officials’ Association of BC;
- land use bylaws support buildings greater than six storeys in height; and,
- local government staff will participate in provincial working groups or provide the Province feedback and other information on mass timber construction projects.

4.4 Issues Related to Encapsulated Mass Timber Construction (EMTC)

While the Planning Department is generally agnostic with respect to construction methods for new development projects, insofar that proposals are consistent with the Zoning Bylaw, Land Use Plans and other City policies, the Building Division and Fire Department have justified reservations about early adoption of EMTC. Various issues related to early adoption are discussed below:

4.4.1 Premature Changes to the BCBC and Shifting of Responsibility

The Province's early adoption of the NBC mass timber construction provisions is experimental in nature. It is not available to all local governments as an early adoption of the proposed NBC changes into the BCBC. Rather, it only applies to those local governments who specifically opt in to be early adopters in advance of the NBC changes. Staff feel that the initiative is premature, as the relevant building codes have not yet been adopted nationally. It is a concerning issue, for example, that the structural portion of the NBC for mass timber construction has not been finalized, particularly with respect to using wood shear walls and wood cores for stairs and elevators. At this point, concrete shear walls and cores are still required for new construction over six storeys. There is no guarantee that the changes to permit EMTC, wood shear walls, and wood cores, or any other related changes to the NBC, will be adopted.

In addition, there has not been sufficient consultation with local governments on the early adoption initiative. Deviations from the NBC changes as adopted by the Province, if deemed necessary by local governments, would not be permitted. The initiative is an unfunded exercise in testing the feasibility of this type of construction on the part of participating local governments. Therefore, the early adoption initiative shifts undue responsibility for early adoption of this new technology onto local governments. The participating local governments are expected to provide feedback and other information on their EMTC projects to the Province. With the requirement that local governments share lessons learned as a result of the initiative, it is apparent that the primary benefit of this pilot project is to the Province in the development of the 2022 BCBC update to accommodate EMTC projects province wide.

4.4.2 Exposed Elements/Tenant Improvements

EMTC adds a fire-resistant barrier to delay the ignition and combustion of encapsulated mass timber elements when they are exposed to fire. For mass timber buildings, however, a portion of the mass timber elements – columns, beams, or a certain extent of wall and ceiling surface within a suite – is permitted to be exposed wood (i.e. not encapsulated).

Office buildings are usually built with the shell only, with interior tenant improvements done by individual tenants upon completion of the base building, and after the Occupancy Permit is granted. Tracking the amount of wood permitted to be exposed within each suite would require a complex and detailed review process that is yet to be established. In addition, tenant improvements and renovation are sometimes undertaken without a Building Permit, and could potentially expose wood elements that are intended to be encapsulated, thereby compromising the building's performance in a fire.

4.4.3 Other Combustible Construction

Currently, the BCBC differentiates between combustible buildings and non-combustible buildings. Unlike a non-combustible building, the construction of a combustible building by itself represents an increased fire load (i.e. the quantity of material that is available to burn). In addition, there are combustible elements permitted in non-combustible buildings that will also be permitted in EMTC. These elements include wood roof sheathing, combustible windows, cladding, flooring, platforms, stairs, partitions, and balconies, all of which are permitted without additional fire protection.

4.4.4 Mixed Uses Allowed

The recent changes to the BCBC allows wood frame and mass timber construction for mixed uses including assembly (such as restaurants) and low to medium hazard occupancies (such as warehouses and labs), where these uses were previously required to be non-combustible (concrete) construction. These uses have much higher fire hazards than office and residential uses, but no additional fire protection beyond that currently required for such occupancies in non-combustible buildings has been contemplated for EMTC.

4.4.5 Fire Prevention

There is nothing in the recently updated BCBC that enhances firefighters' capabilities to fight fire in a mass timber building higher than six storeys in height or regulate firefighting provisions during construction where the mass timber elements are not encapsulated.

4.4.6 Design and Construction Considerations

The Architectural Institute of BC and Engineers and Geoscientists BC are currently working on guidelines for EMTC, which will likely be published by the end of 2020. It is presumed that such guidelines would help define engineering best practices in the design and construction of EMTC buildings. Few design professionals and contractors are involved in the design and construction of EMTC, and until such guidelines are readily available and understood by the regulatory and design communities, it would be premature for the City to commit to being an early adopter and with confidence accept the Letters of Assurance from qualified professionals. Further, there are only three manufacturers in Canada that produce mass timber elements, and it is unclear if there are regulations currently in place that govern the manufacturing process.

4.4.7 Education and Training

The Province, at this time, has not provided guidelines, training or funding to support local governments in the approval of EMTC; conversely the participating local governments are requested to provide feedback and other information on their EMTC projects to the Province. Introducing such a new concept of construction into the code usually requires extensive staff training, but to-date municipal building officials have received limited information on the new EMTC code provisions.

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Given the above, it is recommended that the City of Burnaby not opt in to the Province’s early adoption initiative for EMTC, and instead await the inclusion of mass timber construction for all local governments in the updated BCBC. This approach will also allow the City to review the completed and approved professional associations EMTC guidelines, and the conditions of an updated BCBC.

In advance of the expected 2022 Province-wide code changes, staff will begin reviewing whether any City policy or bylaw changes are required to facilitate mass timber buildings higher than six storeys. Finally, once the BCBC has been amended to include EMTC for all local governments, a report will be forwarded to the Planning and Development Committee, similar to the report to Council on six-storey wood-frame residential buildings that will outline the BCBC changes and any specific requirements of the City regarding the permitting of EMTC buildings.

5.0 CONCLUSION

This report provides Council with information on five and six-storey wood frame buildings and on mass timber wood construction beyond six storeys in height (specifically mass timber construction and EMTC), outlines the Province’s recent early adoption of EMTC, and discusses issues related to this construction technology. Based on the information presented above, staff recommend removing the rezoning requirement to provide a submission by a qualified professional that addresses technical code issues related to five and six-storey wood-frame buildings. In addition, staff recommend that the City not opt in to the early adoption initiative for EMTC prior to the BCBC’s adoption of EMTC for all local governments, which is anticipated in 2022. Finally, staff recommend that a copy of this report be forwarded to: the Building and Safety Standards Branch, Office of Housing and Construction Standards, Ministry of Municipal Affairs and Housing, P.O. Box 9844, Stn. Provincial Government, Victoria, BC, V8W 9T2; the Architectural Institute of BC, #100 – 440 Cambie Street, Vancouver, BC, V6B 2N5; and Engineers and Geoscientists BC, #200 – 4010 Regent Street, Burnaby, BC, V5C 6N2.



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PLANNING AND BUILDING

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cc: Director Engineering
Chief Building Inspector
Fire Chief
City Solicitor
City Clerk