MEDIA BRIEF – TALL MASS TIMBER BUILDINGS

Issue Summary

The International Code Council (ICC), the body that develops the model building codes widely adopted by governments, has undertaken a full review of the International Building Code (IBC) to ensure that building codes are up to date as more Tall Mass Timber Buildings (TMTB) are approved around the world.

In 2015, the ICC Board of Directors empaneled an “Ad Hoc Committee on Tall Wood Buildings” (AHC-TWB) to review the entire IBC for provisions that could be relevant to TMTB. Their mission was to investigate the science related to mass timber and to propose necessary code changes to ensure that mass timber buildings of greater height and area would have the strength and fire resistance required of all buildings to protect the public and fire responders. All buildings, regardless of material used, are required to comply with the fire resistance elements of the IBC.

The AHC-TWB is a consensus-based committee that includes subject matter experts from several materials industries, building officials, architects, engineers, fire protection specialists, fire service professionals, planning officials and other construction industry stakeholders.

The Committee has produced 14 code recommendations for TMTB of up to 18 stories. After a public comment period, the next step in the ICC process will be action at a Public Comment Hearing in October, followed by Online Consensus Voting by governmental officials in November. More information on the code recommendations can be found on the Mass Timber Code Coalition’s website.

Mass Timber Buildings

Recognized by the current IBC as Type IV construction, code-compliant mass timber buildings are not new. However, mass timber buildings taller than the IBC limit are being approved by local authorities more frequently. Successful buildings in the UK, Norway and Canada are recent examples. Currently, 35 projects, from 7 to 24 stories, have been proposed in 21 jurisdictions. The growing popularity of Tall Mass Timber Buildings (TMTB) is due to several attributes:

✔ The resilience of mass timber panels offers the strength of steel at lower weights;
✔ Mass timber is manufactured from renewable resources, in less time, with far less energy consumed;
✔ Mass timber structures offer tight building envelopes with superior insulation properties, saving substantial energy;
✔ Mass timber panels are installed more easily, in less time, at lower cost, and by a more widely available workforce, alleviating a construction labor shortage;
✔ The inherent fire resistance of mass timber panels – where charring insulates the underlying panel structure – meets and generally exceeds IBC fire performance standards;
✔ Architects laud the design flexibility afforded by mass timber panels and the options for better built environments.

Mass timber products include cross-laminated timber (CLT), nail-laminated timber (NLT), structural composite lumber (SCL), and glued-laminated timber (glulam). These products are fundamentally different than traditional dimension lumber.
Fire Resistance Testing

The ICC has long recognized the strength and fire resistance of mass timber technologies. In addition, the IBC requires mass timber buildings to have rigorous and redundant fire protection systems, both passive and active. More details on fire resistance requirements can be found in “A Fire Safety, Environmental and Economic Assessment of Modifying Building Codes for Tall Mass Timber Buildings.”

Tests to confirm ASTM E119 fire resistance ratings have been conducted multiple times by UL, SwRI and the National Research Council of Canada and others. Indeed, 2015 testing demonstrated how charring on mass timber panels in a fire creates a barrier that protects the inner structure for 3 hours and 6 minutes, well beyond the 2-hour requirement in the code.

The AHC-TWB relied on new fire resistance testing to assess code requirements for three new types of Type IV mass timber construction:

**Type IVA:** Up to 18 stories. Fully protected by gypsum wall board interior and exterior. Other structural, passive and active system requirements.

**Type IVB:** Up to 12 stories. Fully protected by gypsum wall board exterior, interior partially protected at intervals. Other structural, passive and active system requirements.

**Type IVC:** Up to 9 stories as allowed by current code. Fully protected by gypsum wall board exterior, full interior exposure of panels permitted. New 2-hour fire resistance rating required as well as structural, passive and active systems.

All new Type IV construction will prohibit combustible materials on exterior walls. All concealed spaces, shafts and exit enclosures must also have noncombustible protection. In addition, mass timber buildings over 120 feet elevation (8-10 stories) must be equipped with dual water supplies for fire sprinkler systems.

Fire performance was validated by a series of full-scale tests at the U.S. Government’s Bureau of Alcohol, Tobacco and Firearms (ATF) Fire Research laboratory in 2017. Importantly, three of these tests were conducted without the intervention of fire sprinklers.

Tests evaluated the contribution of mass timber to a fire; integrity of structural members; performance of connections; performance of through-penetration protection and conditions for any responding fire service personnel. As detailed in the full report of the ATF tests, the results exceeded the fire resistance requirements of the IBC:

**Type IVA:** Fully protected CLT. The fire burned itself out after three hours with no significant charring on mass timber surfaces.

**Type IVB:** Partially protected CLT. Fire test concluded at 4 hours after apartment contents burnout. Exposed CLT self-extinguished due to formation of a char layer.

**Type IVC:** Fully exposed CLT. Apartment contents burned out after 4 hours. CLT self-extinguished after formation of char layer.
Questions and Answers on Tall Mass Timber Buildings

Q1: WHY IS THERE A MOVEMENT TO MASS TIMBER BUILDINGS?

A1: Mass timber isn’t new. It’s recognized in the current code as Type IV, “Heavy Timber” subject to all current requirements for structural strength and fire safety. However, taller mass timber buildings have increased in popularity, particularly with the wider availability of massive cross-laminated timber panels.

Mass timber buildings offer multiple benefits, including less environmental impact, better energy performance, use of renewable resources, carbon sequestration, easier and faster construction, design flexibility and inherent fire resistance. Good examples of successful mass timber buildings can be found in Europe, Australia, Canada and now the United States.

Q2: HOW DOES MASS TIMBER COMPARE TO STEEL AND CONCRETE?

A2: All buildings, regardless of material, must comply with structural safety and fire resistance requirements of the IBC. In fact, the proposed changes in the IBC for mass timber often exceed code requirements and offer more protection than steel or concrete. For example, new Type IVA mass timber (up to 18 stories) has a three-hour fire resistance rating, compared to 2 hours for fire-protected concrete or steel (Type IB).

Mass timber also offers advantages on cost and ease of construction. Mass timber panels are often “plug and play” assemblies that are delivered as needed and can be built more quickly by a wider labor pool, saving money and reducing disruption in communities during construction. A range of safety, environmental and economic advantages are elaborated on in “A Fire Safety, Environmental and Economic Assessment of Modifying Building Codes for Tall Mass Timber Buildings.”

Q3: WHO IS SUPPORTING CHANGES IN THE IBC TO ACCOMMODATE TALL MASS TIMBER BUILDINGS (TMTB)?

A3: The Ad Hoc Committee of Tall Wood Buildings (AHC-TWB) was appointed by the ICC Board of Directors in 2015. Committee members are a broad cross section of materials specialists, industry stakeholders, fire service professionals, fire engineers, structural engineers and building officials. The Committee passed their recommendations overwhelmingly for consideration by the wider ICC membership because the IBC must remain relevant to the movement toward taller mass timber buildings.

The Mass Timber Code Coalition (MTCC) is a coalition of groups in support of the Committee’s recommendations. Our membership includes AHC-TWB members and other groups who recognize that tall mass timber buildings are being built now, under various local codes and processes, and that the IBC should be updated. As tall mass timber buildings become more common, the IBC should continue to provide the tools local officials need to ensure that these buildings meet the highest standards for safety.

Q4: WHO IS OPPOSING CHANGES IN THE IBC FOR TALL MASS TIMBER BUILDINGS?

A4: Supporters are surprisingly broad, including fire service professionals, code officials and industry stakeholders. Conversely, opposition is narrow.

The ready-mixed concrete industry has launched a campaign in opposition to Tall Mass Timber Buildings. They explicitly state that they are in danger of a loss of “market share” as the basis for their opposition. Their opposition ignores two key considerations:

1. The purpose of the code is to ensure safety in the built environment. It is not to improve the market position of any single industry. Tall mass timber buildings are being built today; the code must be prepared to accommodate change and help local officials in protecting the public;

2. The so-called “Build with Strength” campaign improperly cites job site fires at light frame construction projects as the reason to reject mass timber in favor of concrete. These fires, at the early phases of construction, at stick-built projects, occurred before installation of fire protective systems (passive systems and sprinklers). Moreover, mass timber is delivered “just-in-time” to job sites to reduce risk and is inherently more fire resistant than light-frame lumber. Indeed, the AHC-TWC proposals specifically create new requirements for fire and worker safety on construction sites.
TALL MASS TIMBER IMAGES

LifeCycle Tower One, Dornbirn, Austria (Credit: CREE Buildings)

Stadthaus, London, United Kingdom (Credit: Will Pryce)

Carbon12, Portland, Oregon (Credit: Carbon12)

Puukuokka, Kuokkala, Finland (Credit: Auerniitty)

Brock Commons under construction (Credit: Pollux Chung/Seagate Structures)

Interior of the Centre for Interactive Research on Sustainability, University of British Columbia, Vancouver, Canada (Credit: University of British Columbia)