

MASS TIMBER STANDS TALL

Rigorous testing drives 2021 tall wood building code changes

WHAT'S THIS ALL ABOUT?

In response to growing support for taller timber structures throughout the United States, the **International Code Council** approved 14 changes to the International Building Code (IBC) in early 2019, including the introduction of three new construction types and the ability to build up to 18 stories of mass timber. This performance-based evolution of the code is backed by a comprehensive consultation process, wood science and research, and rigorous real-life testing to ensure life safety and fire protection.



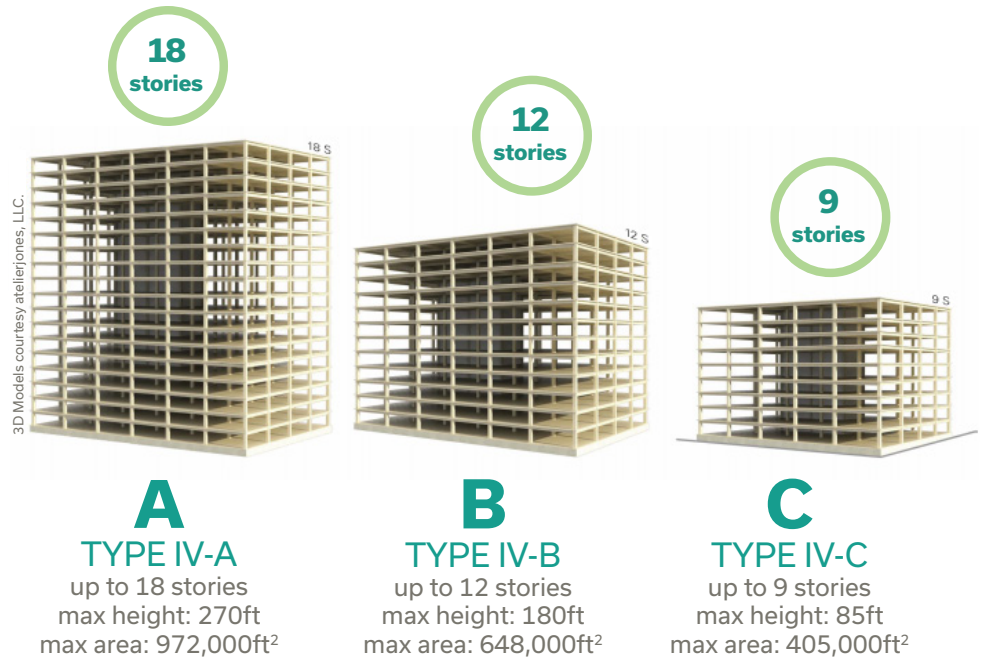
Countries around the world are vying for leadership in the tall wood sector. These code changes help modernize the IBC and position the U.S. to be even more innovative when it comes to mass timber construction.

BACKED BY EXPERTS

A diverse committee of experienced professionals, including construction and code specialists, fire officials, architects, structural engineers and fire protection experts took nothing for granted. The committee determined early on that real-life fire research of the proposed construction types would be instrumental. The group, with the support of organizations including the **US Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF)**, **USDA Forest Products Laboratory** and the **American Wood Council (AWC)**, set out to test and challenge all assumptions.

IBC TO INTRODUCE THREE NEW CONSTRUCTION TYPES

In the wake of evidence that tall wood structures built around the country and worldwide are safe and resilient, the **ICC Tall Wood Building Ad Hoc Committee** debated and settled on renaming the IBC's existing Type IV construction as Type IV-HT and adding three new subtypes: IV-A, IV-B and IV-C. Similar to the noncombustible construction types, I and II, the three "mass timber" construction types are arranged from the highest fire resistance and safety requirements (IV-A) to the lowest (IV-C).



NONCOMBUSTIBLE PROTECTION BY CONSTRUCTION TYPE

TYPE	INTERIOR SURFACE OF BUILDING ELEMENTS	EXTERIOR SIDE OF EXTERIOR WALLS	TOP OF FLOOR ABOVE MASS TIMBER	SHAFTS
A TYPE IV-A	Always required. 2/3 of FRR, 80 minute minimum	40 minutes	1" minimum	2/3 of FRR, 80 minutes minimum, inside and outside
B TYPE IV-B	Required with exceptions. 2/3 of FRR, 80 min. minimum	40 minutes	1" minimum	2/3 of FRR, 80 minutes minimum, inside and outside
C TYPE IV-C	Not required*	40 minutes	Not required*	40 minutes minimum, inside and outside
HT TYPE IV-HT	Not required*	15/32" FRT sheathing or 1/2" gypsum board or noncombustible material	Not required*	Not required*

*Not required by construction type. Other code requirements may apply. 5/8" Type X gypsum = 40 minutes.

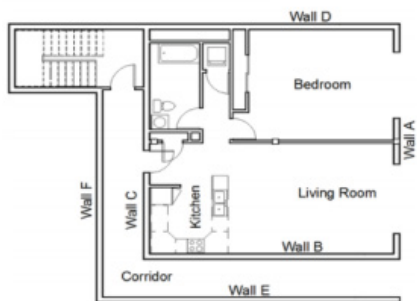
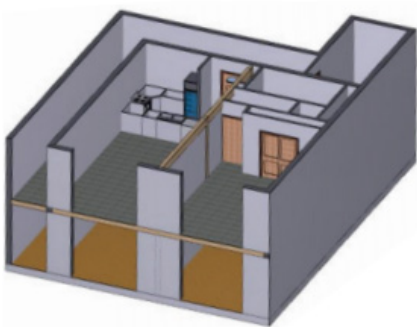
MASS TIMBER STANDS TALL

Rigorous testing drives 2021 tall wood building code changes

A TWO-STORY STRUCTURE FOR REAL-LIFE TESTING

To effectively conduct the tests, a two-story structure was built conforming to the three new construction types (and repaired between tests) and included the

- ✓ CLT Floor & Perimeter Walls
- ✓ CLT Corridor & Stairs Enclosure
- ✓ Glulam Beams & Columns
- ✓ Non-Rated Light-Gauge Steel Framing



FIVE TEST SCENARIOS DEMONSTRATE FIRE PERFORMANCE

A series of **five compartment fire tests** were conducted, all with an identical fuel package representative of a high residential fuel load. The results demonstrated that mass timber performs well under a variety of test conditions.

	TYPE	CONSTRUCTION	SPRINKLERS	FIRE CONTAINED	COMPART. BURN-OUT	PARTIAL/FULLY EXTINGUISH
TEST 1	A TYPE IV-A	Fully Protected	✗	✓	✓	✓*
TEST 2	B TYPE IV-B	Partial Exposed Ceiling	✗	✓	✓	✓*
TEST 3	B TYPE IV-B	Partial Exposed Walls	✗	✓	✓	✓*
TEST 4	C TYPE IV-C	All Exposed Walls & Ceiling	✓	✓	N/A Extinguished by Sprinklers	✓
TEST 5	C TYPE IV-C	All Exposed Walls & Ceiling	✓	✓	N/A Extinguished by Sprinklers	✓

* Important note: tests 1, 2 and 3 represent an extreme combination of fire sprinklers not functioning and no fire service intervention. In each case, the fire was contained within the unit of origin, there were no structural failures, and where CLT was exposed, it self-extinguished.

SIMPLIFYING THE SCIENCE

So what does this all mean? In the coming years, expect measures to be taken at state levels to harmonize regional building codes with the IBC, by adopting the tall wood code provisions.

Early adopters: As a result of this growing evidence, **Oregon and Washington State** now permit tall building construction up to 18 stories.



Next steps: More states are expected to follow suit, although the process will take some time. This research clears the way for three new types of construction permitting mass timber buildings up to 18 stories tall, with the new provisions to be included in the **2021 International Building Code (IBC)**.

Search the Science

Find this research & more at:
research.thinkwood.com

