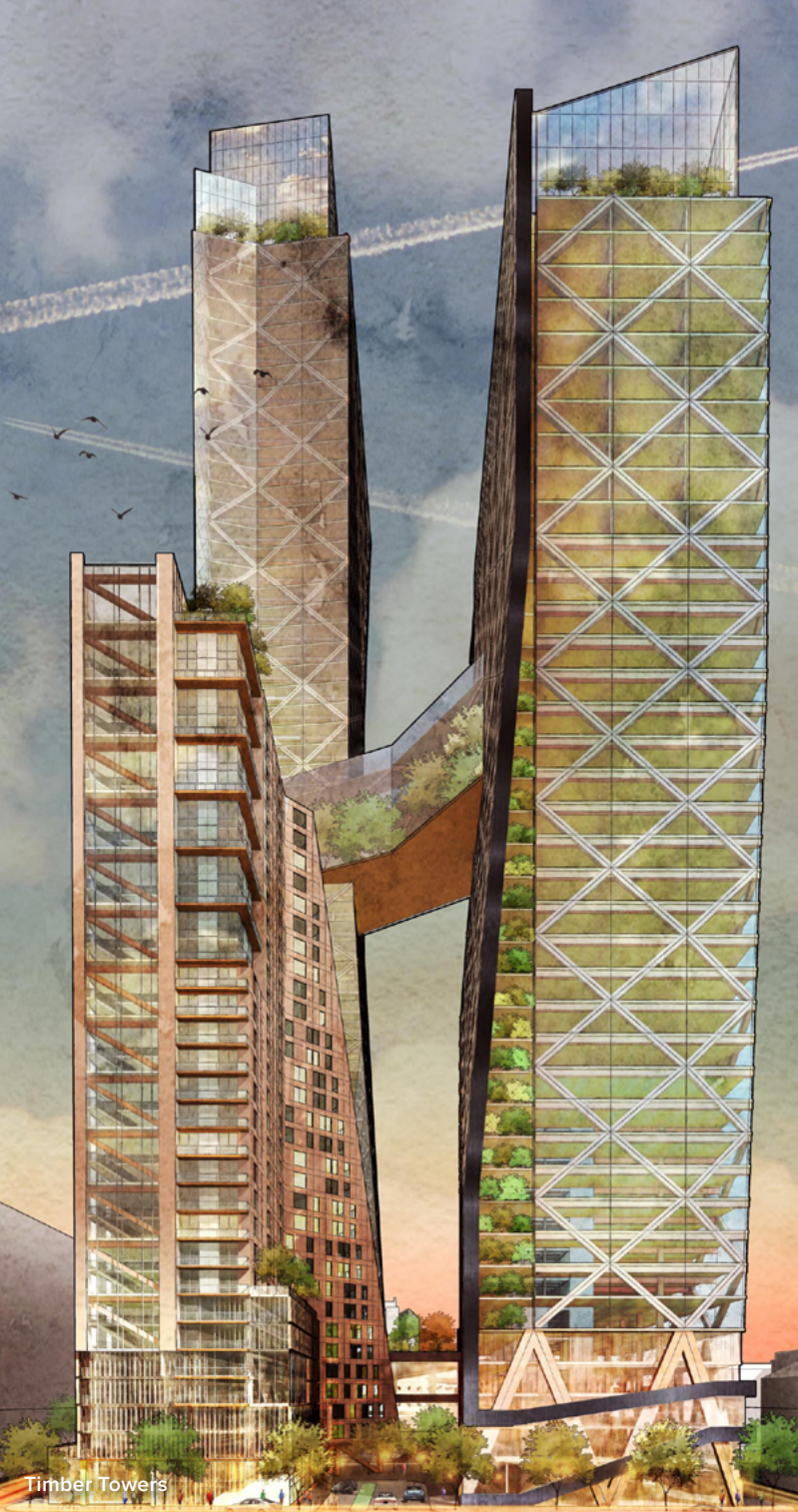


MASS TIMBER





WHAT IS MASS TIMBER?

Mass timber buildings utilize solid or engineered wood for the main structure, as opposed to simply serving as a design accent. It is not to be confused with “stick-built”, “light-frame” or even “heavy-timber” wood construction, as mass timber buildings typically take on loads that are comparable to steel and concrete. There are five common types of mass timber:

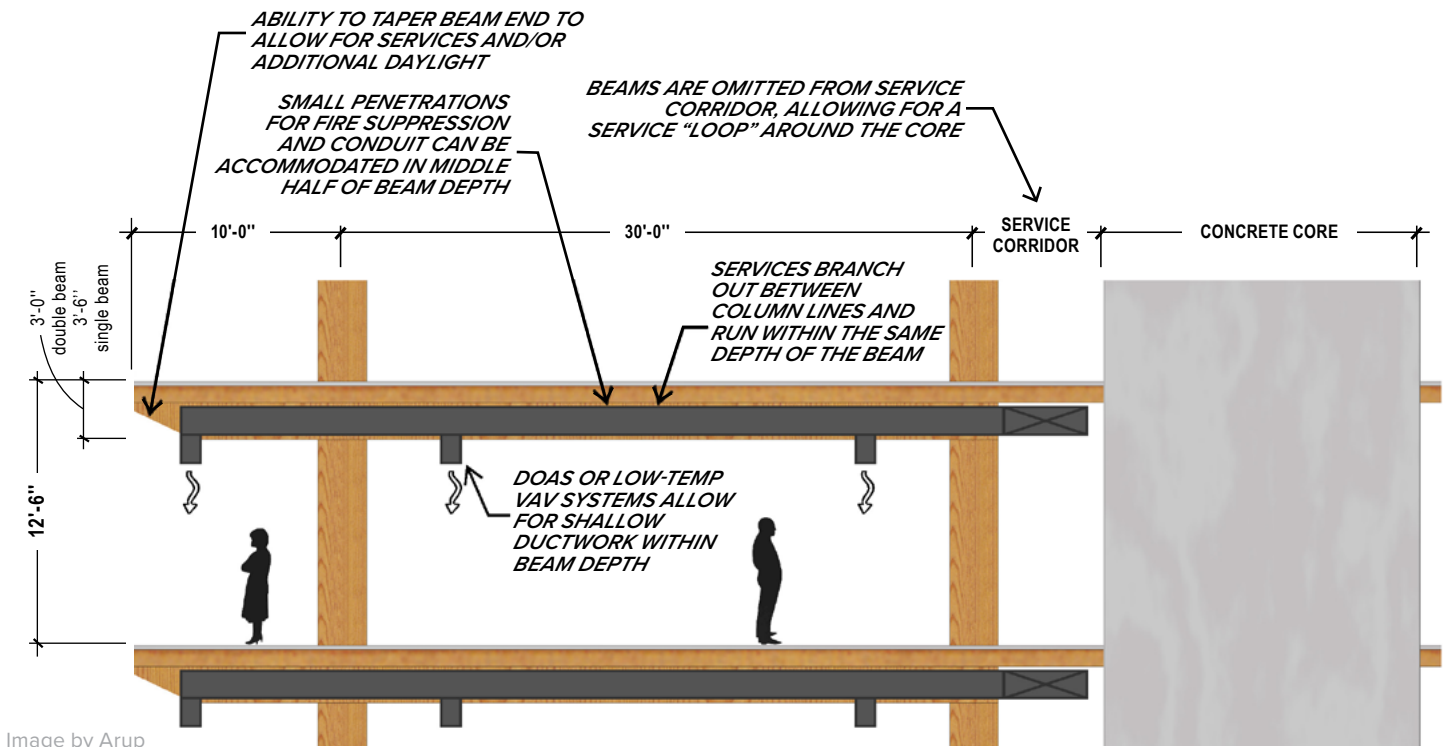
- **CLT:** panels of 3, 5, or 7 layers oriented at right angles to one another and glued together, can be used for slabs, walls, roofs, and elevator cores
- **NLT:** panels created by fastening individual layers of lumber, into one structural element with nails. NLT is more economical than CLT, but can only handle one-way loads
- **DLT:** similar to NLT, except the laminations are achieved with wood dowels instead of nails or glue
- **Glulam:** composed of individual laminations, pressed and glued together and is used for beams or columns
- **PSL:** parallel strand lumber is manufactured by gluing strands of wood together under pressure and is also used for beams or columns

WHY BUILD WITH MASS TIMBER?

- Wood structures are much lighter than concrete, as a result their foundations can be up to 30% smaller.
- It works well for areas in which excavation is either difficult or prohibitively expensive.
- Structures are better at handling lateral loads, such as wind, earthquakes or explosions.
- Typical projects can be built 20% faster than steel or concrete, and with a much smaller construction crew.
- Steel and concrete pricing is typically 50/50 materials and labor, mass timber is more like 80/20.
- Off-site, prefabricated construction is a much safer working environment, and its efficiency results in fewer on-site truck deliveries, less noise, and a building that can be assembled using a power drill.
- People respond positively to timber surfaces and there’s an aspect of biophilic resonance in the look and smell of timber products.

TYPICAL MEASUREMENTS

- Floor to floor heights: 12' 6" (comparable with steel)
- Optimal office column spacing: 20' x 24'
- Optimal office column size: 24" x 24"
- Premium Class A Office spacing: 30' x 30'
- Premium Class A Office column size: 36" x 36"
- Column sizing: 3.0" - 3.6"
- Mechanical systems: VAV or DOAS
- Floor assembly: 8-10" 5 or 7 ply CLT slab with acoustical membrane interlayer and 2" concrete topping slab



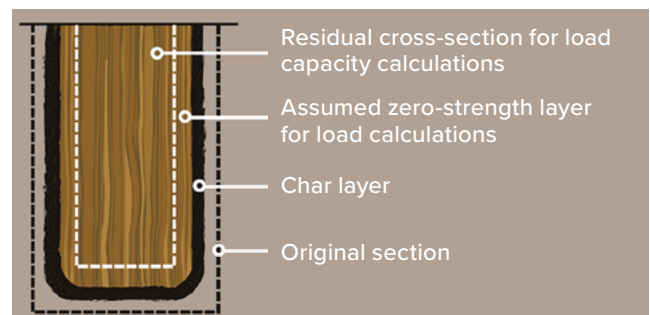
BUILDING CODE, CONSTRUCTION AND HEIGHT CONSIDERATIONS

- "Heavy Timber" is another term for Type IV construction. This category was originally created for large, solid-wood members that are rarely seen in modern-day construction. Though technically not exactly the same, this is the category used when describing mass timber projects to code authorities.
- The 2021 International Building Code (IBC) will soon allow mass timber buildings to be 18 stories.
- The current height limit for mass timber buildings submitting under Type IV is 85 feet.
- Most buildings have a concrete podium, with as many as 5 or 6 stories of mass timber structure above.

FIRE SAFETY

- Mass timber quickly forms a protective char layer in the event of a fire, and maintains its structural integrity much longer than unprotected steel in some fire tests.
- Because it is an engineered, layered product, mass timber burns predictably. Each 3/4" layer of wood provides an hour of fire rating.
 - » 1hr exposure = 1.8in/hr
 - » 2hrs exposure = 1.58in/hr¹

BEAM SECTION



¹ American Wood Council, 2015 National Design Spec for Wood Construction

Image by Forest Products Society

PREMIUM CLASS A OFFICE SCHEME

(40' X 20' BAY)

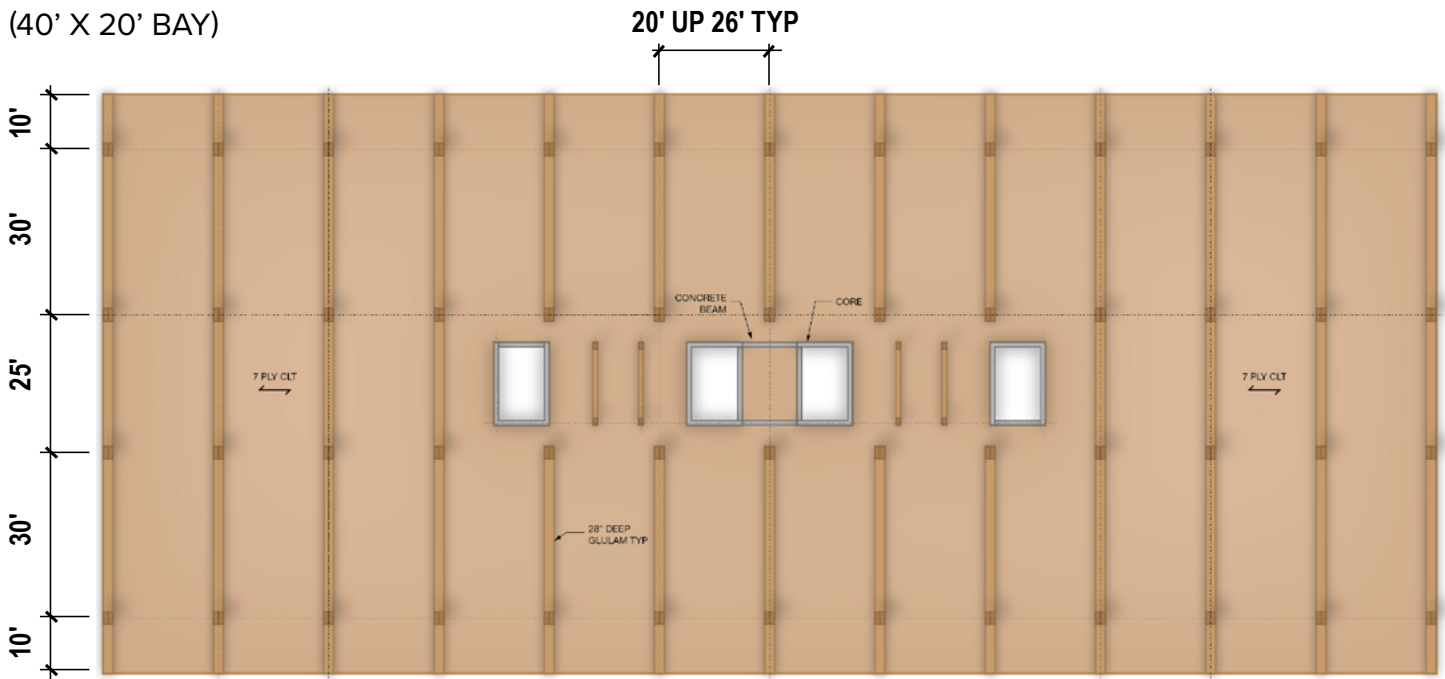
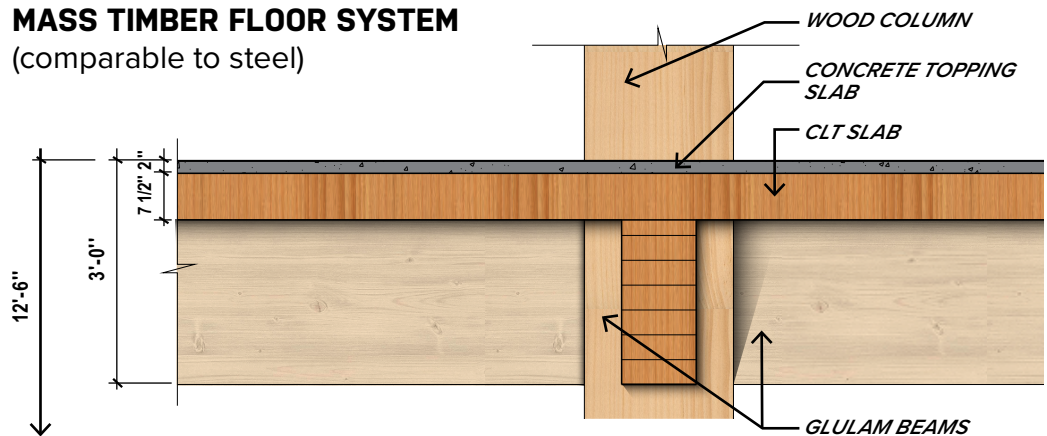


Image by Arup

TYPICAL FLOOR SLAB ASSEMBLY

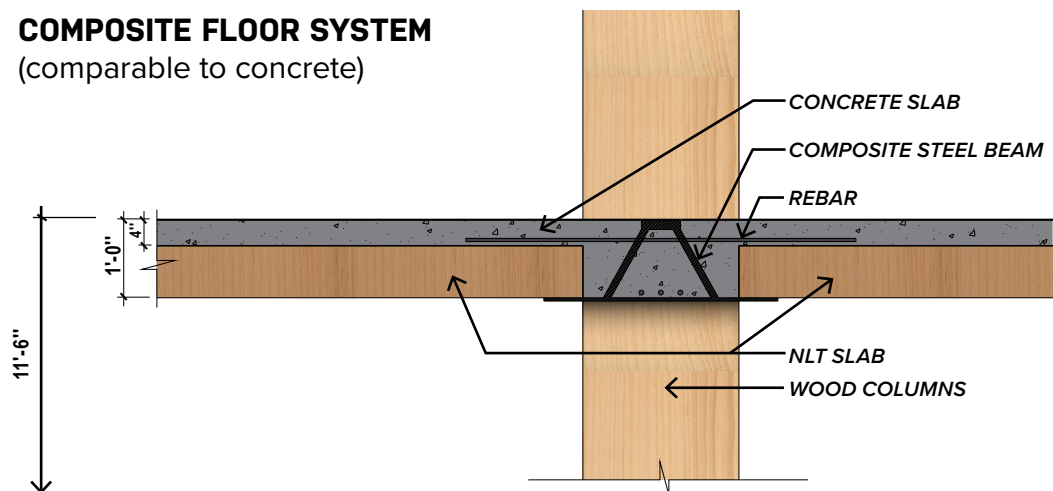
- 2-4" concrete topping slab
- Acoustic interlayer
- 8-10" mass timber structural slab
- glulam or steel structural bay

MASS TIMBER FLOOR SYSTEM (comparable to steel)



Images by Structure Fusion

COMPOSITE FLOOR SYSTEM (comparable to concrete)



MASS TIMBER SUPPLIERS & INSTALLERS

ALL PRODUCTS

SUPPLY & INSTALL

- Element5 (Toronto. Similar to Seagate with less experience)
- Seagate Structures (Vancouver. Installers will price and source from all N. American and European CLT & glulam suppliers)
- Structure Fusion (Montreal. Installers will price and source from all N. American and European CLT, NLT & glulam suppliers)

INSTALL ONLY

- BensonWood (New Haven)
- New Energy Works (New York)
- Swinerton (West Coast GC looking to expand)
- Spearhead (British Columbia)

CLT & GLULAM

SUPPLY ONLY

- Binderholz (Austria, not PRG-320 compliant)
- D.R. Johnson (Oregon)
- Hasslacher (Austria, Germany, not PRG-320 compliant)
- International Beam (Quebec, Ontario and Alabama)
- Martinsons (Sweden, not PRG-320 compliant)
- Moelven (Norway, UK, glulam only)
- Structurlam (British Columbia, Canada)
- Stora Enso (Finland, Sweden. Also produce LVL, not PRG-320 compliant)
- Züblin (Germany, UK, not PRG-320 compliant)

SUPPLY & INSTALL

- Kattera (Spokane, Phoenix)
- KLH (Austria, Portland-based sales team. Use 2 different installers supervised by KLH.)
- Nordic Structures (Quebec. Use their own installers and contract out as required, supervised by Nordic.)



CLT



GLULAM

CLT

SUPPLY ONLY

- SmartLam (Montana)

DLT

- Structurecraft (British Columbia. Structurecraft will only price DLT as the floor system for their projects.)



NLT

- A number of installers are available but most do it once due to the significant construction costs in weather protection.



MASS PLYWOOD PANELS

- Freres Timber (Oregon)



MASS TIMBER SOURCING

- Responsible forestry management in North America has resulted in more than 50 consecutive years of net forest growth exceeding annual forest removals¹.
- Wood is a truly renewable material and also removes carbon dioxide from the atmosphere. Steel and concrete, are finite resources and their extraction is emissions-heavy.
- Softwood is from coniferous trees, which typically remain evergreen throughout the year and are fast-growing and used for structural framing.
- Hardwood is from deciduous trees and is slow-growing, dense, and usually used for millwork and finishes.
- Softwoods such as Douglas fir and Spruce are common on the West Coast, Southern yellow pine is common on the East Coast.

1 Natural Resources Canada; USDA Forest Service



PRICING MASS TIMBER

Hickok Cole is working with Arup, DPR Construction, and Davis Construction to compare the direct cost premium of building a matter of right (MOR) mass timber office building vs baseline steel and concrete and has determined

the difference to be roughly \$10/SF. The owner of one project predicts a \$5/month rent premium so the one-time additional cost for structure will quickly pay for itself.

office vertical expansion Gsf = 106,996SF	STEEL STRUCTURE	WOOD STRUCTURE					HYBRID WOOD/STEEL STRUCTURE	
		Vendor A	Vendor B	Vendor C	Vendor D	Vendor E	Vendor B	Vendor D
cost per square foot	\$44.59/sf	\$48.14/sf	\$50.02/sf	\$55.50/sf	\$56.13/sf	\$83.49/sf	\$57.06/sf	\$62.72/sf
delta vs steel	-	\$3.55/sf	\$5.43/sf	\$10.91/sf	\$11.54/sf	\$38.90/sf	\$12.47/sf	\$18.13/sf

data from Davis Construction

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