

What is mass timber?

Overview of mass timber products and their applications, where to source mass timber for U.S. projects, and key resources for developers, building designers, and construction professionals



Photo Joe Aker

San Jacinto College Anderson-Ball Classroom Building in Pasadena, TX
Kirksey Architecture / Walter P Moore



Photo Andrew Nelson

1510 Webster in Oakland, CA
oWOW / DCI Engineers

Mass timber refers to a category of framing styles characterized by the use of large, engineered wood panels, often paired with engineered wood columns and beams. Panels are most frequently used in horizontal applications for floors and roofs, but can also be used vertically for walls.

It is common to use mass timber in combination with other building systems to achieve benefits greater than those offered by each system alone. Examples include mass timber floors and roof with light-frame wood walls, steel elements in long-span floor systems, and concrete foundations, podiums, cores, and floor toppings.

The term *heavy timber* is typically associated with large cross sections of solid sawn members (beams, purlins and columns), often using tongue-and-groove decking for floors and roofs. Heavy timber is not covered in this document.



What are the common mass timber products and systems?

Cross-Laminated Timber (CLT)

CLT consists of layers—typically three, five or seven plies—of solid sawn lumber or structural composite lumber (SCL), oriented at right angles to one another and glued to form structural panels. CLT can be used for floors, roofs, and walls.

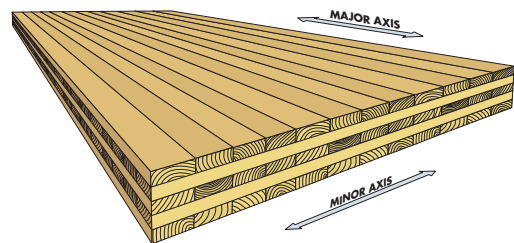
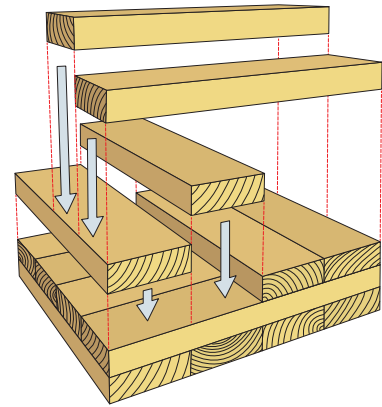
More About CLT

- Exceptional strength, stability, and stiffness
- Two-way spanning capability
- Prefabricated and precise; openings pre-cut in the factory
- Typical panel dimensions: 4 to 12 feet wide and 16 to 60 feet long (varies by manufacturer)
- Typical solid sawn layer thickness: 1-3/8 inches
- Solid sawn species: Commonly softwood, including spruce-pine-fir (SPF), Douglas fir, and southern yellow pine
- SCL CLT made from: Laminated veneer lumber (LVL), laminated strand lumber (LSL), and other SCL products
- Custom manufactured and fabricated for each project (in most cases); delivered and installed in a predetermined sequence

Code Path

Although popular in Europe for 20+ years, CLT was first recognized as a structural building component in the 2015 International Building Code (IBC) when manufactured according to the standard, ANSI/APA PRG 320: Standard for Performance-Rated Cross-Laminated Timber.

The 2021 and 2024 IBC allow CLT meeting minimum size requirements in buildings up to 18 stories in Type IV-A construction, up to 12 stories in Type IV-B, and up to nine stories in Type IV-C. However, CLT can be used in any construction type that allows structural wood.



Photos: Marcus Kauffman

5-ply CLT (left) and SCL CLT

Why choose mass timber?

Faster construction/shorter schedules; prefabricated and precise

Exposed wood

- Aesthetic value; potential for faster leasing and lease premiums; portfolio distinction
- Biophilic benefits; healthy indoor environment

Lightweight structure, especially beneficial on sites with poor soils, for vertical additions above existing buildings, and for multi-story projects in high seismic regions

Labor shortage solutions

- Small crews for timber installation
- Utilize more entry-level laborers when MEPF systems are fully designed, coordinated and pre-planned

Sustainability

- Low carbon impact
- Natural and renewable
- Supports healthy forests and rural economies

Learn more:

[Mass Timber Cost and Design Optimization Checklists](#),¹ [Why Wood: Sustainability](#)²



Photo Jane Messinger

CLT ceiling with glulam beams and columns at 11 E Lenox in Boston, MA
Monte French Design Studio / H&O Structural Engineering



Photo David Papazian

CLT walls and ceiling at Mississippi Workshop in Portland, OR
Waechter Architecture / KPFF

Glue-Laminated Timber (Glulam or GLT)

Structural glue-laminated timber is referred to as glulam when used for framing (e.g., columns and beams), and GLT when used in plank applications (e.g., decking). It is created by combining solid sawn lumber members (typically 2x), layered parallel on their wide faces, with adhesive between layers.

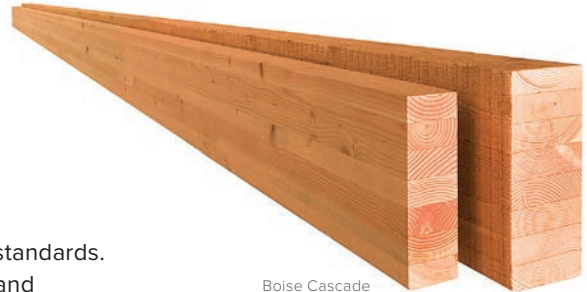
More About Glulam and GLT

- Can be fabricated in almost any shape, though straight elements are most common; jigs may be used to form curves, bends and different radii
- Typical glulam beam and column sizes: 6 to 72 inches deep and up to 100 feet long
- Typical GLT panel sizes: 2 to 4 feet wide and up to 60 feet long
- Beams and columns more common than planks
- Plank design requires consideration of design stresses, layups, lumber species, and grade

Code Path

Glulam and GLT have the same code references and manufacturing standards. They are permitted under IBC Section 2303.1.3 when manufactured and identified as required in the ANSI 190.1 Product Standard for Structural Glued Laminated Timber and ASTM D3737 Standard Practice for Establishing Allowable Properties for Structural Glued Laminated Timber (Glulam).

For more information, APA – The Engineered Wood Association offers a variety of glulam-specific materials in its resource library.



Boise Cascade



StructureCraft



Photo Travis Mark

Photo Opsis Architecture



Glulam columns and beams and GLT ceilings at Timber House in Brooklyn, NY
Mesh Architectures / Silman Structural Solutions

Curved glulam at the Idaho Central Credit Union Arena in Moscow, ID
Opsis Architecture / KPFF / StructureCraft

Dowel-Laminated Timber (DLT)

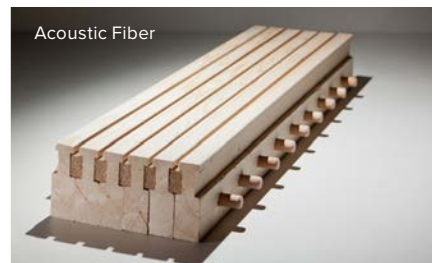
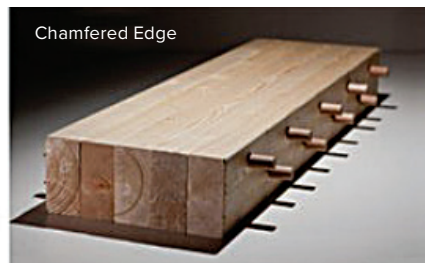
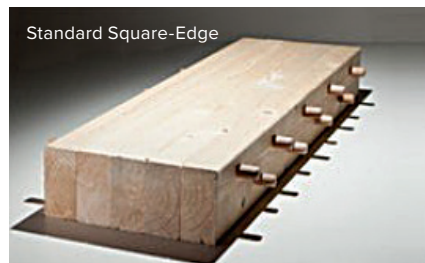
DLT panels are made from solid sawn lumber (2x4, 2x6, etc.) oriented on edge and friction-fit with hardwood dowels. The dowels hold the boards side-by-side, while the friction fit adds dimensional stability. DLT is commonly used for floors and roofs.

More About DLT

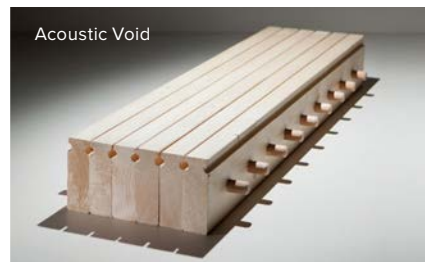
- All-wood composition makes it easy to use with computer-numerical controlled (CNC) machinery such as lathes, routers, and mills; can be modified in the field with hand tools
- Typical panel size: 2 to 12 feet wide and up to 40 feet long
- Different visual profiles used to achieve acoustic or other objectives
- Finger-jointed laminations most common

Code Path

DLT is often used with accompanying third-party evaluation reports that address code compliance.



Photos DowellLam Inc.



DLT and NLT profile options (DLT shown)



Photo Andrew Keithly

DLT ceiling at 1030 Music Row in Nashville, TN
Anecdote Architectural Experiences / StructureCraft

Nail-Laminated Timber (NLT)

NLT has been used for more than a century but is undergoing a resurgence as part of the modern mass timber movement. It is created from solid sawn dimensional lumber (2x4, 2x6, etc.), oriented on edge and fastened with nails or screws to create larger structural panels. It is commonly used for floors and roofs, and less often for walls, including elevator and stair shafts.

More About NLT

- Historically used for warehouses and other large buildings
- Typical panel size: 2 to 4 feet wide and 16 to 40 feet long
- Typically fabricated offsite; onsite fabrication possible for experienced contractors but not common
- Different visual profiles (such as alternating lumber sizes) used to achieve acoustic or other objectives

Code Path

NLT is recognized prescriptively as mechanically-laminated decking in Chapter 23 of the IBC.



StructureCraft



Photo Corey Gaffner courtesy Perkins & Will

NLT ceiling with glulam beams and columns at T3 Minneapolis in Minneapolis, MN
MGA – Michael Green Architecture / DLR Group / Magnusson Klemencic Associates / StructureCraft



Photo Dave Burk ©SOM

NLT ceiling with glulam beams and columns at Wellesley College Science Complex in Wellesley, MA
Skidmore Owings & Merrill / Le Messurier

Timber-Concrete Composite (TCC) Floor Systems

TCC floor systems can be used for longer spans and carry greater loads than non-composite alternatives, and are often seen in multi-story mass timber buildings. They consist of two distinct layers, a timber layer and concrete layer, joined by shear connectors.

More About TCC floor systems

- Timber layer can be CLT, GLT, SCL, another engineered wood product, or solid sawn lumber
- Concrete layer is typically a reinforced concrete slab
- Shear connectors can be common fasteners (e.g., nails or screws), notches cut in the wood, connectors such as embedded plates or glue that transfer the load to a larger surface, or a combination
- May include other materials (e.g., acoustic mat or insulation)

It is also possible for mass timber projects to utilize a non-composite timber-concrete floor system, where the mass timber elements carry the loads and a non-structural lightweight topping is applied to meet fire, acoustic and/or vibration objectives.

Code Path

While the IBC doesn't include requirements for TCC systems, the American Wood Council's National Design Specification® (NDS®) for Wood Construction states that composite construction such as wood-concrete "shall be designed in accordance with principles of engineering mechanics." TCC installation is discussed in IBC Section 5.8.5.

Learn more about the featured projects and their teams on the WoodWorks Innovation Network (WIN)



Photo Alex Schreyer

Floor ready for a concrete topping at the John W Olver Design Building in Amherst, MA; assembly includes 5-ply CLT, rigid insulation for acoustic performance, and reinforced concrete
Leers Weinzapfel Associates / Equilibrium Consulting / Simpson Gumpertz & Heger (EOR)



Photo Hacker

At District Office in Portland, OR, composite action of a reinforced concrete topping over CLT panels allowed the team to eliminate perimeter beams while improving vibration
Hacker / KPFF

Structural Composite Lumber (SCL)

SCL is a family of engineered wood products created by layering dried and graded wood veneers or strands with moisture-resistant adhesive into blocks of material known as billets, which are subsequently re-sawn to specified sizes. In SCL billets, the grain of each layer of veneer or strands runs primarily in the same direction. SCL is sawn to consistent sizes and exhibits highly predictable physical and mechanical properties.

More About SCL

SCL products used in column and beam applications include:

- *Laminated veneer lumber (LVL)* is made by bonding thin wood veneers so the grain of all veneers is parallel to the long direction
- *Parallel strand lumber (PSL)* is manufactured from veneers clipped into long strands and oriented primarily along the strong axis
- *Laminated strand lumber (LSL)* is made from flaked wood strands
- *Oriented strand lumber (OSL)* is made from flaked wood strands with a smaller length-to-thickness ratio than LSL



PSL, LVL and LSL
Weyerhaeuser

Code Path

SCL products are permitted under IBC Section 2303 when manufactured according to ASTM D5456: Standard Specification for Evaluation of Structural Composite Lumber Products.

Where can I purchase mass timber for U.S. projects?

Browse WoodWorks' [manufacturer and supplier directory](#)³ to learn which products are produced by which companies, ask performance and supply questions, and scout material for your next project.

Company profiles and contact information can be found on the [WoodWorks Innovation Network \(WIN\)](#),⁴ a program of WoodWorks that showcases mass timber and innovative light-frame wood projects and their design/construction teams.

Where can I find mass timber design and construction resources?

WoodWorks offers a robust library of mass timber resources for developers, architects, structural engineers, and general contractors. Visit [woodworks.org](#) and search by key word (e.g., tall wood, biogenic carbon, LCA, cost, fire protection, seismic, code, etc.) or resource type (e.g., guides/manuals, technical papers, case studies).

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End Notes

¹ [www.woodworks.org/why-wood/sustainability](#)

² [www.woodworks.org/resources/mass-timber-cost-and-design-optimization-checklists](#)

³ [www.woodworks.org/about/partners](#)

⁴ [www.woodworksinnovationnetwork.org](#)

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