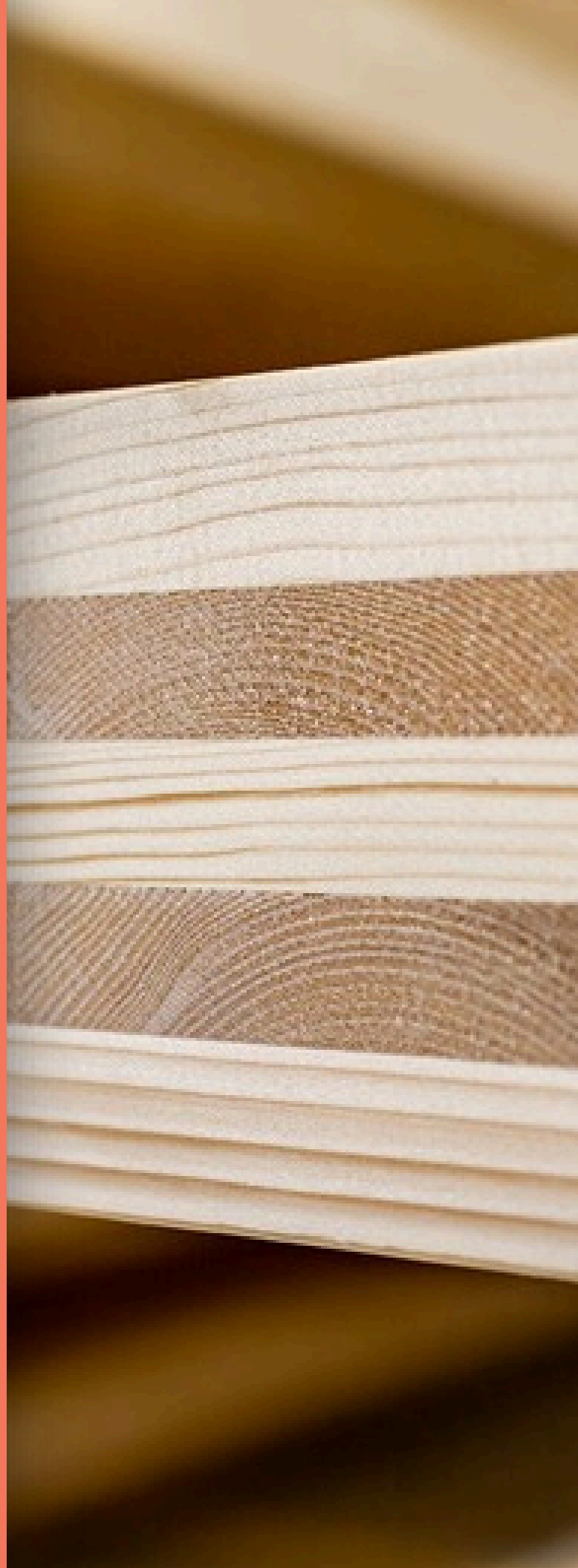


# Mass Timber

TRIDOME STRUCTURES  
*INVITES YOU*  
to discover the world of  
engineered wood!



**TRIDOME**  
STRUCTURES





# TRIDOME STRUCTURES

*Our purpose is to create vibrant environments that nurture people, communities, and the planet.*

## What is Mass Timber?

Mass timber describes a range of large-scale manufactured wooden construction components resulting from a calculated combination of design, engineering, manufacturing, and raw materials.

Mass timber is manufactured in controlled environments from several layers of wood bonded together to form larger pieces that are later assembled on-site to create vibrant environments.

Tridome Structures manufactures several types, including Dowel-Laminated Timber (DLT), Nail-Laminated Timber (NLT), and Glued Laminated Timber (Glulam).

## What's so Special?

Mass Timber has exceptional properties that make it suitable for a wide range of applications. The ability to manipulate its shape while maintaining strength permits the creation of exquisite biophilic designs and aesthetically refined structures. Its sophistication and composition enable the assembly of massive components at an unprecedented rate and scale.

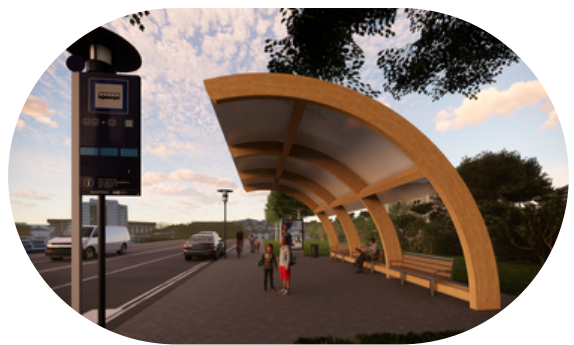
Because of its strength-to-weight ratio and adaptability, it is an excellent replacement for structural systems such as steel, concrete, and traditional building framing. Mass timber provides a premium structure while creating a vibrant, inviting atmosphere that gives back to nature.

## Evolution

The industry has witnessed tremendous growth and evolution, with automated facilities and advanced machinery significantly enhancing production efficiency. Secondary processing tasks, such as drilling holes, surfacing, and even machining, are now often performed by robotics, underlining the high-tech nature of the mass timber production process. Creating more unique opportunities and increasing access and availability.

# Architecturally inspired, sustainably built and designed for the future.

Solutions for any industry



# Glulam

## Glue Laminated Timber

Structural framing member that are most commonly utilized as beams and posts. Dimensional lumber that has been glued together in parallel layers to create an engineered element that is thicker, longer and possesses exceptional strength.

### Highlights

- Used for beams, posts, facades, columns, trusses, bridges, clear span buildings and more
- Manufacturing techniques allow for glulams to be produced straight, chambered, bent, arched, twisted and any combination thereof
- 1/5 the weight of steel
- Unparalleled strength to weight
- Custom and standard dimensions available
- Ideal for long spans
- Can be used in hybrid application with steel and concrete
- Prefabricated and machined for rapid assembly
- Non-conductive
- Dimensionally stable
- Cost effective when all factors are considered



# Freeform Glulam

## Freeform

Freeform glulam is a specialized form of glued-laminated timber that allows for highly customizable and complex shapes, offering architects and engineers remarkable freedom in design. Unlike standard glulam, which is typically manufactured in straight or gently curved sections, freeform glulam can be fabricated into intricate, three-dimensional curves, waves, and even spirals and twists.

## Highlights

- Creating freeform glulam requires sophisticated design tools and precision engineering. CAD directed CNC machining is used to plan and fabricate the unique shapes with high accuracy.
- Our manufacturing process allow for glulam's to be produced bent, arched, twisted and any combination thereof with grain maintained parallel to the centerline
- Despite its intricate shapes, freeform glulam maintains a high strength, making it suitable for load-bearing applications.
- Finished and machined using 7-axis industrial robots, allowing for precise, intricate shapes and high-quality results.



# CLT



## Cross Laminated Timber

Structural wood panel most commonly used as integrated floor and ceiling systems and walls. Formed by layering dimensional lumber in perpendicular sheets to form panels up to 10' wide, 60' long, and 2' thick.

### Highlights

- Used for floors, roofs, walls, facades, multi story buildings, bridges and more
- Manufacturing techniques allow panels to be produced with all cutouts and modifications done in factory
- 1/8 the weight of reinforced concrete
- Unparalleled strength to weight
- Custom and standard dimensions available
- Can be designed to span between columns without beams
- Can be used in hybrid application with steel and concrete
- Prefabricated and machined for rapid assembly
- Cost effective when all factors are considered and at scale
- Non-conductive
- Dimensionally stable



# NLT

## Sustainable Strength for Modern Construction

Nail-Laminated Timber (NLT) has a long legacy in mass timber building, combining proven strength with modern adaptability. NLT offers distinct advantages that make it a reliable and versatile choice for today's architectural and structural applications:

### Highlights

#### Environmentally Conscious

- NLT is created without adhesives, relying on mechanical fastening for panel assembly. This results in a durable, recyclable product that supports sustainable building practices.

#### Efficient and Adaptable

- Prefabricated NLT panels can be produced in a variety of sizes and profiles, simplifying installation and minimizing on-site construction time.

#### Acoustic and Aesthetic Options

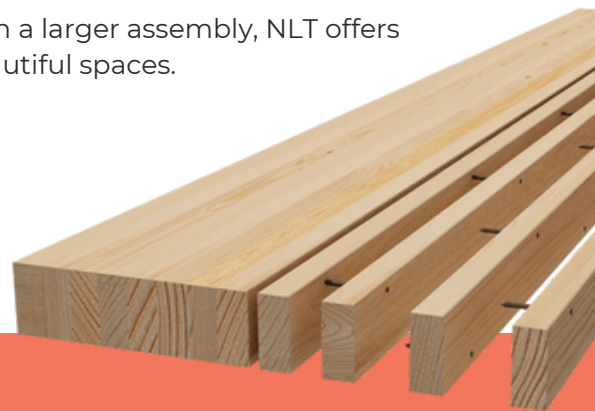
- Panels can be detailed with patterns, grooves, or finishes that enhance both sound performance and visual character, allowing NLT to serve structural and design needs simultaneously.

#### Proven Structural Integrity

- With its layered nail-fastened construction, NLT provides dependable strength for floors, roofs, and walls across a wide range of project types.

#### Design Flexibility

- Whether expressed as a finished surface or concealed within a larger assembly, NLT offers architects and engineers freedom to create efficient yet beautiful spaces.



# DLT

## Sustainable Strength for Modern Construction

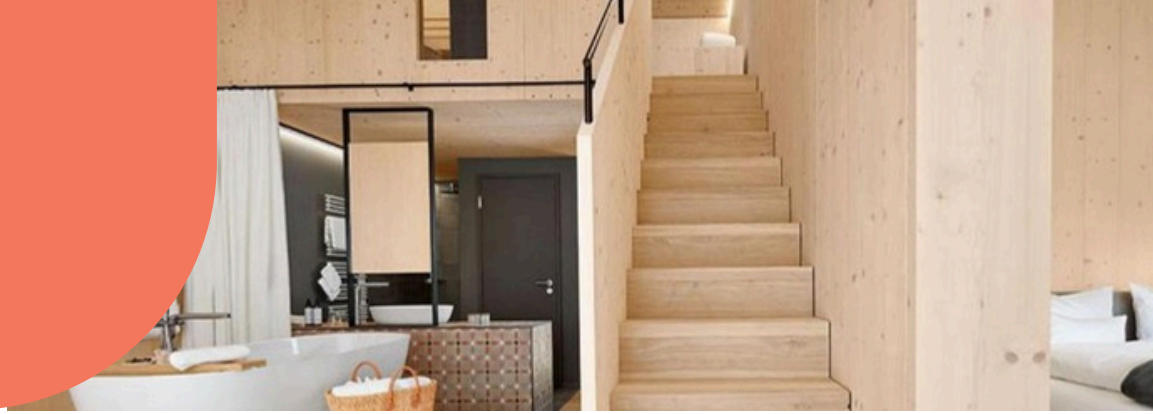
Dowel-Laminated Timber (DLT) is leading the way in mass timber construction, offering several distinct advantages that make it the ideal choice for modern architectural and structural applications:

### Highlights

- Environmentally friendly, DLT uses no adhesives or nails, creating an entirely natural product that enhances sustainability and recyclability.
- DLT panels are prefabricated and easily processed with CNC machinery, ensuring quick installation and reducing on-site labor costs.
- Superior Acoustic Performance
- Customizable acoustic profiles can be integrated directly into the panel, enhancing sound insulation in various applications.
- DLT is ideal for creating complex and innovative designs, offering flexibility in shapes, sizes, and surface finishes.
- Built with a friction-fit doweling system, DLT offers high structural integrity, making it suitable for a wide range of applications, from floors to roofs.



# Solid Wood Panel

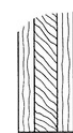


## Cross Laminated Panel

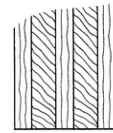
Structurally stable wood panels most commonly used as finishes on floors, ceiling, and walls. Formed by layering dimensional lumber in perpendicular sheets to form panels up to 80<sup>5/8</sup>" wide, 16'-4" long, and thicknesses from 1/2" to 2<sup>3/8</sup>".

### Highlights

- Used for floors, roofs, walls, facades, partitions, furniture, and more
- Fabrication allow panels to be produced with all cutouts and modifications done in factory
- Solid Wood Grain Pattern (Not Veneer)
- Fast and Easy Installation
- Custom and standard dimensions available
- Can be free standing
- Prefabricated and machined for rapid assembly
- Dimensionally stable



3-layer panel



5-layer panel



# Technical Information



## Glulam by Tridome Structures

Utilizes **Spruce-Pine-Fir-South MSR** lumber from Maine and **Spruce-Pine MSR** lumber from Eastern Canada Final design values are **pending ANSI A190.1 certification**.

Targeted layups include **20F and 24F glulam beams and columns** in balanced, unbalanced, and uniform configurations

Offers structural efficiency for various applications:

- Straight beams
  - Cantilevers
  - Multi-story columns
  - Curved members, arched structures
  - Complex curved forms  
(up to 100' in special applications)
- Lengths up to 65'
  - Widths - any multiple of 2.5"
  - Depth - as needed for design

## LignoLoc Nail-Laminated Timber (WNLTL)

- Made from **Spruce-Pine-Fir #2** and **Eastern Hemlock Tamarack #2** grade lumber sourced from New England
- Available in **2x4 to 2x12 thicknesses** for versatile use
- Suitable for applications such as:
  - Floor and roof panels
  - Partitions
  - Shaft walls
- Meets various loading, deflection, and vibration criteria, with fire resistance ratings of **up to 2 hours**
- A sustainable, code-compliant option for **modern residential and commercial structures**
- Panel width from 2' to 10' and lengths up to 60'

# How it's made



## Primary Production

The production of mass timber revolves around transforming raw lumber into structural components suitable for large-scale construction. This process, although uniform in its goal, varies slightly based on the specific type of mass timber product being crafted: CLT, DLT, NLT, or Glulam.

- Selection of Raw Material: The journey of mass timber starts with the careful selection of wood from sustainable sources. The choice of wood, driven by the desired strength and quality, forms the backbone of the final product.

## Glulam

- Both manual and automated methods start with selecting and preparing the lumber, as described in the previous steps.
- Glulam is typically made of several layers of timber glued together under pressure.
- One unique aspect of Glulam production is the possibility to create curved components. The adhesive-coated timber pieces are arranged on curved jigs or molds before being clamped or pressed. This allows the finished product to retain a curved shape, providing a wider range of design possibilities.
- Once the adhesive has cured, the result is a strong structural component that can bear significant loads.

## CLT

- CLT production is an automated process which takes place along a production line.
- The process begins with individual wooden planks, known as lamellas. These lamellas are coated with adhesive and arranged in layers, with each layer positioned at a right angle to the one beneath it. This alternating pattern of layers enhances the structural stability of the final product.
- The layered structure is then placed under a hydraulic or vacuum press, solidifying the arrangement into a large panel of cross-laminated timber.
- After the adhesive has fully cured, the solidified CLT panel is cut into the desired dimensions, preparing it for secondary processing stages.

# How it's made



## NLT

- Unlike CLT, NLT uses nails to fasten layers of timber arranged on edge in the same direction, creating a solid and unified panel.
- Boards are stacked side by side and mechanically fastened with nails, providing reliable strength and structural performance.
- Because no adhesives are used, NLT remains a natural, sustainable option while maintaining efficient production and installation.
- Once assembled, NLT panels are ready for secondary processing, including cutting, shaping, or finishing for a variety of applications.

## DLT

- Unlike CLT, DLT uses wooden dowels to join layers of timber arranged on edge in the same direction, resulting in a strong, unified panel.
- Precise holes are drilled in the lumber for the wooden dowels, which are then inserted, joining the layers together.
- Since there's no adhesive involved, DLT production doesn't require a curing time, thus speeding up the production process.
- Once the dowels are inserted and the panels assembled, the DLT is ready for secondary processing.

## WNLT

- Similar to DLT, WNLT uses wood to join layers of timber arranged on edge in the same direction, resulting in a strong, unified panel. However, we use hardwood nails in each layer instead of dowels
- Hardwood nails are driven into each layer via pneumatic nailer, joining the layers together.
- Since there's no adhesive involved, WNLT production doesn't require a curing time, thus speeding up the production process.
- Once all layers are nailed together and the panels assembled, the WNLT is ready for secondary processing.

# How it's made



## Secondary Processing

Following primary production, mass timber elements undergo secondary processing to refine and finalize the products before they are ready for construction use.

Secondary processing often includes procedures like precision cutting, drilling, finishing, and in some cases, the application of protective or decorative coatings.

Secondary processing can be performed both manually or with the aid of automated systems, including CNC machines and robotic arm technologies.

It's important to note that primary and secondary processing may not always be performed by the same company.

### Automated

- Automated CNC machining and robotic technology handle intricate tasks in mass timber production. These include:
  - Cutting: Both CNC machines and robotic arms are capable of making precise cuts to mass timber components, ensuring each piece fits perfectly in the final assembly.
  - Drilling: These technologies drill holes into the timber for the installation of hardware or for architectural details.
  - Shaping and surfacing: CNC machines and robots carve and shape the wood to meet specific design requirements, including smoothing out the surfaces and creating beveled edges or other shapes.
  - Machining: More complex machining tasks such as slotting, milling, and routing are performed to ensure the timber components are ready for assembly.
- These tools are programmed for precise replication of designs, which is crucial when creating custom components that must fit seamlessly together.
- Robotic arms, with their ability to move in multiple directions, can execute diverse tasks efficiently, enhancing productivity.
- Both CNC machines and robotic arms maintain consistent quality, reducing waste and ensuring each piece of mass timber meets the necessary specifications.
- Automated CNC machining and robotic technology transform primary mass timber products into finalized, construction-ready components.

### Manual

- Manual secondary processing in mass timber production involves various hands-on tasks:
  - Cutting and Drilling: Skilled workers use traditional tools to cut and drill mass timber components, adhering to specifications.
  - Shaping and Surfacing: Craftsmen shape the mass timber pieces to meet the design requirements, smoothing out surfaces and crafting beveled edges or other forms as needed.
  - Machining: More complex tasks like slotting, milling, and routing are performed by experienced workers, preparing the timber for assembly.
- Manual labor allows for a high degree of customization

# Tridome Structures invites you to bring nature back to any setting.

## Mass timber excels at



Assembly



Corrosion Resistance



Cost



Chemical Resistance



Weather Resistance



Fire Resistance



Durability



Seismic Safety



Strength



Recyclability



Fatigue Resistance



Carbon Footprint



Span and Height



Sustainability



Longevity



Acoustics

# Value

## The Nuts and Bolts



### Assembly

Deliberate by design and efficient by nature, mass timber construction follows the DfMA—Designed for Manufacturing and Assembly—model.

Thanks to prefabrication and the material's inherent lightweight properties, on-site assembly is quick and streamlined, requiring less equipment and labour than conventional methods.

Moreover, mass timber aligns perfectly with modular construction techniques, opening doors to accelerated assembly within controlled environments.



### Cost

Per-element, glulams and CLT panels are moderately more expensive than other materials. Upon the inclusion of other factors like unparalleled assembly speed, reduced equipment and labour, and the opportunities for modularization and prefabrication, mass timber quickly becomes a more economical solution

## Test of Time



### Weather Resistance

Wood is hygroscopic breathing in and out moisture forever. Exposure to the element will cause premature aging and can create opportunities for rot and decay. This is easily prevented through careful design, chemical preservatives, and proper ongoing maintenance and reduced exposure to the elements.



### Durability

The utilization of multiple layers of wood to create mass timber elements give it the ability to capitalize on the unique qualities of wood while reducing the drawbacks found in individual pieces increasing the durability

# Resiliency

## Enduring Strength



### Strength

Trees are extraordinarily strong, capable of supporting themselves at incredible heights and withstanding nature's fury.

The microscopic structure of wood, which enables trees to absorb water, transport nutrients from their roots to the top of the tree, and exhibit remarkable flexibility, is also its source of strength.

This microscopic structure is replicated on a massive scale to create pieces that are orders of magnitude larger and stronger..



### Fatigue Resistance:

Mass timber's remarkable fatigue resistance originates from the inherent structure of wood and its engineered construction.

The natural fibrous, cellular structure of wood efficiently absorbs and disperses stress, while the layered design of mass timber enhances this effect.

As glulam and CLT consist of multiple wood layers bonded together, they distribute loads evenly, mitigating individual layer weaknesses.

The aligned grains in glulam further augment strength and fatigue resistance, while high-quality adhesive bonding in controlled conditions ensures enduring resilience against repetitive loads and stresses



# Resiliency

## Enduring Strength



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### Fatigue Resistance:

Wood is not negatively affected by fatigue and repetitive loading



### Span and Height

Currently the largest free span mass timber structure is a 532 wide bulk storage dome in New Brunswick, Canada

At 25 stories high—284 feet—the Ascent MKE Building, located in Milwaukee, Wisconsin, is officially the tallest mass timber building in the world, moving ahead of Norway's Mjösa 18-story tower



### Longevity

The Horyu-ji temple, the oldest timber structure in the world, withstanding countless earthquakes and fires since 607 AD



# Cellular Level

## Hostile compounds



### Chemical Resistance:

Wood is naturally resistant to many chemicals that would cause harm to other building materials. The use of wood in chemical processing and for the storage of corrosive chemicals is well established, and wood is regarded as possessing a high degree of resistance to degradation by numerous chemical



### Corrosion Resistance:

Rust is a common concern with steel structures; timber does NOT rust nor is it harmed by salts or other corrosive agents

## Microscopic attack



### Bacteria:

In all environments, wood is attacked by microbiological organisms. While some bacteria will slightly weaken wood's structure wood has been proven to be naturally antibacterial.



### Fungi:

The most common form of deterioration for timber is fungal decay. Serious damage can only be caused by fungi if the moisture content of the wood is above the fiber-saturation level, which occurs if water adds approximately 30% to the wood's weight. This fiber-saturation level can not occur solely from a humid environment >90%: wood must come into contact with water.

# Preservation

## Hostile Exposure



### Fire Resistance:

#### Char layer

- Under high heat and fire, mass timber uniquely forms a char layer. This acts as an effective insulator, protecting the internal wood from further combustion and ultimately leading to self-extinguishment.

#### Strength Preservation

- During a fire, the majority of a mass timber's strength, located beneath the surface layer, remains unaffected. The char layer acts as a protective shield, maintaining the structural integrity and resistance of the building.

On June 22, 2022 a full-scale fire safety test was conducted on a mass timber construction at the Canadian Explosives Research Lab in Ottawa. Simulating an open-plan office environment with typical furnishings, the structure remarkably withstood the fire, extinguishing quickly after the first hour. This test, offering crucial data on mass timber's response to severe fire scenarios, underscores its robust performance, comparable to non-combustible construction. Witnessed by over 150 Canadian experts, this pivotal event bolsters the development of fire safety guidelines and building codes for mass timber constructions, reinforcing its standing as a secure, resilient, and sustainable material for future construction.



# Stability

## Hostile Environments



### Seismic Safety

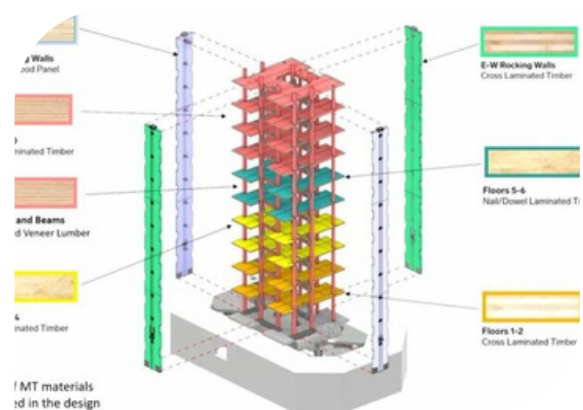
#### High Ductility

- Ductility refers to the amount of deformation a material can withstand before fracturing (in other words, it's the capacity to bend before breaking). Wood's high ductility is made possible by its unique cellular composition, which gives it exceptional strength parallel to the grain.

#### Low Weights

- The reduced mass of a timber building results in less inertial force created by seismic waves, leading to improved seismic performance.

On May 9, 2023 at the University of California San Diego's high-performance outdoor shake table, a ten-story mass timber frame underwent seismic simulations replicating the force of the 6.7 magnitude Northridge earthquake of 1994 and the 7.7 magnitude Chichi earthquake that occurred in Taiwan in 1999. Demonstrating significant resilience, the structure sustained virtually no structural damage in both tests. This event, which can be viewed in this [video](#), marks the first instance where a mass timber building of this height has been subjected to such testing.



# Impact

## Life Cycle

*In order to maximize mass timber's environmental benefits, proper end of use procedures are vitally important*



### Recyclability

**Re-use-** Extends the life of the timber and maximizes carbon sequestration, while reducing the need for new wood and lowering production emissions.

**Biomass Energy-** If re-use is not possible, the timber can be used to produce biomass energy through direct combustion that does not maximize emissions reduction but does enable a fossil fuel offset.

**Landfill-** Mass timber can be sent to landfill, though this is the least desirable option as it releases stored carbon and does not recover energy from the wood products



### Sustainability

Producing mass timber requires far less energy, water, and GHG emissions than other building alternatives

Sustainable forest management has proven successful in planting more trees than are harvested each year.

## Carbon Sequestration



### Carbon Footprint

Mass timber, when sourced from sustainable forests, has negative net carbon emissions. Trees naturally remove around two tons of CO<sub>2</sub> from the atmosphere to create one ton of their own dry mass as part of the photosynthesis process.

Mass Timber buildings remove 800 kilograms CO<sub>2</sub>/m<sup>3</sup> from the air and locks in that carbon throughout the life cycle building.

1640kg CO<sub>2</sub> sequestered per tonne

# Guiding Principles



Our overarching principle is: "Always a positive *EPSP* impact." The principle ensures that the products and services we provide always seek to deliver a positive Environmental, Psychological, Social, and Physical result.

## ENVIRONMENTAL

Wood does not deplete the planet of its resources. It creates warm natural environments that sequester carbon and clean the air we breathe. The lifecycle of mass timber is part of a natural cycle that we can benefit from while reducing our impact on the environment.

## PSYCHOLOGICAL

The warm, natural look and feel of mass timber provides an atmosphere for improved individual and community well-being. The inclusion of nature in our built environment has proven to positively affect how we all feel

## SOCIAL

Our built environment is a shared connection and serves as a basis for social change. The natural beauty, impressive scale, and strength of mass timber can inspire stewardship of our planet and communities.

## PHYSICAL

Our surroundings greatly influence our physical well-being. Biophilic design, natural elements, and health atmospheres create opportunities for healthy lifestyles.

*Little known fact, wood continues to "breathe" after it has been cut, as a result it posses a unique quality of acting as an air purifier*

Will you follow the well-worn  
path, or pioneer it?



# TRIDOME STRUCTURES

Our purpose is to create vibrant  
environments that nurture people,  
communities, and the planet.

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Serving Canada, USA and the Planet

Tridome Structure

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