

INNOVATIONS IN WOOD CONSTRUCTION - FROM THE FOREST TO STRUCTURE

Mass Timber / Sustainability / Fire & Building Code

Saskatchewan
Energy Management
Task Force
Feb 7, 2024



AGENDA



WOODWORKS & MASS
TIMBER



CWC & SUSTAINABILITY



FIRE / BUILDING CODE
IMPLICATIONS ON WOOD

WoodWorks is an industry led, federally and provincially supported program of the Canadian Wood Council, aimed to promote and educate the economic and environmental benefits of wood construction.





THANK YOU TO OUR PARTNERS

National Funder



Natural Resources
Canada

Ressources naturelles
Canada



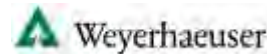
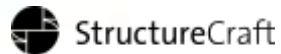
Provincial Funder

Industry Funder



Alberta
Forest
Products
Association

National Partners



Provincial Partners



Boise Cascade®
ENGINEERED WOOD PRODUCTS

WoodWorks AB

Thank you to our funders and partners for their ongoing support



Project Support

Primary Role

Photo source: LGA Architectural Partners

1 on 1



Tech Calls



Help Desk



Presentations



Technical Resources

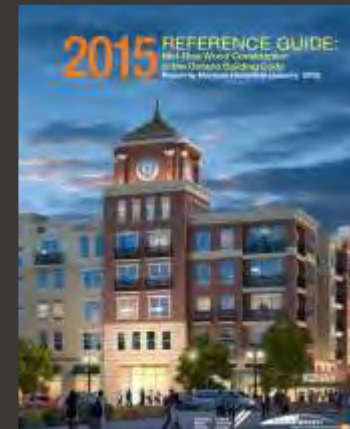
Photo source: LGA Architectural Partners

Publications

Case Studies

References

Guides



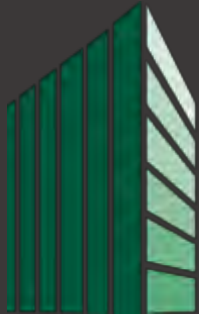
Events

Photo source: LGA Architectural Partners

WSC

Seminar / Workshops

Guides



WOOD
SOLUTIONS
CONFERENCE

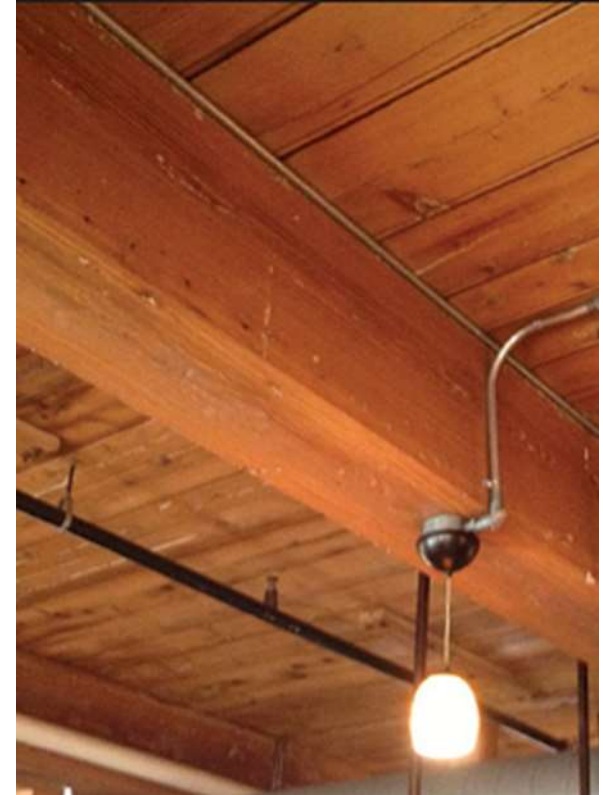
Wood Webinar Wednesday
Preserved Wood:
Deck Specification and Use
JUNE 19 AT 2:00 PM PST
REGISTER TODAY!
WOOD-WORKS.CA

HOSTED BY
  **WOOD THAT LASTS**
Sustainable Wood Solutions

PRESENTED BY
Dustin Branson, MSW
Executive Director
Western Wood Preservation Institute



WHAT IS HEAVY TIMBER?



WHAT IS MASS TIMBER?



MASS TIMBER

LIGHT WOOD-FRAME



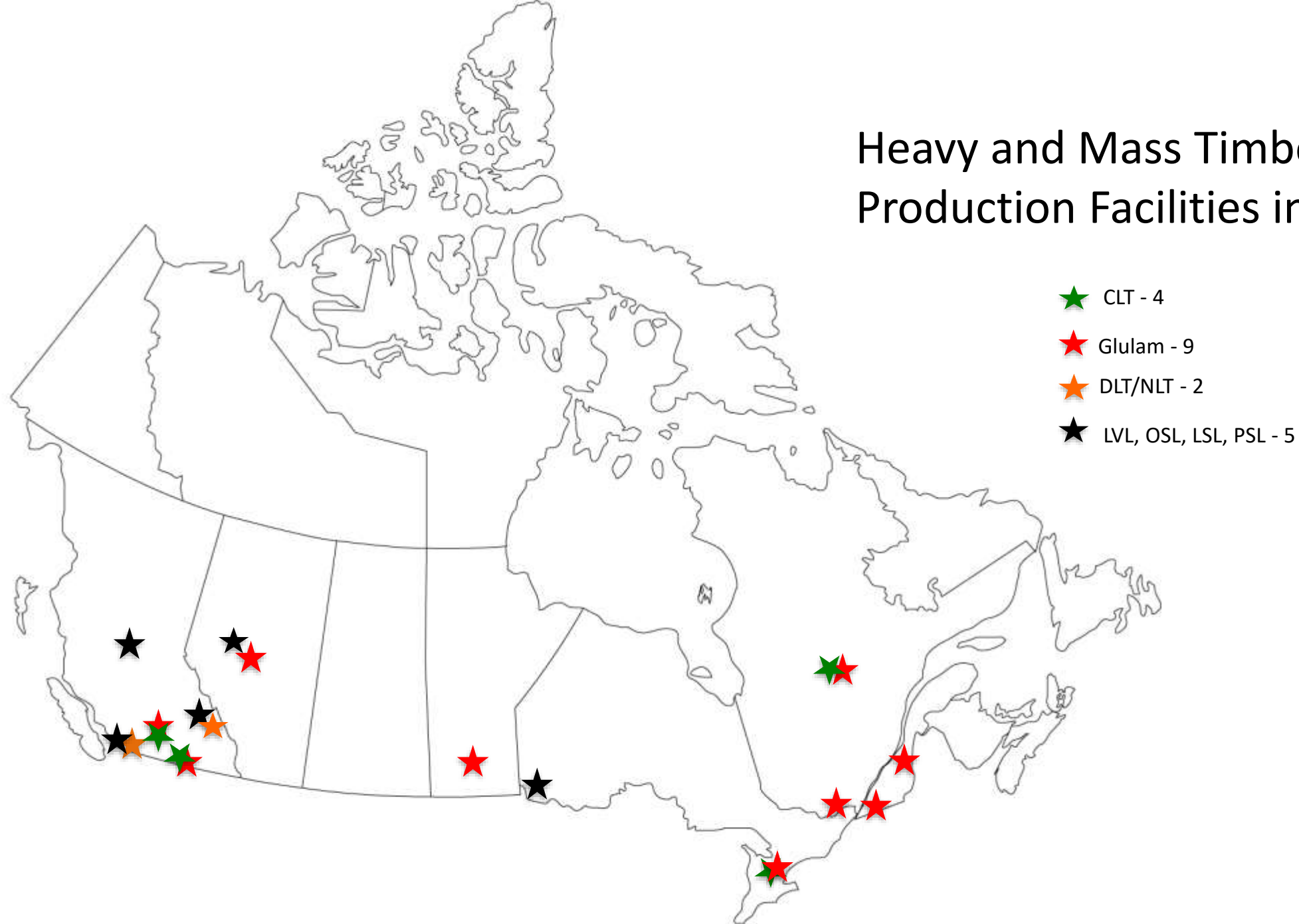
POST + BEAM



MASS TIMBER



Heavy and Mass Timber Production Facilities in Canada



INNOVATIONS IN MASS TIMBER PRODUCTS

NAIL LAMINATED TIMBER

GLUE LAMINATED TIMBER

CROSS LAMINATED TIMBER

LAMINATED STRAND LUMBER

LAMINATED VENEER LUMBER

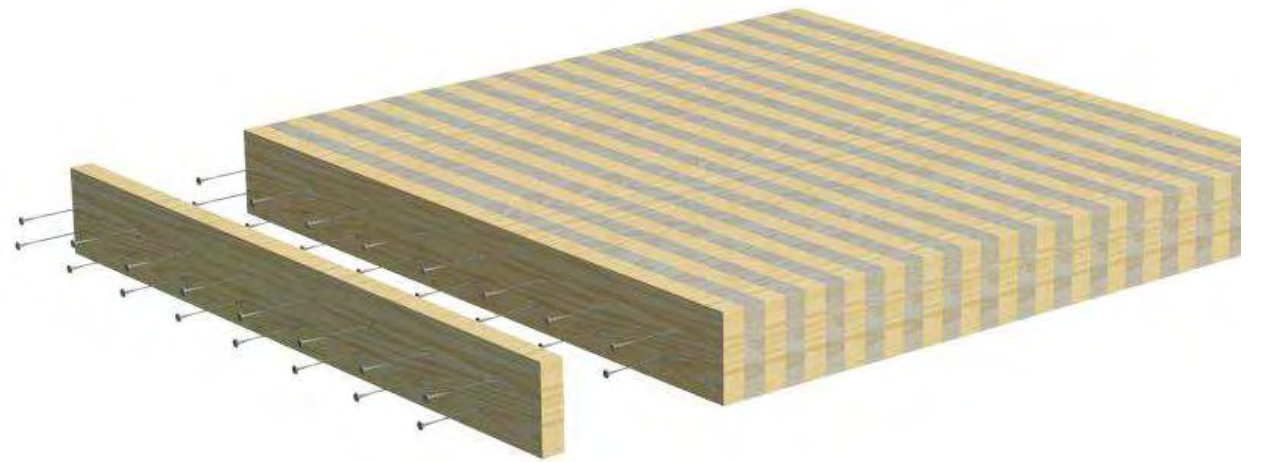
WOOD CONCRETE COMPOSITE

DOWEL LAMINATED TIMBER

MASS PLYWOOD PANEL

INNOVATION - NLT

Nail Laminated Timber



INNOVATION – NLT

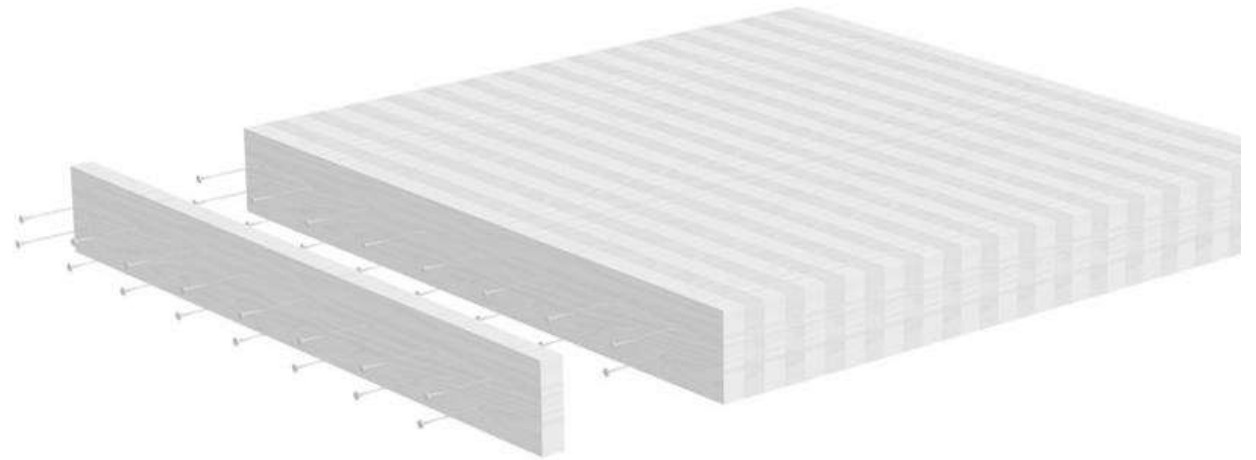
Alternative Names: nailed timber, nail-up, edge-lam

System: regular framing members (2x, 3x) on edge + fastened together

Suppliers: StructureCraft (Delta, BC), any good carpenter

Basic Info: material/fibre used: S-P-F No.2 & Better/ Douglas Fir No.2& Better

- Used for walls, floors and roofs with Plywood or OSB sheathing added to one side to provide a structural diaphragm



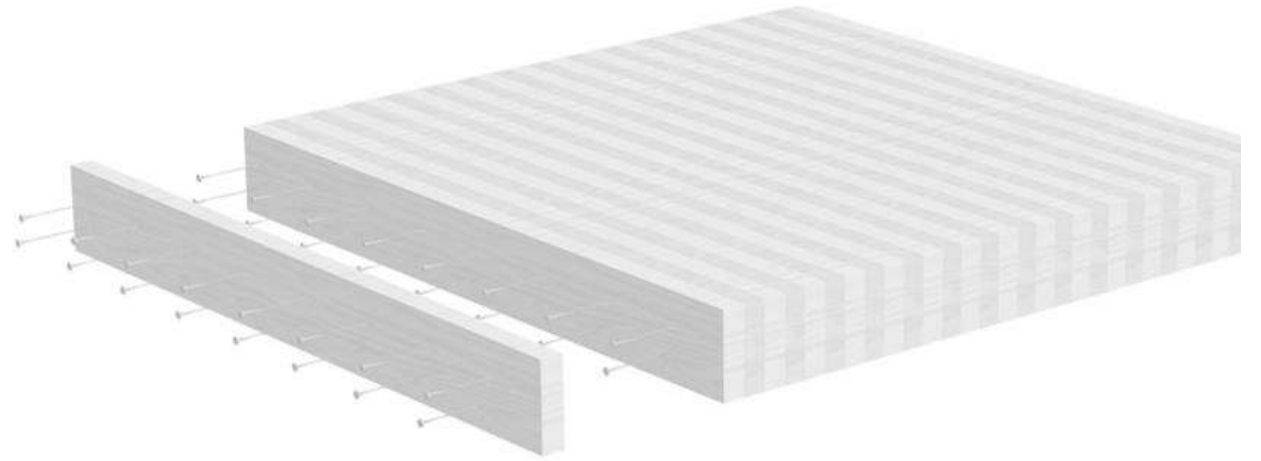
INNOVATION - NLT

Comments:

Code Acceptance- NLT is recognized in both Canadian and American building codes

Speed of construction – 25,000 sq ft floor plate can be installed in little as a week

Easy to modify on site if necessary, ex. drilling holes for services







Athabasca University Academic Research Centre

Architect: Manasc Isaac Architects

Location: Athabasca, AB

Wood Supplier: Western Archrib

Completion: 2011



Athabasca University Academic Research Centre



Architect: Manasc Isaac Architects
Location: Athabasca, AB
Wood Supplier: Western Archrib
Completion: 2011

Samuel Brighthouse Elementary School



Architect: Perkins + Will Canada
Location: Richmond, BC
Area: 10,000 sq ft roof
Completion: 2010

Samuel Brighthouse Elementary

Perkins + Will Canada



Varscona Theatre



Architect: group 2 Architecture

General Contractor: PCL

Location: Edmonton, AB

Completion: 2016

Varscona Theatre



Architect: group 2 Architecture
General Contractor: PCL
Location: Edmonton, AB
Completion: 2016

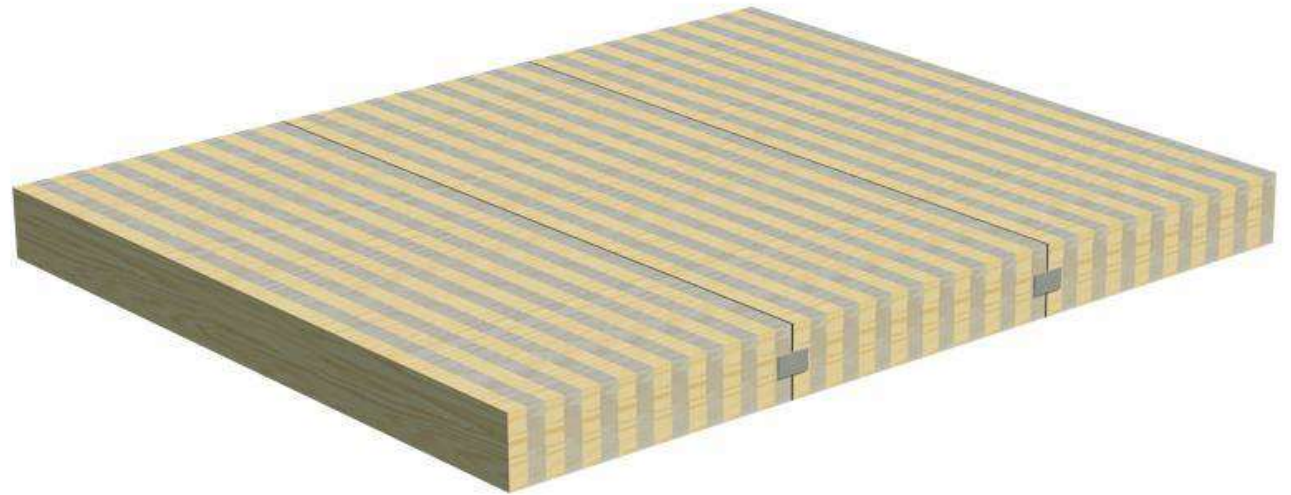
Varscona Theatre



Architect: group 2 Architecture
General Contractor: PCL
Location: Edmonton, AB
Completion: 2016

INNOVATION - GLT

Glue Laminated Timber



INNOVATION - GLT

Alternative

Names: glued edge laminated timber, edge laminated timber, edge-lam, WestDek

System: “glulam beams on edge”

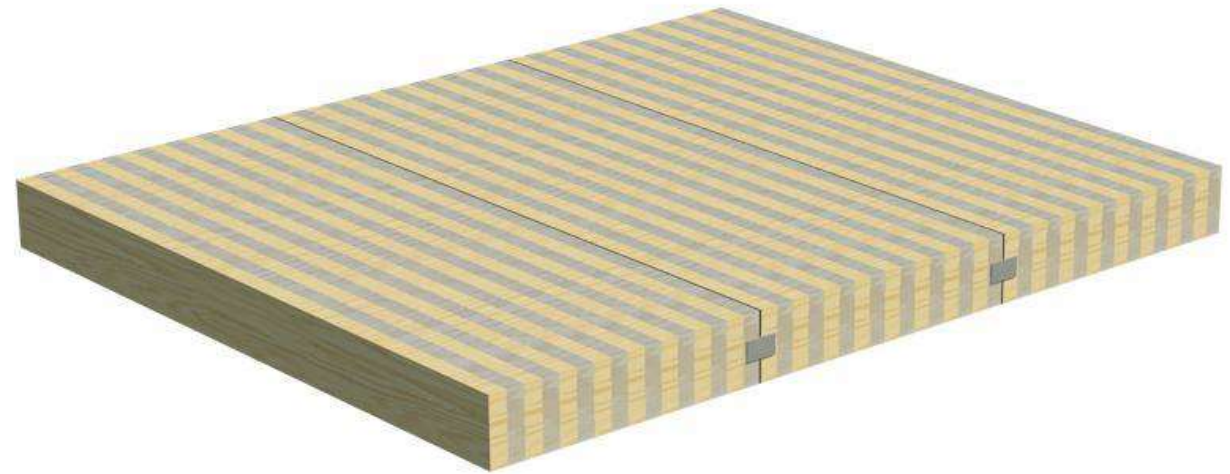
Suppliers: Structurlam (Penticton), Western Archib (Edmonton), Nordic (Montreal) or any other glulam supplier

Basic Info: - material/fibre: S-P-F / D. Fir / Black Spruce / ...

- adhesive: Phenol Resorcinol (black) or

Melamine (clear)

- floor, roof (and wall) with Plywood sheathing for lateral loads



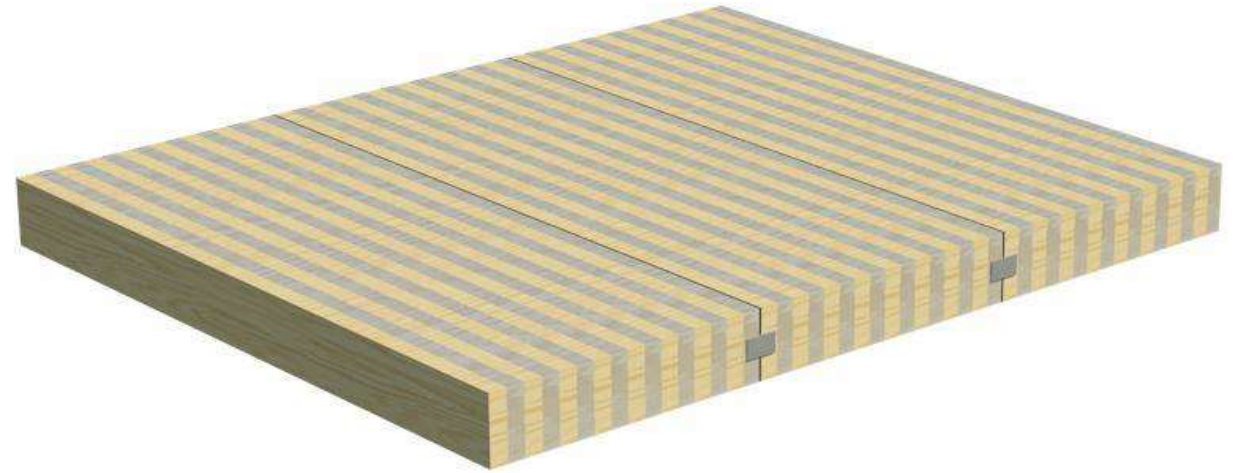
INNOVATION - GLT

Comments:

Standardized product
(CSA, ANSI, APA)

Requires care with
regards to swelling / shrinkage
perpendicular to grain

Glulam beam $\neq$ GLT



The Mosaic Centre for conscious community and commerce



The Mosaic Centre for conscious community and commerce



The Mosaic Centre for conscious community and commerce



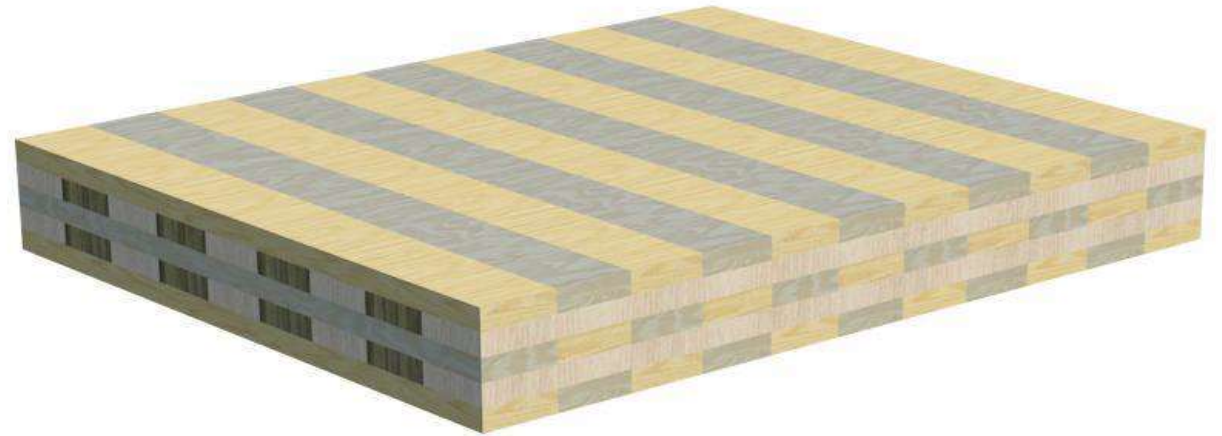


- Low Rise Commercial / Mass Wood
- Westblock 30,000 sqft office



INNOVATION - CLT

Cross Laminated Timber



INNOVATION - CLT

Alternative

Names: cross laminated timber, x-lam

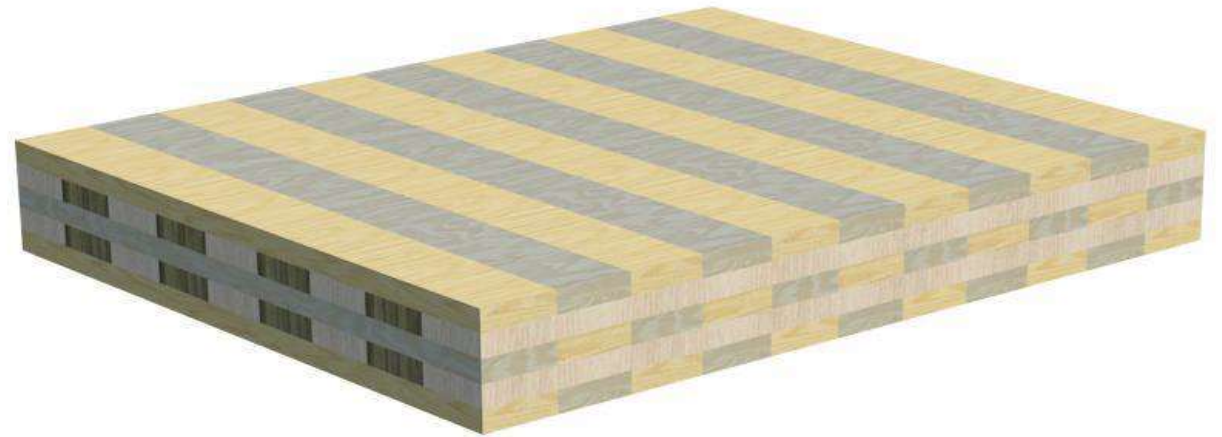
System: cross laminated timber panels
2x members glued together

Suppliers: Structurlam (Penticton, BC),
Nordic (Montreal, QC), Smartlam

(Whitefish, MT), Timber
Structures Inc. (Ontario), Element 5,
Kalishnikoff (2020)

Basic Info: material/fibre: S-P-F / Black
Spruce

floor, roof and wall with joints detailed for
lateral loads



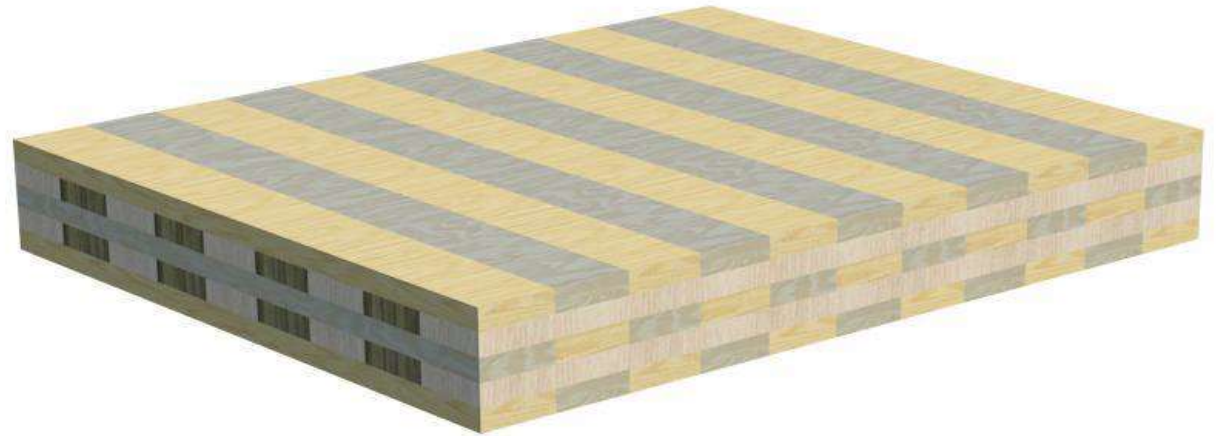
INNOVATION - CLT

Comments:

Standardized product (APA, ANSI)

Dimensionally very stable

Two directional span capabilities



Fort McMurray airport the office mcfarlane + biggar architects



Fort McMurray airport the office mcfarlane + biggar architects



Fort McMurray airport the office mcfarlane + biggar architects



New Brighton middle school Calgary, AB



New Brighton middle school Calgary, AB



New Brighton middle school Calgary, AB



New Brighton middle school Calgary, AB



New Brighton middle school Calgary, AB



INNOVATION - LSL

Laminated Strand Lumber



INNOVATION - LSL

Alternative Names: n/a

System: laminated strand lumber
(timber strands glued together)

Suppliers: Weyerhaeuser, Louisiana
Pacific,

Basic Info: material/fibre: Aspen

floor, roof and wall with joints
detailed for lateral loads (limited
thicknesses!)



INNOVATION - LSL

Comments:

Standardized product (ANSI,
APA, CCMC)

Dimensionally relatively stable





**civic Centre
north Vancouver, bc**



**civic Centre
north Vancouver, bc**



INNOVATION - LVL

Laminated Veneer Lumber



INNOVATION - LVL

Alternative Names: Microlam, Versalam

System: laminated veneer lumber (veneers stacked & glued together)

Suppliers: Louisiana Pacific, Weyerhaeuser, Boise Cascade, West Fraser

Basic Info: material/fibre: D. Fir

floor, roof and wall with joints detailed for lateral loads (limited thicknesses!)



INNOVATION - LVL

Comments:

Standardized product (ANSI,
APA, CCMC)

Dimensionally relatively stable



Metropol Parasol



Metropol Parasol

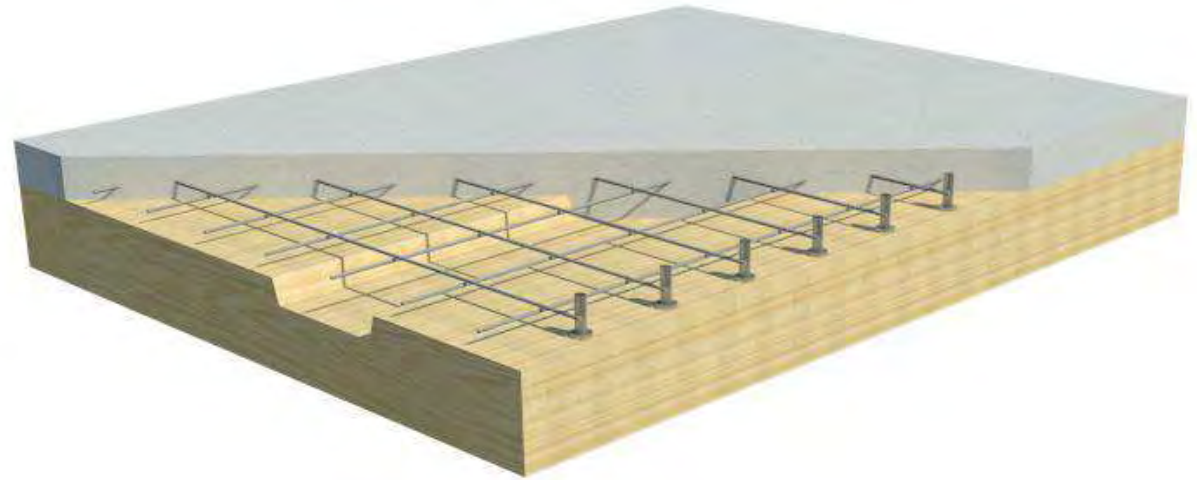


Metropol Parasol



INNOVATION - WCC

Wood Concrete Composite



INNOVATION - WCC

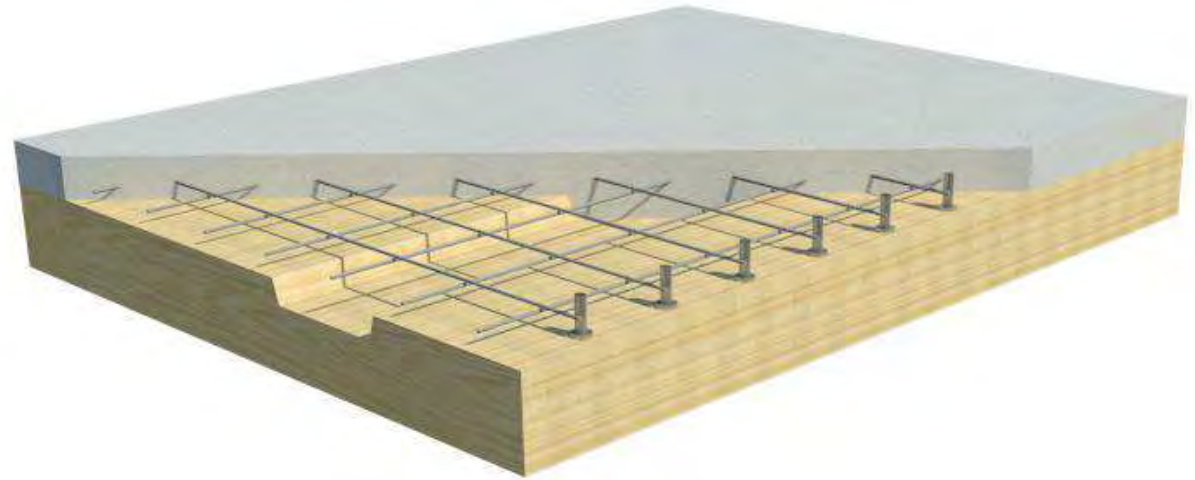
Alternative Names: Timber –
Concrete – Composite

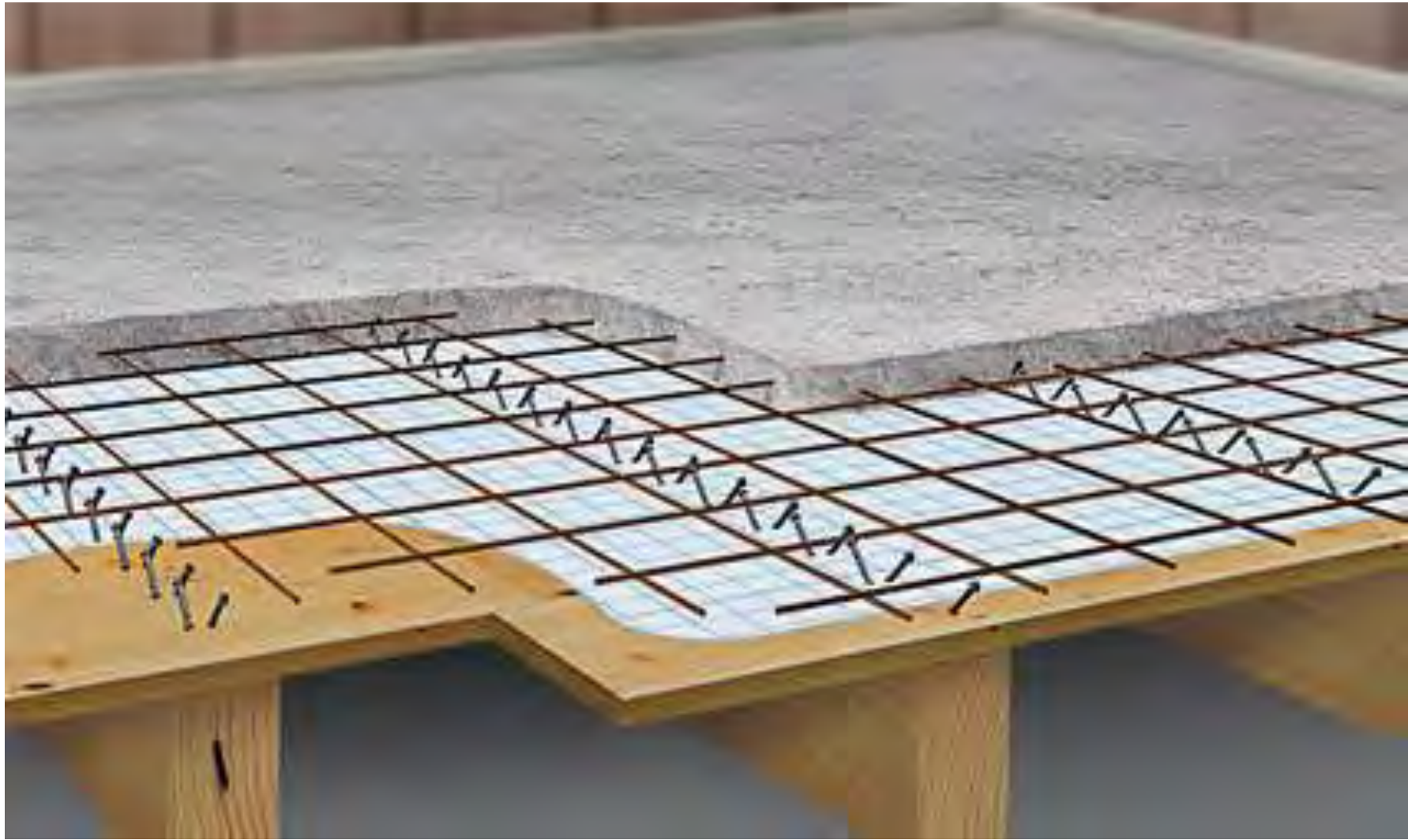
System: Solid wood panel at bottom,
concrete over top (acting as one unit)

Base layer can be nearly any solid
wood panel

Connector supplied by wood panel
supplier or general contractor

stiff and strong diaphragm





HBV STEEL MESH CONNECTORS



HBV STEEL MESH CONNECTORS



Earth sciences building UBC, Vancouver



Earth sciences building UBC, Vancouver



A COMPOSITE LAMINATED TIMBER PANEL BEING CRANED INTO PLACE.

Earth sciences building UBC, Vancouver



INNOVATION - DLT

Alternative Names: Dowel Laminated Timber

System: regular framing members (2x) on edge + fastened together with hardwood dowels

Suppliers: StructureCraft (Delta, BC), WoodPecker (Exshaw, AB)

Basic Info: material/fibre used: S-P-F No.2 & Better/ Douglas Fir No.2& Better

- Used for walls, floors and roofs with Plywood or OSB sheathing added to one side to provide a structural diaphragm







INNOVATION - MPP

Alternative Names: Mass Plywood Panel

System: veneer-based engineered wood product— Mass Plywood Panel (MPP).

Suppliers: Freres Lumber

Basic Info: up to 12'x48'x48" thick

-Used for walls, floors and roofs





Coronation Community Recreation Centre

6 Important Design Elements of Mass Timber

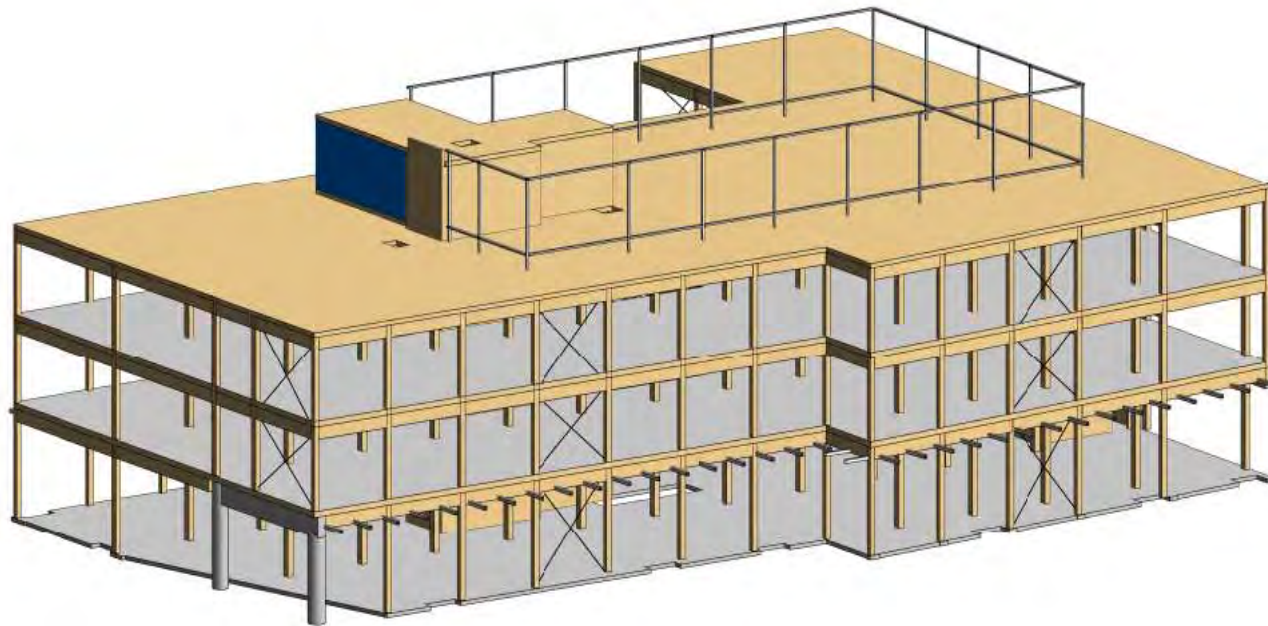
1. Grid
2. Connections
3. Collaboration
4. Fire
5. Budget and expectations
6. Acoustics and vibration



GRID - plays a key role in success for;

- Manufacturing optimization
- Occupant needs
- Overall building height
- Foundation design – distributing load in poor soil = spread the load

Fitting wood to a grid designed for steel or concrete may not be the best utilization.



Connections and fasteners



Connections

- “off the shelf”
- Custom made
- Delegated design



Photo courtesy of MTC Solutions

Collaboration becomes:

- Efficiency
- More than expected
- Prefabrication
- Modularization
- Better details for other trades
- Pre-coatings
- Pre- construction is more intense but, installation is fast



Atco Centre, Calgary, AB.

Scope of Work

- **What you can expect from your Mass Timber supplier;**
 - Supply of glulam and mass timber panels
 - CNC fabrication – accuracy is much higher
 - Design assist – usually in connections working with design engineer
 - Supply of connections to make up the glulam package
 - Fastening hardware – screws, bolts, pins, ect
 - Detailed 3D shop drawings
 - Packaging or containerizing as required for the project
 - Specialized curved beams and round columns
 - Custom coatings
 - Prefabrication
 - Project managed
 - A complete kit of parts for fast and accurate assembly of a mass timber project
 - Co-ordination with installation and other trades

Fire

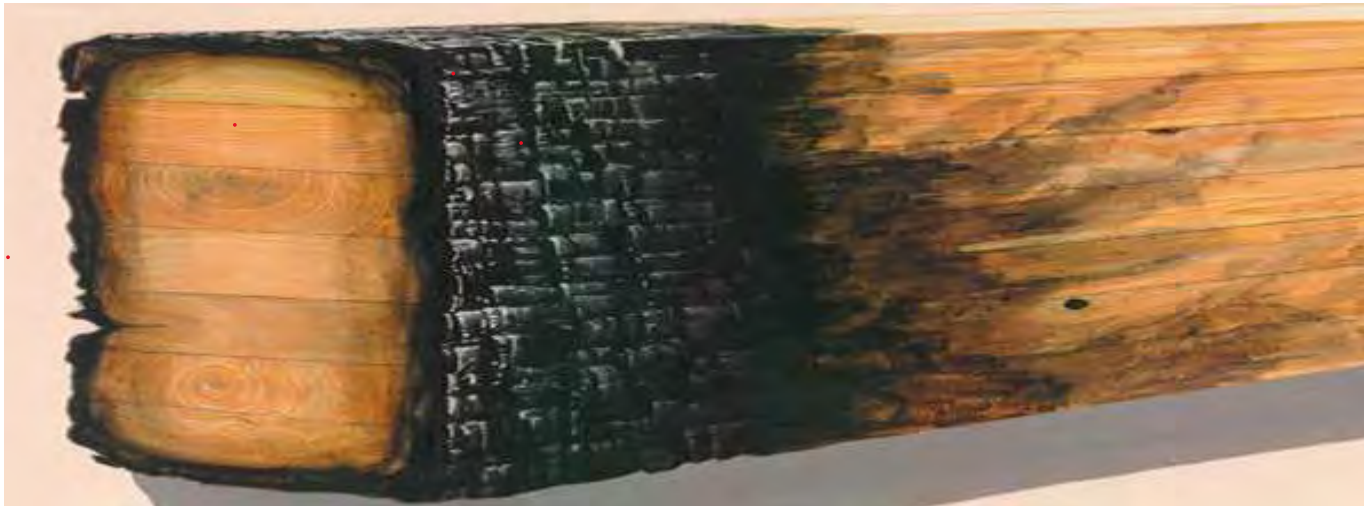
- Fire design requirements tell us the minimum deck size we need.
- Wood resists fire by charring – more wood = more resistance
- Volume of wood is a primary cost driver so we need to be cautious with what we choose here

Common requirements and sizes for plates / slabs

45 minute roofs 3 1/8" GLT, 3 ply CLT, 1 1/8" T+G plywood

1 hour floors 5 1/8" GLT, 5 ply CLT

2 hour floors 6 7/8" GLT, 7 ply CLT

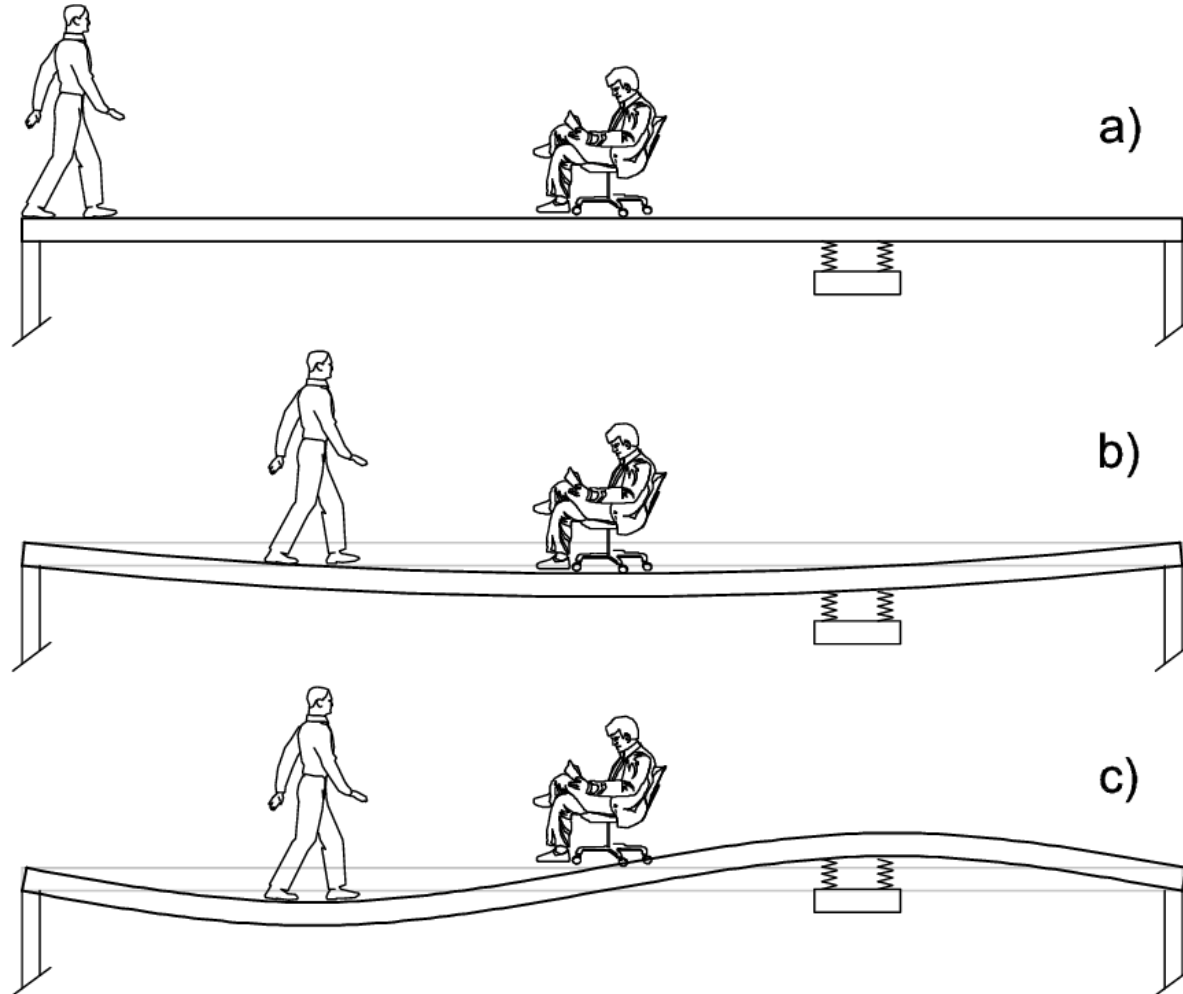


Fire – a real example



Photo courtesy of Beamcraft

Acoustics and Vibration – not the same thing



Acoustics

Acoustics – the code is somewhat vague on what is required, however, the legal system is well aware of poor acoustics. Engaging experts in this field for the details is valuable.



Acoustics

Soprema Insonofloor
Soprema Insonomat

IIC 49



Acoustics

Common floor for office or residential assembly



BUDGET



- Complexity** – costs involved to engineer, cut, and connect complex systems will cost more.
- Curves** – costs of curves are mitigated by repetition and quantity.
- Coatings** on wood – are additional coats required? Stain adds color/ versatility but adds to cost. Contradictory specifications. 3 coat systems can increase the cost by 17%
- Coatings** on steel connections – powder coating, stainless steel, custom castings.
- Clarity** of drawings and scope. Cost of the unknown. Are two trades covering the same material or scope?
- Moment** connections- complex with wood

BUDGET

- Start early with potential suppliers
- Cost consultants are not all knowledgeable on Mass Timber
- Design can heavily influence cost
- Seek collaboration
- Don't use Dilbert



thank you