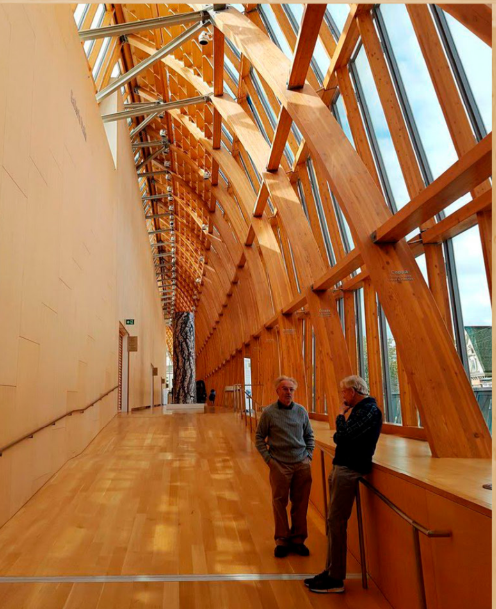
MASS TIMBER TIPPING POINT

A Study of Mass Timber Uptake Through the Experiences of North America's Leading Architects and Engineers

architecture 2030

PILOT PROJECTS



JULY 2025
FINAL REPORT

Tipping Point - Call To Action

Scott Francisco

Founding Director, Pilot Projects

Like many of you, my work days are filled with conversations and collaborations with people all over the world working on different corners of the sustainability puzzle. And every day it becomes clearer to me that the future of our cities and the future of our forests are tightly linked. Cities have always been the biggest consumers of material resources, usually with little regard for far away environmental impacts, the regenerative capacities of the landscapes, or the rural people that live in them.

Lately we see a real shift where urban leaders and consumers recognize that their decisions matter. City governments, businesses and residents recognize that their decisions can be turned into powerful tools that protect our shared climate, biodiversity and social systems.

The enthusiasm of people at all positions in these value systems from tree-fellers to apartment renters, points to the fact that mass timber can bring a reciprocity with nature "home" to the city — to the offices, warehouses and bedrooms of billions. Mass timber allows every day people to challenge our industrial dependency on single-use, non-renewable, high carbon materials, and to manage our relation to forest landscapes in ways that benefit the full spectrum of people, and all life on our beautiful shared planet home.

Erica Spiritos

Founder/Director, Erica Spiritos LLC

I grew up walking jobsites with my father around New York City, but I was not compelled by the construction industry until I discovered mass timber in my mid-twenties. With new eyes, I saw that construction (the process, not just the end result) could be elegant, quiet, safe, clean, even aromatic.

In many ways, construction is a destructive process, as we take from the earth to develop our built environment. With mass timber, I see a shift toward reciprocity where the way we build buildings can support the long-term health of forests, people and communities. And with wider interest in and adoption of mass timber, I imagine how these new relationships to wood sourcing might inspire conversations about other materials and their impacts.

From my vantage, I also see that while there are industrial, exploitive ways of delivering mass timber projects, there are also cooperative, egalitarian and restorative ways. Let's lean into knowledge-sharing and collaboration. Lean into partnering with competitors. Lean into diversity and biodiversity. We must consider this paradigm shift from all angles. It is not enough to build healthy buildings. We need to build healthy teams, healthy companies and healthy industries.

Vincent Martinez

CEO, Architecture 2030

With an unprecedented amount of global new construction projected to be built, design professionals are keen to apply renewable, bio-based materials in their projects to reduce and store carbon emissions. There is also a growing movement around the transparency of supply chains, understanding the origin of our material choices, and using life cycle assessments to evaluate design and procurement decisions.

While there is a growing consensus within the design community of the merits of applying mass timber elements in projects, there is still a lack of confidence in championing those solutions, which is hindering the scale of adoption. Building confidence can only be addressed by building trust. Each new project provides more historical material and construction data, more design and construction learning, more supply chain stories, more market metrics, more trust. Leading designers, builders and clients are already unlocking the potential of mass timber by stepping forward and showing what is possible, leading the way for others to follow in their path and widen it.

Andrew Waugh

Founding Director, Waugh Thistleton Architects

There is a global imperative that demands a new approach to architecture and construction.The transformation of the construction industry requires new materials and knowledge. This can only occur through conversation and collaboration within the industry.

As an industry, we have the opportunity to embrace recent advances in engineered natural materials and the buildings they can create. Mass Timber provides a viable alternative to more energy-intensive materials and processes, allowing us to construct healthier buildings from potentially replenishable resources. The emerging industries these technologies create have the potential to boost rural economies and make use of locally sourced materials.

As design professionals, we need to learn how to work with new criteria for engineering our buildings and adapt to new processes and demands in construction. There is an opportunity to rethink architecture and engineering while making demands on the provenance of the materials we use.

This is an exciting chance to learn collectively, to improve our responsibility towards our planet and society, and to create a healthier, beautifully crafted built environment.

Table Of Contents

Construction crew aligning mass timber beam-column connections for Limberlost Place in Toronto. Source: Salina Kassam courtesy of Moriyama Teshima Architects.

Project Partners

Architecture 2030's mission is to rapidly transform the built environment from a major emitter of greenhouse gasses to a central solution to the climate crisis. For two decades, they have provided the leadership and designed the actions needed to achieve the CO2 emissions reductions for a high probability of limiting planetary warming to 1.5°C.

Pilot Projects is a design and systems thinking practise with a shared mission to catalyze big systemic changes. We lead global networks, initiatives and communities of practice that seek to improve the beneficial interdependencies between urban and natural environments worldwide.

Key Consultants

Erica Spiritos - Erica is the Founder and Director of Erica Spiritos LLC, an award-winning consultancy dedicated to advancing sustainable mass timber construction across North America. Her expertise spans project delivery, supply chain management, and sustainable wood sourcing, with a commitment to social justice exemplified in projects like Heartwood workforce housing.

Andrew Waugh - Andrew is a founding director of Waugh Thistleton Architects, an architecture practice dedicated to designing buildings and places of the highest architectural quality that acknowledge their impact on the environment. He has led the practice on award winning schemes from synagogues to social housing, offices and public buildings and was responsible for the design and delivery of Murray Grove, the building which spearheaded the international movement in tall timber construction.

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U.S. Endowment for Forestry and Communities

Acknowledgment

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Contributing Firms
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DCI Engineers
DLR Group
EHDD Architecture
EQUILIBRIUM Consulting
EwingCole
Fast + Epp
Flad Architects
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SmithGroup
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Thornton Tomasetti

Introduction

A Mass Timber Tipping Point

Cities worldwide are facing an unprecedented surge in urban development, with global building floor area projected to double by 2060—equivalent to constructing a new New York City monthly for 40 years[1]. While operational carbon emissions can be reduced through building upgrades over time, embodied carbon from materials and construction becomes permanently fixed once a building is complete. This urgency demands immediate action to reduce embodied carbon in new construction to meet the Paris Climate Agreement's 1.5°C warming limit.

Mass timber presents a promising opportunity for positive transformation in the construction industry. The global market is expected to grow from its current USD 1 billion valuation to USD 2.15 billion by 2033, offering significantly lower embodied carbon compared to conventional concrete and steel construction[2]. Beyond carbon benefits, mass timber buildings can often be built faster and lighter than conventional alternatives, while the exposed wooden structural surfaces offer natural aesthetic appeal to developers. Yet despite these advantages, mass timber use in construction is not scaling at the pace needed to address our climate challenges.

Understanding the concept of a "tipping point"—that moment when an idea, trend, or social behavior crosses a threshold and spreads rapidly—is essential for accelerating mass timber adoption[3]. For mass timber, this tipping point would be marked by the emergence of a shared understanding across the building industry that timber has moved beyond its niche toward meaningful prominence, where architects routinely consider timber from project inception, contractors price it competitively without risk premiums, and clients expect timber options as standard practice. The environmental crisis provides the contextual conditions that make the time ripe for transformative change, while mass timber's visible beauty and tangible benefits enhance its potential for widespread appeal. However, we remain distant from this threshold: according to the Softwood Lumber Board, more than 18,000 buildings are built annually in the United States with steel and concrete that could, by code, actually be built with wood[4], yet WoodWorks data shows only 155 mass timber projects began construction or were completed in 2024[5]. Leading architects and engineers are perfectly positioned to be catalytic actors in this transformation, possessing the technical expertise, professional networks, and client relationships necessary to trigger the contagious processes needed for mass timber to become mainstream.

This report investigates the paradox of why, despite these compelling benefits, mass timber adoption remains limited. Our research addresses two key questions: What challenges are impeding North America's leading architectural and engineering firms from scaling up mass timber in their practices? And what strategies might overcome these barriers? Through a comprehensive North America-wide survey of 43 firms (representing 409 offices), workshops with 12 leading firms, interviews with industry leaders, and literature review, we identified 25 unique challenges. Each challenge is analyzed through six distinct challenge themes: Experience, Cost, Confidence, Sourcing, Policy, and Carbon.

Beyond identifying challenges, our research uncovered promising solutions across North America. From Heartwood's groundbreaking housing model in Seattle to Limberlost Place's innovative "beamless" system in Toronto, these projects demonstrate pathways to overcome industry barriers. Success stories reveal how integrated design processes, systematic technical research, strategic public-private collaborations, and pioneering regulatory approaches are accelerating adoption. Based on these findings, we recommend coordinated action across five key industry

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1 Architecture 2030. (n.d). Why The Built Environment. https://www.architecture2030.org/why-the-built-environment/why-buildings/#:~:text=RAPID%20GROWTH,every%20month%2C%20for%2040%20years.

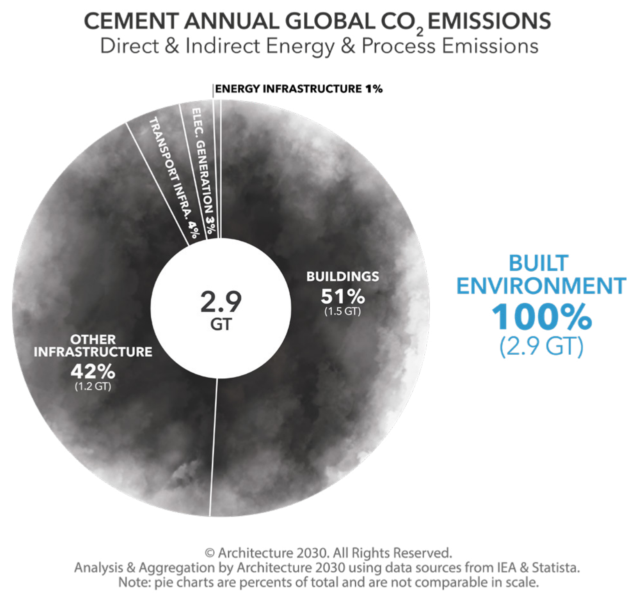
2 The Brainy Insights. (2024, July). Mass Timber Construction Market Size by Material Type, Application, Regions, Global Industry Analysis, Share, Growth, Trends, and Forecast 2024 to 2033. Report I.D: TBI-14017.

3 Gladwell, M. (2006). The tipping point: How little things can make a big difference. Little, Brown.

4 Softwood Lumber Board. (n.d.). WoodWorks aims to convert 400 projects to wood construction this year. Softwood Lumber Board. https://softwoodlumberboard.org/woodworks-aims-to-convert-400-projects-to-wood-construction-this-year/

5 Atkins, D., Anderson, R., Dawson, E., Spiritos, E., & Muszynski, L. (2024). International Mass Timber Report. Trifecta Collective LLC. https://masstimberconference.com/report/

groups to address the interconnected barriers preventing mass timber from reaching its tipping point. Architects and engineers must demonstrate cost competitiveness, build deep material understanding, design in timber from project inception, and integrate carbon analysis into early decision-making. Building contractors need to adapt cost management approaches, invest in direct experience, and embrace collaborative project delivery methods. Mass timber supply chain stakeholders should enhance industry access, optimize production efficiency, support standardization efforts, and strengthen supply chain transparency. Governments can lead through direct procurement, modernize regulatory frameworks, and develop carbon incentives. Industry influencers must scale contractor education programs and strengthen partnerships with public and educational institutions. The findings serve multiple audiences seeking actionable strategies to help mass timber reach its tipping point—transforming from an innovative alternative to a mainstream solution for sustainable construction with significant climate and economic benefits.



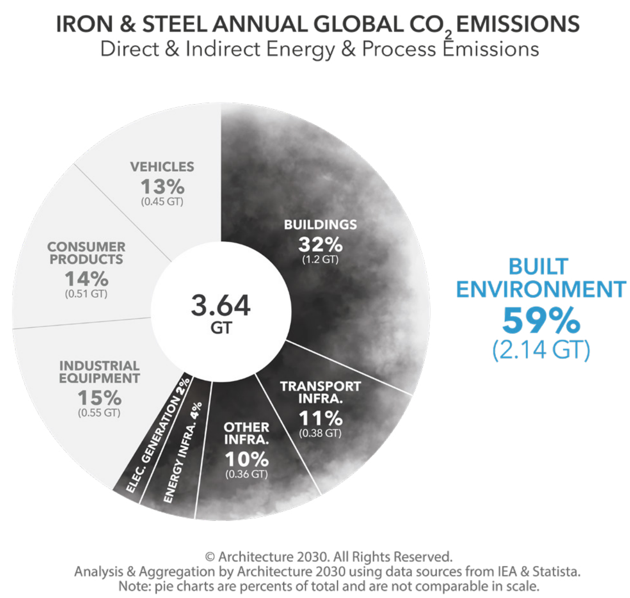


Image source: Architecture2030.

What is Mass Timber?

Mass timber refers to a category of engineered wood products characterized by the use of large, solid wood components for structural frames, such as wall and floor slabs, columns and beams. These systems typically combine engineered wood panels with engineered wood columns and beams to create complete structural systems.[7] While mass timber can be used independently, it is often integrated with other building systems like light-frame wood walls, steel elements, or concrete foundations to maximize the benefits of each material.[6]

The mass timber family encompasses several key products including Cross-Laminated Timber (CLT), Glue-Laminated Timber (Glulam/GLT), Nail-Laminated Timber (NLT), Dowel-Laminated Timber (DLT), solid-sawn timber and Structural Composite Lumber (SCL). Each product uses different methods to create large-format structural wood elements, often combining smaller pieces of lumber through adhesives, mechanical fasteners, or friction-fit connections.

Mass timber products can also be combined with concrete to create composite systems. For example, timber-concrete composite (TCC) floor systems consist of a timber layer and concrete layer joined by shear connectors, allowing for longer spans and greater load capacity than non-composite alternatives.

The development of mass timber represents a significant advancement in wood construction technology, offering architects and engineers new possibilities for sustainable building design while maintaining structural integrity and performance requirements.

Benefits & Performance

Mass timber can offer numerous advantages across multiple performance criteria, making it a viable alternative to conventional materials like steel and concrete:

Environmental Performance: Mass timber can provide significant environmental benefits, with trees naturally sequestering approximately two tonnes of CO_2 to create one tonne of wood mass.[12] Its lightweight nature also reduces transportation emissions and site disturbance during construction.

Health and Wellbeing: Research shows wooden environments can reduce stress levels, improve concentration, and create positive emotional responses. Studies of building occupants in wood environments have found decreased heart rates and stress levels compared to standard environments.[13]

Construction Efficiency: Mass timber construction can be approximately 25% faster than concrete construction, with 90% less construction traffic and 75% fewer workers on the active deck.[8] Additional benefits include lighter structural weight reducing foundation requirements, precise prefabrication, and simplified assembly.

Cost Considerations: While structural frame costs for mass timber may be comparable or slightly higher than conventional construction materials, overall project costs can be lower due to reduced foundation costs, lower labor costs, shortened construction schedules, and reduced equipment requirements. Studies have found average cost savings of approximately 4% compared to conventional construction.[9]

Structural Performance: Mass timber demonstrates excellent structural performance despite common perceptions about wood construction. Its high strength-to-weight ratio makes it effective for resisting both seismic and wind forces. The lightweight nature of mass timber reduces inertial forces during earthquakes, while the high in-plane stiffness of panels helps resist lateral distortion.[10]

Fire Performance: When exposed to fire, mass timber chars at a consistent rate (approximately 0.65 mm/min), creating an insulating layer that protects the structural core. Tests have demonstrated that unprotected mass timber assemblies can achieve 2-hour fire ratings under standard testing conditions.[11]

6 Wood Works. (2004). What is mass timber? Wood Works. https://www.woodworks.org/resources/what-is-mass-timber/
7 Think Wood. (2020). Mass Timber in North America Expanding the possibilities of wood building design. Architectural Record, 208(4), 132-133.
8 Harte, A. M. (2017). Mass timber–the emergence of a modern construction material. Journal of Structural Integrity and Maintenance, 2(3), 121-132.
9 Abed, J., Rayburg, S., Rodwell, J., & Neave, M. (2022). A Review of the Performance and Benefits of Mass Timber as an Alternative to Concrete and Steel for Improving the Sustainability of Structures. Sustainability, 14(9), 5570.
10 Ibid.
11 Muszynski, L., Gupta, R., Hong, S. H., Osborn, N., & Pickett, B. (2019). Fire resistance of unprotected cross-laminated timber (CLT) floor assemblies produced in the USA. Fire Safety Journal, 107, 126-136.
12 Abed et al. (2022).
13 Think Wood. (2020). Mass Timber in North America Expanding the possibilities of wood building design. Architectural Record, 208(4), 132-133.

Opportunities for Architects and Engineers[14]

Mass timber presents significant opportunities across the construction and forestry sectors, driven by both market demands and environmental considerations:

Market Leadership and Innovation: The construction industry's early adopters (approximately 25% of industry leaders) are positioned to influence broader industry practices and building codes through pioneering sustainable building solutions.[15]

Structural and Design Advantages: Mass timber panels offer exceptional dimensional stability with submillimeter precision, enabling innovative two-way slab designs and prefabrication potential previously unavailable in timber construction. The engineered composition redistributes natural wood defects, resulting in enhanced strength and superior performance.

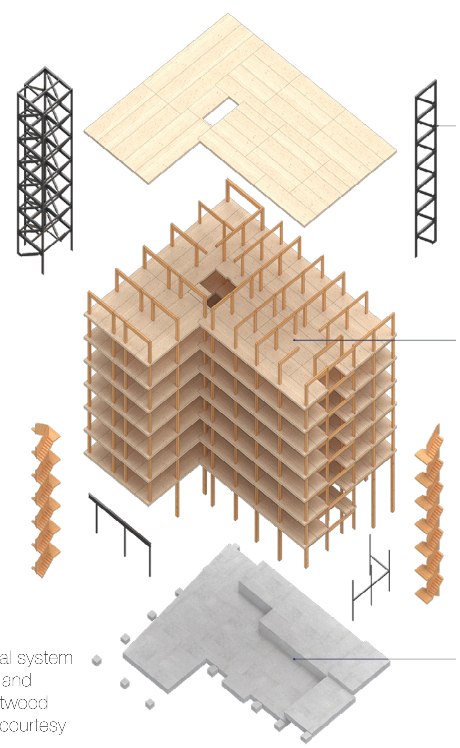
Manufacturing Expansion: Regions with significant timber resources and large construction markets present substantial opportunities for expanding manufacturing capacity. Advancements in bio-based adhesives and optimized panel configurations can further reduce environmental impacts while meeting specific project requirements.[16]

Technical Innovation: New opportunities are emerging in connection systems, including fire-resistant connections and sophisticated joinery solutions that combine traditional woodworking techniques with modern precision manufacturing. Advanced CNC technology and innovative fire protection strategies continue to expand design possibilities.

Construction Efficiencies: While there may be an initial premium for mass timber projects (median less than 2%), studies show projects frequently achieve 20% overall schedule reduction, with superstructure completion times reduced by 25% compared to traditional methods.[17] Mass timber also dramatically reduces on-site labor requirements, with some projects requiring 50-70% fewer site staff for structural framing.

Market Differentiation: Mass timber buildings demonstrate compelling market advantages, with lease rates often 11-65% higher than comparable buildings and accelerated lease-up periods. The biophilic qualities and sustainability credentials create distinct marketing advantages that support premium rental rates and tenant attraction.[18]

Circularity Potential: The modular nature of mass timber components presents significant opportunities for future adaptation and material recovery. Design for Disassembly (DfD) principles applied to mass timber construction create potential for component reuse and material recovery at end-of-life.[19]



Mass timber structural system with hybrid concrete and steel elements. Heartwood Workforce Housing, courtesy of atelierjones.

14 Abed et al. (2022).
15 For a comprehensive overview of mass timber opportunities, see Atkins, D., Anderson, R., Dawson, E., Spiritos, E., & Muszynski, L. (2024). International Mass Timber Report. Trifecta Collective LLC.
16 Ibid.
17 Atkins, D., Anderson, R., Dawson, E., Spiritos, E., & Muszynski, L. (2024). International Mass Timber Report. Trifecta Collective LLC.
18 Ibid.
19 Ibid.

The Heart Of Our Research: Dialogue

Over the course of 8 months, the Mass Timber Tipping Point (MTTP) project team conducted 12 in-depth day-long Mass Timber Expertise Exchange Workshops with leading architecture and engineering firms across North America. These customized sessions, each spanning approximately 8 hours, generated over 100 hours of conversations with practitioners and industry leaders.

12 Full Day Workshops

hellmuth + bicknese architects

Fast+Epp

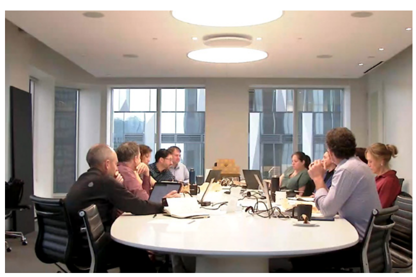
Moriyama Teshima Architects

ARCADIS

HKS

atelierjones, llc

GRIMSHAW



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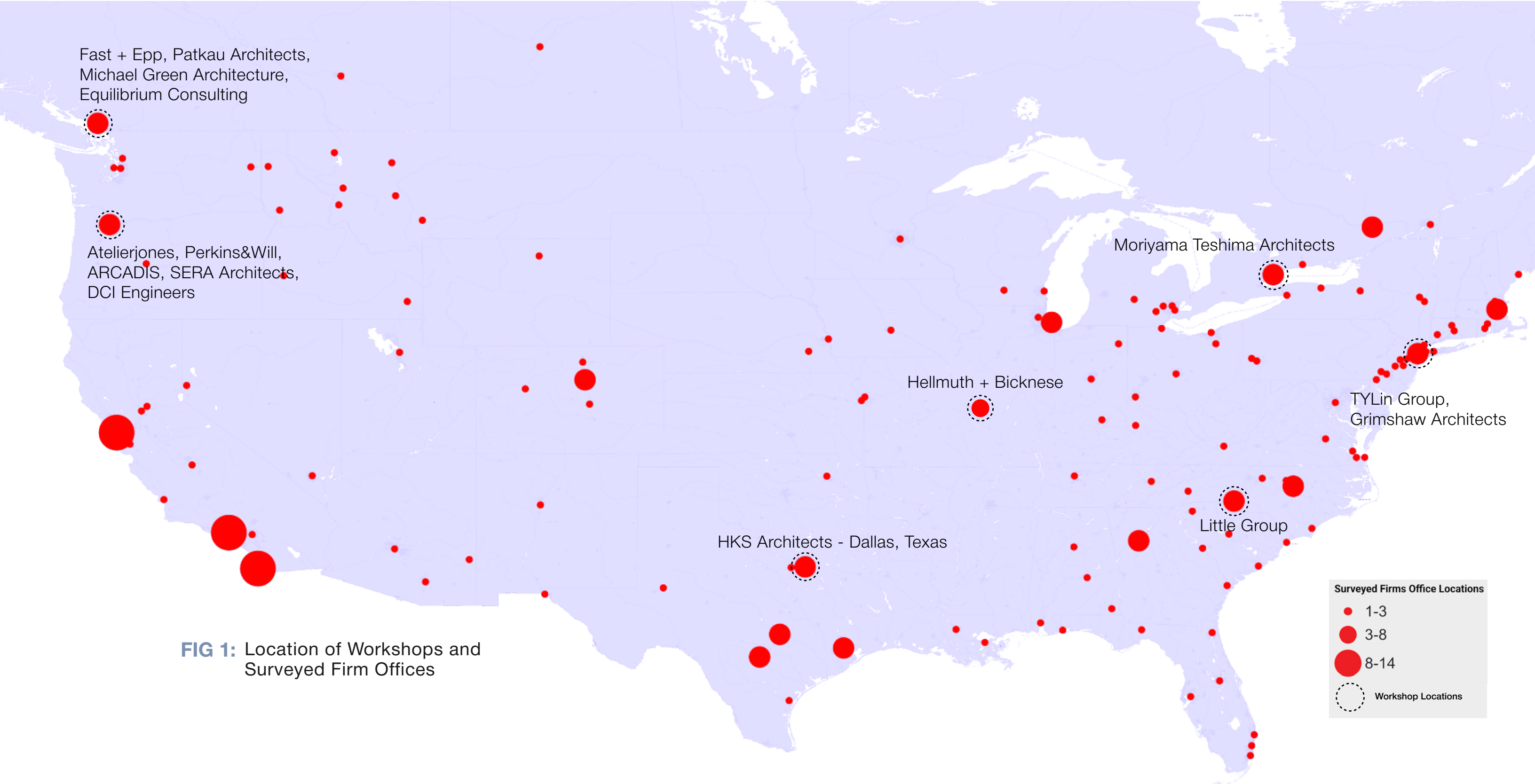


FIG 1: Location of Workshops and Surveyed Firm Offices

These workshops formed the cornerstone of our research, bringing together diverse perspectives from across the mass timber ecosystem. Each session was designed to uncover key issues related to mass timber implementation, climate impacts, and timber sourcing that would inform both regional and global systems change. By gathering principals, design leaders, sustainability specialists, marketers, and technical experts from the same firm in one room, we created a unique forum for candid discussion that couldn't be captured through surveys alone.

The firms participating represented a wide spectrum of the industry – from smaller studios with specialized mass timber expertise to international firms with hundreds of offices worldwide. This diversity allowed us to examine implementation challenges across different regional contexts, regulatory environments, and market sectors.

Our facilitation team guided participants through structured exercises designed to extract both practical insights and strategic vision. These activities helped firms reflect on their own mass timber journeys while contributing to the broader industry knowledge base. The workshops explored when, why, and how firms successfully implemented mass timber, what barriers they encountered, and how they addressed sourcing challenges.

Following each workshop, our team produced comprehensive summary documents capturing the key insights, challenges, and opportunities identified during the session. These summaries formed a rich dataset that was systematically analyzed using both human expertise and AI-powered tools. The patterns and themes that emerged ultimately informed the 25 key challenges presented in this report.

While the workshops built upon quantitative data gathered through our initial industry survey of over 40 leading firms, they provided a crucial qualitative dimension to our research. By combining the breadth of survey data with the depth of workshop insights, supplemented by targeted interviews and literature review, we've developed a comprehensive understanding of the systemic issues affecting mass timber adoption.

> *"As architects, we have an opportunity and responsibility to lead the charge in addressing the climate crisis through our design and actions. We were delighted to engage with the Mass Timber Tipping Point team, exchanging insights and expertise on the transformative power of mass timber in championing low-carbon architecture and discussed avenues for even more responsible design and construction practices."*
>
> **- Moriyama Teshima Architects**

Executive Summary

Architecture and engineering firms around the world are seeking ways to simultaneously reduce embodied carbon in buildings while meeting the increasing demand for high performance and aesthetics. Mass timber offers a compelling solution. Through extensive research with architecture and structural engineering practitioners across the continent, this report identifies the critical challenges limiting mass timber adoption and provides actionable strategies to tip the balance towards widespread use.

WHY MASS TIMBER? WHY NOW?

In the coming decades, the architecture and engineering community must significantly reduce buildings' carbon footprint as global floor area is projected to double by 2060. With embodied carbon locked in at construction completion, immediate action is vital to meet climate targets since conventional materials like concrete and steel contribute heavily to construction's environmental impact.

Mass timber offers a transformative alternative with environmental benefits plus practical advantages: faster construction, lighter structures, strong seismic performance, and biophilic qualities that enhance occupant wellbeing. The market is expanding rapidly, projected to reach $2.15 billion by 2033, with innovations continually broadening its applications.

Highlights

1. 25 distinct challenges were identified that impede the adoption of mass timber. These challenges reveal interconnected barriers across technical, financial, and cultural domains that currently prevent mass timber from reaching its potential.
2. Six key challenge themes emerged: Experience, Cost, Confidence, Sourcing, Policy, and Carbon. These themes shape the mass timber implementation landscape for designers and were distilled through a multi-dimensional evaluation framework grounded in empirical data and theoretical insights.
3. There are precedents from design firms of successful case studies (e.g. projects, practices, research and policies) that were able to circumvent the major challenges.
4. Key resources already exist, but must be better leveraged by key industry groups, recognizing that mass timber adoption requires coordinated action across the entire building ecosystem.

25 Key Challenges Identified

This report presents findings from extensive research with 43 surveyed firms representing 409 offices, 12 in-depth workshops with leading architecture and engineering firms, and subject matter expert interviews across North America. Through rigorous analysis of both qualitative and quantitative data, we identified 25 distinct challenges that consistently emerged across diverse geographic regions and firm types.

Table 2 in the Key Findings section presents these challenges ranked by significance, with weights from 0-10 reflecting their relative impact on mass timber implementation. Each challenge is mapped across six thematic lenses (Experience, Cost, Confidence, Sourcing, Policy, and Carbon), with points distributed to show how each challenge manifests across multiple dimensions. This distribution reveals important patterns—while experience-related challenges are the most numerous, cost-related challenges carry higher average point allocations, reflecting their critical impact on project viability. The three highest-weighted challenges all contain significant cost components, highlighting economic considerations as primary barriers to mass timber adoption.

Understanding these interconnections is essential for developing effective interventions. For example, addressing contractor cost inflation (primarily a cost issue) also requires tackling experience gaps and confidence concerns. Similarly, improving supply chain verification would enhance both sourcing capabilities and carbon accounting accuracy.

Six Emerging Challenge Themes

The 25 challenges can be organized into six overarching challenge themes that frame the mass timber implementation landscape from the perspective of designers. These themes emerged through our research methodology as we analyzed survey data, workshop insights, and interview findings. During our analytical process, we developed a multi-dimensional evaluation framework based on both the collected data and relevant theoretical constructs identified in our literature review.

The six challenge themes—Experience, Cost, Confidence, Sourcing, Policy, and Carbon—were selected based on their prominence across all data sources and their ability to capture distinct yet interconnected dimensions of the mass timber implementation landscape:

1. ***Experience:* Technical Knowledge Gaps and Industry Know-how**

   The industry lacks practical mass timber knowledge, creating an "inexperience loop" where firms cannot secure projects without experience but cannot build experience without projects.

2. ***Cost:* Real and Inflated Financial Constraints**

   Mass timber faces actual cost premiums plus inflated estimates due to risk-averse contractor pricing and insurance rates that can be several times higher than for conventional construction.

3. ***Confidence:* Doubt in Mass Timber's Performance Potential**

   Persistent skepticism about mass timber's capabilities creates negative perception bias and insurance issues that limits opportunities, despite evidence supporting its structural integrity and fire resistance.

4. ***Sourcing:* Supply Chain Limitations and Bottlenecks**

   North American supply chains face fragmentation, limited manufacturing capacity, inconsistent availability, and logistical challenges including long transportation distances and procurement timing issues that delay projects and undermine sustainability benefits.

5. ***Policy:* Conflicting Regulatory Frameworks and Code Implementation**

   Mass timber's classification as a combustible material triggers additional requirements while inconsistent code adoption across jurisdictions creates regulatory uncertainty.

6. ***Carbon:* Misaligned Calculation Methodologies and Incentives**

   Lack of standardized carbon calculation methods and insufficient policy incentives for embodied carbon reduction create barriers for project teams. Municipalities struggle to control embodied emissions that cross jurisdictional boundaries, while inconsistent biogenic carbon accounting makes it difficult to consistently quantify environmental impacts.

Relative Importance of the Challenges and Themes

Understanding mass timber barriers requires looking beyond isolated obstacles to see their complex interdependencies. Our analysis of the 25 challenges reveals how these barriers reinforce one another across multiple dimensions—creating systemic resistance that no single intervention can overcome. By mapping each challenge across our six thematic areas, we've uncovered critical patterns that explain why mass timber adoption has been slower than its technical capabilities would suggest.

The stacked bar graph (Figure 2) illustrates how our 25 challenges distribute across the six thematic areas, with each bar representing the relative contribution of different themes to each challenge. Experience represents the largest category by number (appearing in 18 of 25 challenges), indicating the industry's fundamental need for technical skill development and knowledge sharing. However, cost-related challenges, while fewer in number (15 of 25), carry higher average higher average point allocations, reflecting their critical impact on project feasibility.

Confidence and Policy challenges cluster in the middle range, representing persistent but potentially addressable barriers, while

FIG 2: The cumulative impact of the 25 challenges, by theme

Sourcing challenges are concentrated in medium-weighted issues. Carbon challenges are the least numerous but remain important, particularly as climate considerations become increasingly central to construction decisions.

Success Stories and Solutions

Notable projects across North America demonstrate pathways to successful mass timber implementation.

Heartwood in Seattle

The Heartwood project in Seattle—the first Type IV-C timber building completed under the new tall-wood provisions of the 2021 IBC—achieved a 38% embodied carbon reduction (108% when including stored carbon) while creating 126 units of "missing middle" housing for residents earning 60-100% of Area Median Income. The project successfully navigated newly adopted code provisions, leveraged a $250,000 Wood Innovations Grant from the U.S. Forest Service, and employed regional sourcing within a 500-mile radius to reduce transportation carbon impacts while supporting local economies.

Fast + Epp's Concept Lab

Fast + Epp's Concept Lab demonstrates how dedicated firm-led research can advance technical solutions through systematic testing. Located in Fast + Epp's mass timber hybrid headquarters in Vancouver, the lab combines physical testing capabilities with digital innovation. Their research on point-supported CLT, seismic performance, and connection systems has produced tangible outcomes, including the development of parametric design tools that enable significant material optimization in structural frames, reducing costs while enhancing sustainability.

NYC Mass Timber Studio

The NYC Mass Timber Studio exemplifies how strategic collaboration can overcome implementation barriers in challenging urban contexts. This technical assistance program launched by the New York City Economic Development Corporation (NYCEDC) brings together design teams, developers, regulatory agencies, and technical experts to advance multiple projects toward development. The initiative has already yielded tangible results, including the Walter Gladwin Recreation Center in the Bronx receiving building permits, and the NYC Department of Buildings publishing its first Technical Bulletin on mass timber, establishing clear guidance for future projects.

Limberlost Place in Toronto

In Toronto, Limberlost Place showcases innovative structural solutions that advance institutional mass timber construction. This pioneering 10-story, 225,000 SF educational building features a unique "beamless" structural system comprising glulam columns and CLT/concrete composite panels. The project team conducted extensive research with UNBC and Beiberech University to validate the performance of novel timber-concrete composite connections and developed specialized moisture management protocols to address unpredictable weather conditions—a critical risk for mass timber projects.

Fire Tests for Code Changes in the ICC

Pioneering fire testing initiatives led by the International Code Council, American Wood Council, and the USDA Forest Service, with support from Susan Jones of atelierjones, provided the scientific foundation for code changes enabling mass timber buildings up to 18 stories. The 2017 tests at the ATF facility and 2020 testing in Sweden with the RISE Institute included sustained four-hour fires without sprinkler or fire department intervention. The 2020 results led to further code updates in 2022, including changes to the Type IV-B provisions that increased the allowable percentage of exposed wood ceilings and beams from 20% to 100%.

Kaiser Borsari Hall
Kaiser Borsari Hall at Western Washington University demonstrates how mass timber can effectively integrate with advanced technologies in STEM education. This $53M Type III-B lab building achieved a 63% embodied carbon reduction and 100% operational carbon reduction while addressing vibration concerns through strategic programming. The project eliminated a planned basement level, saving $2.1M and reducing carbon emissions by 226 tCO_2, while its all-electric systems leverage WWU's PSE Green Direct program for 100% renewable energy. The project's success prompted WWU to mandate mass timber for all future projects as part of their sustainability action plan targeting carbon neutrality by 2035.

Amherst College
The Amherst College Student Center & Dining Commons exemplifies successful integration of mass timber with adaptive reuse strategies. This 144,000 SF project innovatively repurposes the concrete foundation of the former Merrill Science Center, preserving embodied carbon while demonstrating how mass timber can complement existing structures in campus renewal efforts. The project team employed advanced form-finding techniques to integrate mass timber components with the existing foundation structure, building in appropriate tolerances to manage the precise nature of prefabricated mass timber against the more variable existing conditions.

These successful implementations showcase how thoughtful design approaches, regulatory collaboration, and innovative structural solutions can overcome the identified challenges while delivering projects that balance environmental performance, economic viability, and occupant wellbeing.

Report Recommendations for Key Industry Groups

Based on our comprehensive analysis of the 25 challenges impeding mass timber adoption, we have developed targeted recommendations for five key industry groups. Each recommendation addresses multiple interconnected barriers while providing clear pathways for action. More guidance and resources for implementing these strategies are available in the Concluding Thoughts & Recommendations section of this report.

Recommendations for Architects and Engineers

1. **Demonstrate Cost Competitiveness -** Push design teams toward cost-effective solutions and present comprehensive value propositions that address holistic costing gaps and contractor cost inflation.
2. **Build Deep Material Understanding -** Invest in comprehensive material education and commit to partnering with experienced firms to break the inexperience loop.
3. **Design in Timber from the Beginning -** Consider timber from project inception and foster true architect-engineer collaboration through early engagement approaches.
4. **Integrate Carbon Analysis into Early Design Decision-Making -** Make life cycle assessment standard practice during schematic design when material selections and design decisions can still influence project outcomes.

Recommendations for Building Contractors

1. **Adapt Cost Management and Procurement Approaches -** Build comprehensive supplier knowledge, implement detailed cost tracking systems, and advocate for procurement-friendly design approaches.
2. **Invest in Direct Experience -** Visit manufacturing facilities, study completed buildings, and engage with industry education to build confidence and expertise.
3. **Embrace Collaborative Project Delivery Methods -** Be receptive to early engagement opportunities and advocate for delivery methods that optimize mass timber project success.

Recommendations for Mass Timber Supply Chain

1. **Enhance Industry Access and Education** - Expand facility tour programs and invest in technical support capacity to build AEC community knowledge.
2. **Optimize Production and Material Efficiency** - Develop closer sawmill relationships and enhance production processes to improve cost competitiveness.
3. **Support Product Standardization Efforts** - Collaborate on industry standards and develop product interchangeability to reduce project complexity.
4. **Strengthen Supply Chain Transparency** - Document sourcing practices and make environmental documentation accessible to support project sustainability narratives.

Recommendations for Governments

1. **Lead Through Direct Procurement-** Specify public buildings in mass timber and create market signals through government procurement preferences.
2. **Modernize Regulatory Frameworks** - Accelerate code adoption, develop consistent approval processes, and enable jurisdictional learning.
3. **Develop Carbon and Sustainability Incentives -** Implement embodied carbon policies and create economic incentives that translate carbon reduction into economic value.
4. **Develop Carbon and Sustainability Incentives** - Implement embodied carbon policies and create economic incentives that translate carbon reduction into economic value.

Recommendations for Industry Influencers

1. **Scale Contractor Education and Training Programs -** Expand construction management training capacity and develop comprehensive cost education resources.
2. **Strengthen Partnerships with Public and Educational Institutions -** Support public-private collaboration and expand educational institution partnerships beyond current architect-focused programs.

These coordinated actions across all stakeholder groups are essential for reaching mass timber's tipping point in North American construction markets.

Priority Actions for Industry Transformation

Of these recommendations, the highest-impact actions focus on cost and experience: architects and engineers demonstrating cost competitiveness, contractors investing in direct learning, supply chain partners supporting standardization efforts, governments leading through procurement, and industry influencers scaling contractor education. These represent the essential first steps for each stakeholder group.

Future Research Opportunities

This research represents a significant milestone in understanding mass timber adoption challenges, but it is designed as one phase of ongoing work meant to be continued and refined by others. While this study successfully captured the perspectives of architects and engineers, it represents one subset of voices within the broader mass timber community. Future research should prioritize targeted engagements with building contractors, developers, and supply chain partners whose perspectives are essential for understanding the full spectrum of implementation challenges and opportunities.

Looking Ahead

Mass timber stands at a critical juncture—a potential tipping point. The path forward requires coordinated action across all stakeholder groups, but the opportunity is transformative. Our research demonstrates that while scaling mass timber faces significant challenges, there are clear pathways forward. By implementing these recommendations, North America has the potential to lead the world in sustainable, low-carbon building practices. The time for action is now.

Methods

This report presents findings from a comprehensive mixed-methods study examining mass timber implementation across North America's architecture and engineering sectors. Our research identified 25 key challenges analyzed through six overlapping themes: Experience, Cost, Confidence, Sourcing, Policy, and Carbon. This framework provides a structured approach for understanding both challenges and solutions in the mass timber sector.

Research Design and Approach[20]

The study employed a sequential explanatory mixed-methods approach, beginning with a comprehensive literature review to establish foundational understanding of the mass timber landscape. This was followed by quantitative survey data collection and qualitative workshops and interviews, providing both breadth and depth to our analysis. This design enabled triangulation across multiple data sources, strengthening the validity and reliability of findings.

The literature review examined academic research, industry reports, regulatory documentation, case studies, and industry knowledge platforms to establish current understanding and identify knowledge gaps in mass timber implementation. This foundation informed the development of our survey and workshop protocols.

Survey Implementation

Our initial research phase centered on a comprehensive industry survey developed through collaboration between Architecture 2030, Pilot Projects, and leading industry experts. The survey targeted 167 architectural and engineering firms across North America, representing diverse firm sizes, geographic locations, and mass timber experience levels. Firms received both digital access through Survey Monkey and printable versions, enabling collaborative input across departments and office locations. This approach achieved a 26% response rate with 43 firms participating, collectively representing over 400 North American offices and studios.

The survey consisted of 42 questions covering firm demographics, mass timber experience, project outcomes, implementation barriers, and future outlook. Analysis followed a rigorous three-stage process: (1) initial examination using Survey Monkey's native analytics tools to establish baseline patterns; (2) comprehensive data standardization, coding responses into a unified dataset; and (3) advanced analysis using PowerDrill AI and Claude AI to identify emerging patterns and industry trends.

In-Person Workshops

Building on survey findings, we conducted twelve in-depth, day-long Mass Timber Expertise Exchange Workshops during 2024-2025 with selected architectural and engineering firms across North America. These workshops engaged more than 80 architecture, engineering, and construction professionals, accumulating 100+ hours of direct industry engagement and 1000+ hours of transcript content. Participating firms ranged from pioneering mass timber specialists to those with limited mass timber experience, ensuring diverse perspectives.

Each workshop followed a structured format designed to explore firms' experiences with mass timber, document successes and challenges, and identify systemic barriers to wider adoption. Workshop activities included:

1. **Experience sharing sessions:** Participants shared concrete examples from their mass timber projects, focusing on both successes and challenges.
2. **Structured mapping exercises:** Firms created mind maps highlighting internal strengths and weaknesses as well as external opportunities and challenges related to mass timber implementation.
3. **Case study discussions:** Detailed exploration of specific mass timber projects highlighted practical implementation issues and successful solutions.
4. **Supply chain analysis:** Examination of firms' approaches to sourcing mass timber and their relationships with manufacturers and suppliers.

20 The full methodology, including detailed descriptions of analytical processes, assessment frameworks, and limitations, is provided in Appendix A.

Workshop Agenda: 9:30 am - 4:00 pm (5 hr + 1.5 hr breaks)				
Time	**#**	**Activity**	**Duration**	**Led by**
9:00		Breakfast provided by Mass Timber Tipping Point Intros & late entries Agenda quick review	30min	PP/2030
9:30	1.	Vision → what does Mass Timber mean to the firm?	15 min	Firm
		Context for the workshop will be delivered by facilitators.	15 min	PP/2030
10:00	2.	*Timber Tales* - Firms will be asked to present two (2) stories about their mass timber projects, one achievement and one set of lessons learned.	20 min	Firms
10:20	3.	*Survey Summary* - In this discussion based activity, workshop facilitators will compare high level insights from the MTTP survey with firm's responses. This will help set the stage for the *Defining Success* activity.	30 min	PP/2030
10:50		——————— *Coffee break* ———————	15 min	
11:05	4.	*Defining Success* - In this discussion and whiteboard activity, workshop facilitators will take insights from the *Timber Tales* and *Survey Summary* activities to stimulate a conversation aimed at uncovering what success in mass timber looks like for participants, both currently and in the future.	60 min	PP/2030
12:05		——————— *Lunch break* ———————	60 min	
1:05	5.	*SWOC Mind Mapping : Strengths, Weaknesses, Opportunities and Challenges* - In this visualization activity, workshop facilitators will collaborate with firm to diagrammatically map out the firm's experience integrating mass timber in its projects.	40 min	PP/2030
13:45		——————— *Coffee break* ———————	15 min	
14:00	6.	*Barriers to Scale* - Workshop facilitators will lead a large group discussion based on the *SWOC Mind Mapping* activity to identify the barriers that the firm faces in scaling up its mass timber use.	60 min	PP/2030
15:00	7.	Wrap up discussion	30 min	PP/2030
15:30		End		

Agenda of a Workshop Conducted. *Source:* Architecture2030 & Pilot Projects, 2024.

Data Collection and Analysis Methods

A multi-channel approach ensured comprehensive data capture across all research activities. Workshop sessions were recorded using live virtual transcription tools, generating detailed transcripts converted to PDF format and analyzed using AI-powered tools. Additional documentation methods included visual mapping exercises, participant worksheets, and facilitator field notes. The research team synthesized these diverse data sources with direct workshop outputs, stakeholder feedback, and facilitator observations to create comprehensive summaries shared with participating firms for validation.

The challenge identification process followed a grounded theory approach with three coding phases:

1. **Open coding:** Initial review of all data sources to identify emergent themes generated approximately 35 preliminary challenge codes
2. **Axial coding:** Systematic organization of preliminary codes into related clusters reduced the number to 30 distinct challenge categories
3. **Selective coding:** Final refinement resulted in the 25 key challenges presented in this report, prioritizing those that appeared across multiple data sources and geographic contexts

For systematic assessment of identified challenges, we developed a multi-dimensional evaluation framework. The six challenge themes emerged from both the research data and relevant theoretical constructs in sustainable construction literature. For each theme, specific evaluation criteria were established to ensure consistent analysis across challenges.

Challenges were prioritized through a mixed-methods weighting process incorporating frequency analysis, impact assessment, cross-sectional analysis, and solution feasibility. This resulted in a tiered categorization of challenge significance, providing readers with clear understanding of each challenge's relative importance.

Validation Measures

Several measures ensured validity and reliability:

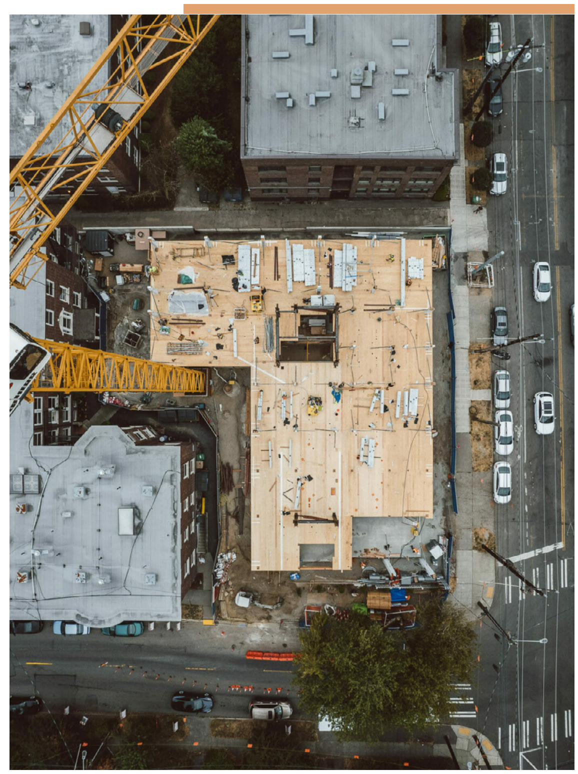
1. **Triangulation:** Challenges were validated through multiple data sources, prioritizing those appearing consistently across survey responses, workshop discussions, interviews, and debriefing sessions.
2. **Expert validation:** A panel of industry experts reviewed the challenge framework and assessment.
3. **Participant verification:** Draft findings were shared with participants, who provided detailed feedback on accuracy and completeness.
4. **Negative case analysis:** The research team actively sought contradictory evidence for each challenge.

While robust in design and execution, this methodology has limitations including self-selection bias, temporal limitations capturing a rapidly evolving sector, geographic concentration of participants, organizational-level perspective, and reduced scope of debriefing workshops due to funding constraints.

Key Findings

This study synthesizes research findings from surveys, workshops, and structured discussions with leading architecture and engineering firms across North America. Through these extensive engagements, we identified 25 distinct challenges that currently limit the adoption of mass timber in the building industry. These barriers, which range from technical knowledge gaps to regulatory hurdles, have been systematically analyzed and weighted to provide a structured understanding of the mass timber implementation landscape.

Our research methodology combined quantitative survey data from 43 firms (representing over 400 North American offices) with qualitative insights from twelve in-depth workshops involving more than 80 building industry professionals. This mixed-methods approach allowed us to examine each challenge through six overlapping emerging themes: Experience, Cost, Confidence, Sourcing, Policy, and Carbon – providing a comprehensive framework for both understanding barriers and identifying opportunities in the mass timber sector.



Heartwood project under construction.
Image Source: Timberlab, courtesy of atelierjones. 2024.

The 25 Challenges: Ranked and Weighted

Table 2 (Pg 19) represents our analysis of the 25 key challenges identified through our research. To determine the significance of each challenge, we employed a mixed-methods weighting process that incorporated both quantitative metrics and qualitative assessment:

1. **Frequency analysis:** We quantitatively measured how often each challenge was mentioned across survey responses and workshop transcripts, with frequency indices normalized by data source.

2. **Impact assessment:** We qualitatively evaluated the severity of each challenge's impact on project outcomes, based on case examples provided by participants.

3. **Cross-sectional analysis:** We examined how challenges manifested differently across geographic regions, firm sizes, and project types.

4. **Solution feasibility:** We assessed the actionability and potential pathways to address each challenge, informed by participant-generated solution concepts.

These four dimensions were integrated into a composite significance score for each challenge (represented as a weight out of 10), enabling their relative prioritization. Additionally, each challenge has been analyzed through our six challenge themes, with points distributed to show how strongly each challenge relates to each theme.

Table 2: 25 Unique Challenges

1.	Holistic Costing Gaps	10/10 WEIGHED IMPORTANCE	Costing methods typically emphasize well-known itemized comparisons over lesser-known systemic savings.	3 Experience	6 Cost	1 Confidence	0 Sourcing	0 Policy	0 Carbon
2.	Limited Expert Contractors	10/10 WEIGHTED IMPORTANCE	The scarcity of qualified mass timber installers leads to bottlenecks and exaggerates price pressures.	6 Experience	2 Cost	1 Confidence	1 Sourcing	0 Policy	0 Carbon
3.	Contractor Cost Inflation	10/10 WEIGHTED IMPORTANCE	Construction firms apply substantial risk premiums when undertaking mass timber projects.	2 Experience	7 Cost	1 Confidence	0 Sourcing	0 Policy	0 Carbon
4.	Lack of Product Standardization	9/10 WEIGHTED IMPORTANCE	The diversity of strength, appearance, and dimensional characteristics across mass timber producers and products (i.e., connectors and panels)complicates the design and procurement process.	4 Experience	1 Cost	0 Confidence	4 Sourcing	0 Policy	0 Carbon
5.	Insufficient Leadership Advocacy	9/10 WEIGHTED IMPORTANCE	Many design professionals have low risk tolerances and lack in-house mass timber experience resulting in a hesitancy to promote it during client consultations.	5 Experience	0 Cost	4 Confidence	0 Sourcing	0 Policy	0 Carbon
6.	Values Versus Priorities	8/10 WEIGHTED IMPORTANCE	Sustainability benefits emphasized by designers often remain secondary to client cost considerations and business realities.	1 Experience	2 Cost	3 Confidence	1 Sourcing	1 Policy	0 Carbon
7.	Building Code Modernization	8/10 WEIGHTED IMPORTANCE	Regulatory framework modernization and adoption lags behind timber construction technology advancement.	1 Experience	1 Cost	1 Confidence	0 Sourcing	5 Policy	1 Carbon
8.	Material Cost Competition	8/10 WEIGHTED IMPORTANCE	Mass timber structural systems typically exceed concrete and steel in base material costs.	1 Experience	5 Cost	1 Confidence	1 Sourcing	0 Policy	0 Carbon
9.	Regulatory & Permitting Inconsistencies	7/10 WEIGHTED IMPORTANCE	Jurisdictional authorities evaluate performance-based solutions without standardized assessment frameworks.	2 Experience	0 Cost	0 Confidence	0 Sourcing	5 Policy	0 Carbon
10.	Fire Safety Perception	7/10 WEIGHTED IMPORTANCE	Regulatory bodies and insurers maintain reservations regarding mass timber's fire performance despite technical evidence and longstanding historical data on heavy timber use in buildings.	1 Experience	0 Cost	4 Confidence	0 Sourcing	2 Policy	0 Carbon
11.	Not Valuing Carbon	7/10 WEIGHTED IMPORTANCE	Insufficient regulatory mechanisms incentivize comprehensive life-cycle assessment implementation.	0 Experience	1 Cost	1 Confidence	Sourcing	1 Policy	4 Carbon
12.	Designer Inexperience Loop	7/10 WEIGHTED IMPORTANCE	Emerging firms without demonstrated expertise encounter self-reinforcing barriers to entering the mass timber sector.	2 Experience	1 Cost	4 Confidence	0 Sourcing	0 Policy	0 Carbon

Table 2: 25 Unique Challenges

#	Challenge	Weighted Importance	Description	Experience	Cost	Confidence	Sourcing	Policy	Carbon
13.	Geographic Supply Constraints	6/10	The lack of local production facilities present challenges in material transportation logistics.	0	1	0	5	0	0
14.	Unique Project Delivery Requirements	6/10	Conventional project delivery contracts may prove incompatible with timber-specific needs.	4	1	0	0	1	0
15.	General Contractor Resistance	6/10	Contractors that self-perform subcontracts like concrete face financial disincentives to transition to timber systems.	0	4	2	0	0	0
16.	Public Procurement Policies	6/10	Government procurement criteria restricts alternative structural systems like mass timber.	0	1	0	0	4	1
17.	Negative Perception Bias	4/10	Isolated implementation failures receive disproportionate attention relative to successful applications.	0	0	3	1	2	0
18.	Technical Skill Development	5/10	Professional development in mass timber requires substantial knowledge acquisition investment and direct experience.	3	2	0	0	0	0
19.	Gatekeeping Knowledge	5/10	Protecting market advantages restrict industry-wide knowledge dissemination and collaborative advancement.	2	0	2	0	1	0
20.	Expanded Service Requirements	5/10	Architecture and engineering firms are forced to expand their services beyond the traditional professional scope, often with little to no financial incentives or support.	3	1	0	1	0	0
21.	Procurement & Installation Timeline	5/10	Extended material acquisition periods complicate construction sequencing and project scheduling.	1	1	0	3	0	0
22.	Achieving Building Certifications	5/10	Environmental certification requirements occasionally conflict with local sourcing desires and regional material availability.	0	1	0	2	1	1
23.	Carbon Calculation Complexity	4/10	Biogenic carbon assessment methodologies lack standardization across platforms, standards, policies and rating systems.	1	0	0	0	0	3
24.	Supply Chain Verification	3/10	Lack of supply chain transparency presents challenges in verifying environmental claims.	0	0	0	2	0	1
25.	Structural Analysis Tools	3/10	Performance analysis software typically used for regulatory compliance requires calibration for mass timber's distinctive material properties.	2	0	0	0	1	0

Six Challenge Themes

The 25 challenges identified in Table 2 can be organized into six overarching challenge themes that frame the mass timber implementation landscape from the perspective of designers. These themes emerged through our research methodology as we analyzed survey data, workshop insights, and interview findings. During our analytical process, we developed a multi-dimensional evaluation framework based on both the collected data and relevant theoretical constructs identified in our literature review.

The six challenge themes—Experience, Cost, Confidence, Sourcing, Policy, and Carbon—were selected based on their prominence across all data sources and their ability to capture distinct yet interconnected dimensions of the mass timber implementation landscape:

1. *Experience:* Technical Knowledge Gaps And Industry Know-How

The mass timber industry faces a critical shortage of practical experience across the entire building sector. One study found that approximately 55% of U.S. construction firms have no experience with mass timber projects, and among those with experience, the majority have less than one year (Ahmed & Arocho, 2020). This knowledge gap spans all aspects of mass timber implementation, from design and engineering to installation and systems integration. Workshop participants consistently highlighted an inexperience loop where firms struggle to secure mass timber projects without demonstrated experience, but cannot build experience without projects. The problem extends to coordination between stakeholders, with many practitioners identifying poor coordination as a significant barrier. Mass timber construction requires early and sustained collaboration between designers, manufacturers, and contractors – a significant departure from traditional project delivery methods. Despite valuable resources provided by organizations like WoodWorks, which offers free project assistance, education, and design tools, the industry still lacks sufficient established professional development pathways and widespread knowledge-sharing networks. These gaps continue to hinder many firms' ability to build and maintain the specialized expertise needed for mass timber implementation at scale.

2. *Cost:* Real and Inflated Financial Constraints

Financial barriers present persistent challenges to mass timber adoption in North America. Studies indicate that mass timber typically costs 2-5% more than conventional concrete and steel building constructions, but the perceived cost premium is often much higher due to risk-averse contractor pricing (Ahmed & Arocho, 2020). Our workshops consistently identified contractor cost inflation as a primary barrier, where general contractors unfamiliar with mass timber apply substantial risk premiums to their bids. This inflation varies regionally, with areas having fewer built examples experiencing higher cost premiums. The financial picture is further complicated by construction insurance concerns, with documented cases where insurance for mass timber buildings cost five times more than for conventional construction, adding hundreds of thousands of dollars to project budgets. These higher costs stem from industry uncertainty about fire safety and water damage risks, despite technical evidence demonstrating mass timber's resilience. Lenders' unfamiliarity with mass timber projects often leads to financing challenges, creating additional barriers for project teams.

3. *Confidence:* Doubt in Mass Timber's Performance Potential

Industry skepticism about mass timber's performance capabilities continues to hinder its widespread adoption. Despite extensive testing demonstrating mass timber's fire resistance and structural integrity, workshop discussions consistently revealed persistent concerns about its long-term durability and safety. This skepticism is particularly pronounced among lenders, insurers, clients, and code officials, who tend to focus disproportionately on isolated failures rather than successful implementations. The research identified persistent challenges with conservative fire design requirements and emotional responses to wood construction that create significant barriers. Unlike structural engineering, which follows clear performance-based pathways, fire protection often faces prescriptive requirements and jurisdictional resistance to alternative solutions, even when testing data supports them. This perception problem creates a reinforcing cycle: as negative perceptions persist, fewer projects move forward, limiting the number of successful examples that could help shift industry attitudes.

4. *Sourcing:* Supply Chain Limitations and Bottlenecks

North American mass timber supply chains suffer from fundamental structural challenges that distinguish them from their more integrated European counterparts. Unlike European manufacturers who often control their wood supply through vertically integrated operations, North American suppliers typically operate in a more fragmented environment. This fragmentation leads to coordination challenges, limited standardization, and increased costs. Manufacturing complexities further strain the supply chain, as mass timber requires lumber dried to 15% moisture content, compared to the 19% standard for dimensional lumber (Allen, Bentley and Leung, 2024; Syed, 2020). This difference, combined with limited manufacturing facilities and inconsistent lumber specifications, creates significant supply constraints and efficiency challenges throughout the production process.

Geographic supply constraints emerged as a significant theme across multiple workshops, with many regions experiencing a complete absence of local mass timber suppliers. Even in timber-rich regions, limited manufacturing capacity creates procurement challenges. These geographic limitations often result in long transportation distances, increasing both costs and carbon footprints – paradoxically undermining one of mass timber's key sustainability benefits.

5. *Policy:* Conflicting Regulatory Frameworks and Code Implementation

Regulatory frameworks and building codes continue to create significant implementation hurdles for mass timber construction. Despite evidence of mass timber's fire resistance, its classification as a combustible material triggers additional requirements and costs. Our research identified how inconsistent code adoption across jurisdictions creates uncertainty for developers and designers, while varying approval processes complicate project planning and execution.

Many major cities lag behind national standards in building code updates, often being one full iteration behind other jurisdictions that have adopted newer International Building Code versions allowing for taller mass timber buildings. Skepticism from local authorities, particularly fire departments, adds to the challenge, often due to the lack of extensive data on mass timber buildings. This makes it difficult for insurers and approval committees to accurately assess and price risk. The lack of standardized incentives for sustainable construction further complicates the policy landscape. Without consistent regulatory support and clear pathways for approval, many project teams find it difficult to justify the additional effort required to pursue mass timber solutions.

6. *Carbon:* Misaligned Calculation Methodologies and Incentives

While the carbon benefits of mass timber are widely recognized, the industry struggles with standardization and verification challenges. The complexity of carbon benefit calculations, combined with limitations in current software tools, makes it difficult to consistently quantify environmental impacts. Our workshops revealed varying approaches to carbon accounting, with some practitioners excluding biogenic carbon from calculations to provide more conservative estimates, while others highlighted the challenges of communicating carbon benefits to clients without standardized metrics. Additionally, public misconceptions about forest harvesting and inconsistent treatment of biogenic carbon across rating systems create further barriers, compounded by evolving research and data quality issues.Integration of life cycle assessments into design processes remains challenging, particularly given the gaps in long-term carbon storage data. These challenges in measuring and verifying carbon benefits can make it difficult for project teams to justify mass timber adoption purely on environmental grounds. The industry needs more robust and standardized methodologies for calculating and communicating carbon benefits to support widespread adoption.

Relative Importance of the Challenges and Themes

Understanding mass timber barriers requires looking beyond isolated obstacles to see their complex interdependencies. Our analysis of the 25 challenges reveals how these barriers reinforce one another across multiple dimensions—creating systemic resistance that no single intervention can overcome. By mapping each challenge across our six thematic areas, we've uncovered critical patterns that explain why mass timber adoption has been slower than its technical capabilities would suggest.

The stacked bar graph (Figure 3) illustrates how our 25 challenges distribute across the six thematic areas, with each bar representing the relative contribution of different themes to each challenge.

This visualization reveals important patterns in the mass timber implementation landscape:

1. Experience challenges are most numerous but vary in significance, highlighting the industry's broad need for knowledge development across multiple domains.
2. Cost challenges, while fewer, carry the higher average point allocations, underscoring their critical impact on project viability.
3. Confidence and Policy challenges cluster in the middle range, representing persistent but not insurmountable barriers.
4. Sourcing challenges are concentrated in medium-weighted issues, reflecting supply chain limitations that are significant but potentially addressable through industry development.
5. Carbon challenges are the least numerous but remain important, particularly as climate considerations become increasingly central to construction decisions.

The overlapping nature of these challenges highlights the need for integrated solutions that address multiple barriers simultaneously. For example, addressing contractor cost inflation (primarily a cost issue) also requires tackling experience gaps and confidence concerns. Similarly, supply chain verification improvements would enhance both sourcing capabilities and carbon accounting accuracy.

This multidimensional analysis provides a framework for prioritizing interventions and developing coordinated strategies to overcome the barriers to mass timber adoption. In the subsequent chapter, we will take a deeper look at each of specific solutions that address these interconnected challenges, with particular focus on high-impact opportunities that can accelerate the industry's transition toward sustainable mass timber construction.

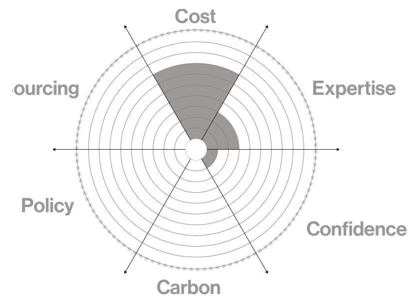
FIG 3: The interconnection of the 25 challenges according to their sectors of impact.

25 Challenges: A Closer Look

This chapter explores the 25 specific challenges to the wider adoption of mass timber in North American construction derived from our extensive engagement with leading architecture and engineering firms across the continent. While mass timber offers compelling environmental and performance benefits, these systemic obstacles—ranging from cost uncertainties and technical barriers to regulatory inconsistencies and experience gaps—continue to limit its implementation. Each challenge is examined through both the firm-specific experiences and industry-wide knowledge. The goal of this detailed list is to provide enough specificity that these challenges can be strategically addressed, individually and in systemic batches, through pilots, new policies and other creative approaches by the diverse stakeholders involved.

A Mass Timber building under construction in Toronto, Ontario.
Source: Pilot Projects, 2022.

1. Holistic Costing Gaps



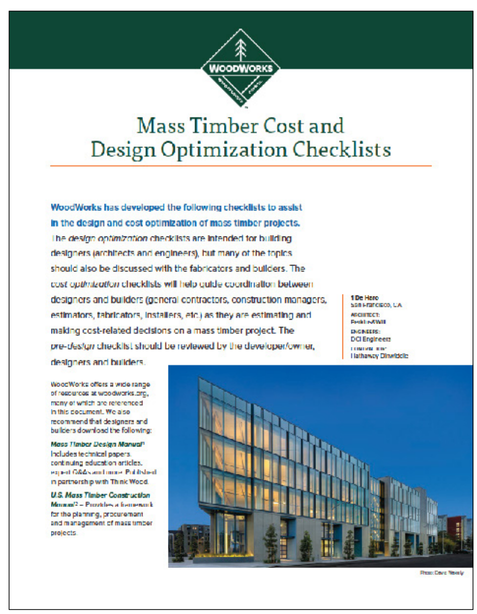
Accurately estimating the true cost of mass timber projects requires a comprehensive approach that many in the industry struggle to implement. Workshop participants identified that conventional cost estimation approaches often fail to capture the full economic picture of mass timber construction.

The core challenge is evaluating mass timber's total impact on project costs beyond just the structural system. Workshop participants emphasized that while the structural elements of mass timber typically carry a premium compared to concrete or steel, this analysis misses significant cost benefits in other areas. These benefits include reduced foundation sizes, reduced finishing requirements where wood is exposed, faster erection times, and accelerated project schedules that allow earlier occupancy.

Participants described how current estimation practices tend to make a structure-to-structure comparison rather than capturing associated benefits and schedule advantages. This segmented approach makes it particularly difficult to demonstrate the full value proposition of mass timber, as its benefits often manifest across multiple line items in the construction budget.

Workshop participants noted that early-phase cost estimation is particularly problematic for mass timber adoption. Without comprehensive data that accounts for these integrated benefits, teams frequently eliminate mass timber during schematic design based solely on structural cost comparisons.

> *"The industry as a whole faces challenges with comprehensive cost evaluation for mass timber. Even with experienced partners, we have noticed that analyzing comparative costs across different construction typologies can be complex. This is an area where the continued development of standardized holistic costing practices would benefit all stakeholders."*
>
> **- Arcadis**



WOODWORKS

Mass Timber Cost and Design Optimization Checklists

WoodWorks has developed the following checklists to assist in the design and cost optimization of mass timber projects.

The *design optimization* checklists are intended for building designers (architects and engineers), but many of the topics should also be discussed with the fabricators and builders. The *cost optimization* checklists will help guide coordination between designers and builders (general contractors, construction managers, estimators, fabricators, installers, etc.) as they are estimating and making cost-related decisions on a mass timber project. The *pre-design* checklist should be reviewed by the developer/owner, designers and builders.

1 De Haro
San Francisco, CA
ARCHITECT:
Perkins&Will
ENGINEERS:
DCI Engineers
Hathaway Dinwiddie

WoodWorks offers a wide range of resources at woodworks.org, many of which are referenced in this document. We also recommend that designers and builders download the following:

Mass Timber Design Manual – Includes technical papers, continuing education articles, expert Q&As and more. Published in partnership with Think Wood.

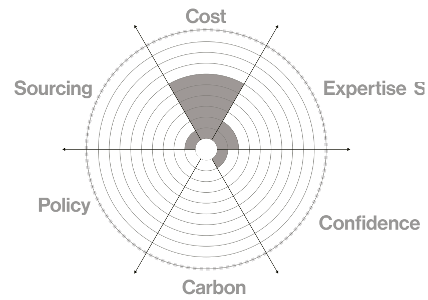
U.S. Mass Timber Construction Manual – Provides a framework for the planning, procurement and management of mass timber projects.

Photo: Dave Weekly

WoodWorks provide specialized technical documents designed to help professional architects and engineers enhance their expertise. Source: WoodWorks, 2022.

Holistic Costing Gaps	Costing methods typically emphasize well-known itemized comparisons over lesser-known systemic savings.					
10/10 WEIGHED IMPORTANCE	3 Experience	6 Cost	1 Confidence	0 Sourcing	0 Policy	0 Carbon

2. Limited Expert Contractors



The scarcity of contractors experienced with mass timber installation emerged as a significant barrier across North America. Multiple workshops highlighted how contractors' unfamiliarity with mass timber often exhibit subjective risk aversion towards using the material, which leads to conservative approaches and missed opportunities for optimization. While the Pacific Northwest has a more developed mass timber ecosystem than most North American regions, even there, experienced contractors remain limited in number. Workshop participants noted that only a small subset of contractors in any region have developed significant mass timber expertise through repeated projects, creating a scarcity of qualified installers across the continent.

Moisture management during construction emerged as a particular pain point across multiple firm interviews. Architecture and engineering teams consistently highlight moisture issues during construction and water leakage during use as significant challenges. There are concerns about public perception, with stakeholders often believing moisture problems are more significant for timber than other materials. Without proper moisture control protocols and experience, contractors may create long-term damage that undermines mass timber's durability, performance and aesthetics.

The experience gap extends beyond physical construction to project planning and trade coordination. Contractors inexperienced with mass timber often struggle to accurately schedule installation sequences and manage the interdependencies between different trades. This coordination challenge is particularly critical with mass timber construction, where improper sequencing or unauthorized field modifications can compromise the material's structural integrity.

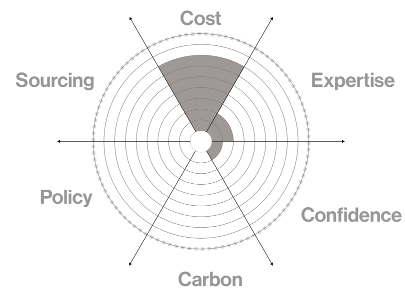
Workshop participants described instances where contractors allowed trades to drill unauthorized penetrations through structural elements or improperly handled prefabricated components, creating both immediate safety issues and long-term performance problems.

> *"We need more suppliers to increase competitiveness in the construction market. We need more education to owners and contractors to alleviate the perceived risk of the new material and avoid excess premiums. And we need more new and existing projects, which will help create a comfort level with the material, reducing the perceived risks to owners, contractors, insurers and the like."*
>
> **- Thornton Tomasetti**

These coordination challenges often prevent mass timber projects from achieving one of their key potential advantages - rapid construction through prefabrication. Several workshops noted that actual construction timelines frequently fell short of theoretical efficiency gains due to contractor learning curves and the complex dance of coordinating multiple trades around a less familiar structural system. The result is that many mass timber projects don't fully realize the schedule benefits that make them financially competitive with conventional construction methods.

Limited Expert Contractors	The scarcity of qualified mass timber installers leads to bottlenecks and exaggerates price pressures.					
10/10 WEIGHTED IMPORTANCE	6 Experience	2 Cost	1 Confidence	1 Sourcing	0 Policy	0 Carbon

3. Contractor Cost Inflation



Building contractors frequently add perception-based risk premiums when pricing mass timber projects due to their limited experience with the material. In the Pacific Northwest, despite having a relatively more established mass timber ecosystem compared to other North American regions, one firm reported contractors adding up to 20% in contingency fees compared to concrete or steel projects. The issue of contractor cost inflation emerged as a challenge across different regions, but with varying intensities. In areas with the most experienced contractors and mass timber suppliers, some contractors are better able to estimate the true cost of mass timber pricing as they gain experience and have more internal historical data on which they rely. Meanwhile, firms in regions with less mass timber development report that risk premiums from inexperienced contractors can significantly impact project feasibility.

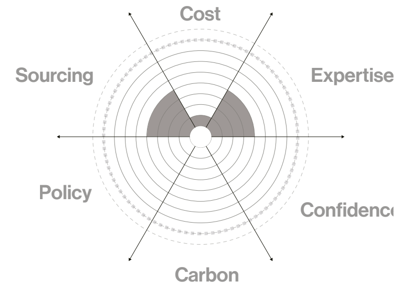
This inflated pricing creates a self-reinforcing cycle where fewer projects move forward with mass timber, limiting opportunities for contractors to gain experience and confidence in accurate pricing. The problem is especially evident when general contractors join projects during early concept design phases. Without mass timber experience, these contractors tend to steer projects toward traditional materials they're more familiar with or materials they can self-perform. This creates financial incentives to avoid mass timber, as contractors often prioritize systems they can install themselves rather than conducting objective cost analysis that might favor innovative solutions. This self-performance aspect, explored further in Challenge 8, creates additional economic disincentives for contractors to recommend mass timber solutions.

> *"Costing challenges represent 90% - 95% of the problems that we face getting mass timber into our projects. This includes early accurate costing, and holistic costing that compares apples to apples and includes the benefits with the additional expense. The remaining problems tend to relate to finding contractors with the necessary mass timber expertise we need to ensure the project's success."*
>
> **- Fast + Epp**

This study compares the value potential of mid-rise timber construction in British Columbia. *Source:* BC Housing Research Centre, 2022.

Contractor Cost Inflation	Construction firms apply substantial risk premiums when undertaking mass timber projects.					
10/10 WEIGHTED IMPORTANCE	2 Experience	7 Cost	1 Confidence	0 Sourcing	0 Policy	0 Carbon

4. Lack of Product Standardization



The lack of standardized mass timber products and assemblies creates uncertainty in this design process, which can lead to inefficiency, increased costs, and challenges in material procurement. Standardization applies not just to the timber, but to connection details, and building assemblies, which must be "reinvented" on every project.

Currently, most mass timber components are fabricated on a project-by-project basis, leading to inefficiencies and increased costs. Workshop discussions revealed that manufacturers often customize panel dimensions, connection details, and assembly systems for each project. Smaller projects face a particular disadvantage in this system, as they lack the scale to justify extensive customization but still require the same level of design development - essentially paying a premium for bespoke solutions rather than benefiting from established standards that could make mass timber more accessible across project sizes.

A significant standardization challenge involves connection details and fasteners. The absence of industry-standard connection systems across the industry amplifies the learning curve, creates uncertainty and reduces designer confidence. The result is a potentially less efficient design and higher cost, as teams are left to develop custom solutions for each project. Many firms reported spending substantial time designing and detailing connections that could be standardized across the industry.

Standardization of products has been complicated by the differing structural characteristics of each species of wood used to manufacture mass timber across North America. The varying capacities and grades offered by suppliers makes it difficult to progress the structural design before a procurement decision has been made. This lack of interchangeability between manufacturers increases procurement risk, and can result in redesign work once a supplier is selected.

> *"The standardization of screws, fasteners, and other connection materials for mass timber would streamline the design process and make procurement more efficient. Currently we're dealing with too many proprietary systems."*
>
> **- Fast + Epp**

Fast + Epp has a concept lab that produces critical results for promoting new uses of mass timber.
Source: Pilot Projects, 2024.

Lack of Product Standardization	The diversity of strength, appearance, and dimensional characteristics across mass timber products & producers complicates the design and procurement process.					
9/10 WEIGHTED IMPORTANCE	4 Experience	1 Cost	0 Confidence	4 Sourcing	0 Policy	0 Carbon

Case Study No. 1

Innovative Beamless Structure | Limberlost Educational Building

Limberlost Place, a ten-storey exposed mass timber building designed by Moriyama Teshima Architects with Acton Ostry Architects for George Brown College in Toronto. This pioneering structure features assembly spaces throughout its full height while achieving net-zero carbon emissions. Source image: Moriyama Teshima Architects.

Location
Toronto, Ontario, Canada

Collaborators
Moriyama Teshima Architects
Acton Ostry Architects
Fast + Epp Structural Engineers
Introba
Morrison Herschfield
Transsolar Inc.
Nordic Structures

Completion Date
In Progress

Project Type
Type I-A Educational

Size
10-story, 225,000 SF

Mass Timber Elements
Glulam columns
7-ply CLT panels
CLT/concrete composite panels

Overview

Limberlost Place is a pioneering 10-story, 50% exposed, mass timber institutional building designed for George Brown College's School of Architecture in Toronto. The project demonstrates innovative structural solutions and climate-responsive design strategies while achieving ambitious sustainability targets well in advance of Toronto's 2030 TEDI, TEUI, and GHGI reduction goals.

"Key Challenges" Addressed

This project addresses a variety challenges captured by our list of 25 challenges.

#8 Lack of Product Standardization: The team developed a unique "beamless" structural system comprising bespoke glulam columns and CLT/concrete composite "slab bands" that support standard CLT infill panels, creating a highly standardized yet adaptable solution for column-free learning spaces.

#23 Structural Analysis Tools: The design team conducted extensive research and testing with UNBC and Beiberech University to validate the performance of novel timber-concrete composite connections, developing data-based solutions to address limitations in existing structural analysis tools.

#14 Building Code Modernization: The project team had to navigate complex code interpretations for exposed mass timber elements, securing approvals through performance-based solutions that demonstrated equivalent fire safety to prescriptive requirements in a jurisdiction unaccustomed to assembly occupancy, tall timber buildings.

#7 Unique Project Delivery Requirements: To accelerate construction while ensuring quality, the project utilized prefabricated envelope systems with integrated two-story panels and unitized curtain walls, addressing weather protection for the mass timber structure while minimizing on-site labor requirements.

Solutions Implemented

- The team developed a unique 'beamless' structural system using bespoke glulam columns and CLT/concrete composite 'slab bands' to support standard CLT infill panels, creating column-free learning spaces while maintaining minimal structural depth.
- Full-scale testing of timber-concrete composite connections with UNBC and Beiberech University provided empirical data to validate the structural performance and advance industry knowledge about hybrid systems.
- The 3-bar plan organization creates a flexible floor plate with demising walls that can evolve over time, with windows placed at regular intervals to ensure future adaptability as program needs change.
- The team utilized prefabricated envelope components with two-story heights.
- The comprehensive timber-concrete composite research program yielded valuable data that has advanced industry knowledge and will benefit future mass timber projects.

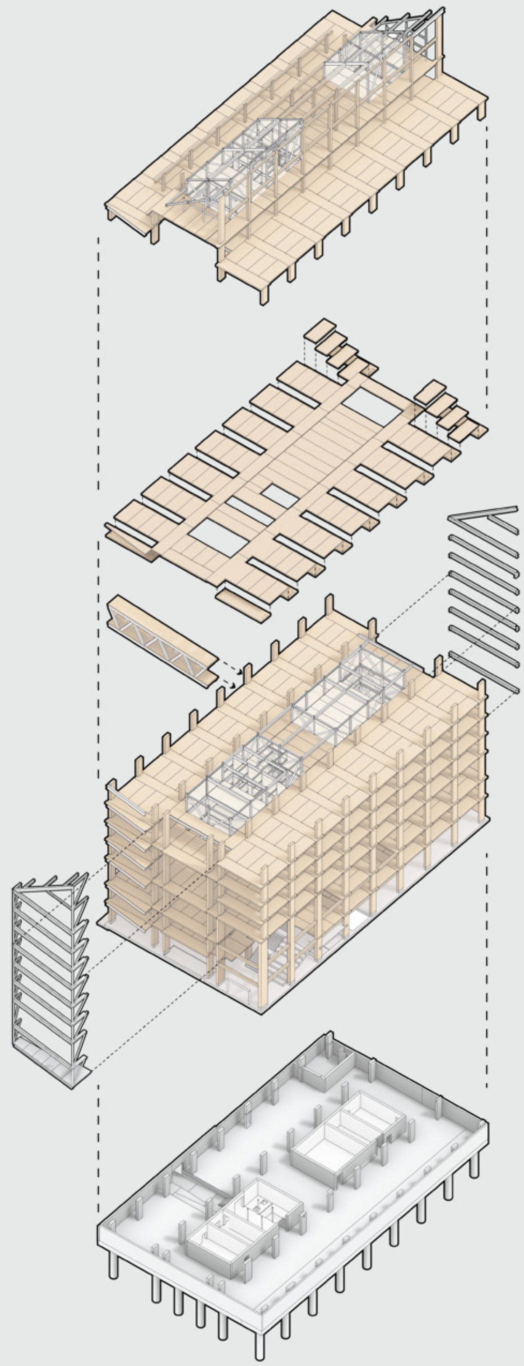


Image source: Moriyama Teshima Architects, 2023.

Outcomes & Lessons Learned

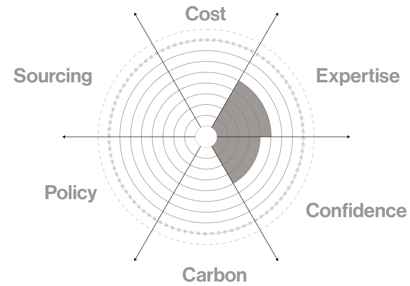
- The project exceeds Toronto Green Standards V3 Tier 4 requirements
- The 3-bar plan organization creates a flexible floor plate with demising walls that can evolve over time, contributing to the building's long-term adaptability and resilience.
- The integration of exposed mass timber structural elements with the building's sustainability strategies demonstrated that structural expression and environmental performance can be harmoniously unified, creating spaces that simultaneously showcase timber's beauty while contributing to occupant comfort and energy efficiency.
- The comprehensive timber-concrete composite research program yielded valuable data that has advanced industry knowledge and will benefit future mass timber projects.

Learn More

More information about the Limberlost project is available online:

Project Page
Detailed Project Case Study
Information about the large span beamless structural system

5. Insufficient Leadership Advocacy



Reluctance to make firm-level commitments to actively champion mass timber solutions limits the industry's capacity to advance adoption. Even in firms with substantial technical experience, leadership often hesitates to strategically position their organizations as mass timber advocates or to proactively present mass timber as a preferred solution to clients. This gap between internal capability and external advocacy prevents mass timber from gaining the market momentum it needs to become mainstream.

Without leadership mandates to prioritize mass timber solutions, staff at all levels lack the organizational support needed to confidently promote mass timber. The knowledge gap is especially pronounced at the business development and client relationship level, where technical mass timber experience from design teams often fails to translate into compelling client presentations and proposals. Several workshops emphasized that while technical teams may possess deep mass timber knowledge, this expertise frequently remains underutilized because client-facing staff lack the confidence, messaging tools, or leadership backing to effectively advocate for innovative wood solutions.

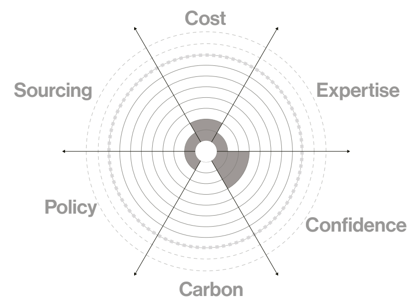
The leadership gap manifests in how firms allocate resources and structure their practices. Without high-level commitment to building mass timber capabilities, teams struggle to develop the specialized expertise needed to overcome technical and regulatory hurdles. Several firms reported that even after completing successful mass timber projects, leadership often failed to institutionalize that knowledge or strategically position the firm to pursue similar work, limiting opportunities to build on initial successes.

This leadership hesitation particularly affects how firms approach business development and client education around mass timber. Without confident advocacy from principals and directors, project teams lack the authority and resources to effectively challenge client preconceptions or counter resistance from contractors and code officials. Multiple workshops emphasized that successful mass timber adoption requires firm leadership to make deliberate, strategic commitments to developing specialized expertise, establishing relationships with suppliers and fabricators, and positioning their organizations as mass timber innovators.

> *"I'm always thinking about the teams in our organization to determine if we have the people we need to do a mass timber project should it come along? The more time that passes without having worked on a mass timber project, the higher the chances are that you're losing technical knowledge. This impacts efficiency, because if the person who knew how to do a specific thing left then we have to learn it all over again."*
>
> **- SERA Architects**

Insufficient Leadership Advocacy	Design professionals demonstrate hesitancy promoting timber solutions during client consultations.					
9/10 WEIGHTED IMPORTANCE	5 Experience	0 Cost	4 Confidence	0 Sourcing	0 Policy	0 Carbon

6. Values Versus Priorities



The market disconnect between stated sustainability goals and actual project decision-making creates a persistent barrier to mass timber adoption. Workshop discussions revealed that while clients often express commitment to sustainability and carbon reduction, their actual decision-making consistently prioritizes cost, schedule, and familiarity over environmental benefits. This misalignment between stated values and actual priorities creates a challenging environment for proposing mass timber solutions.

When budget pressures emerge, decision-makers typically revert to familiar materials and methods, undermining stated environmental commitments and wasting significant design resources already invested in mass timber solutions. This late-stage pivot forces design teams to essentially restart structural design in a different material system, adding cost and time that's rarely accounted for in the initial decision to abandon mass timber. Several firms reported having to completely redesign projects after months of mass timber development work, effectively doubling design efforts without corresponding fee adjustments.

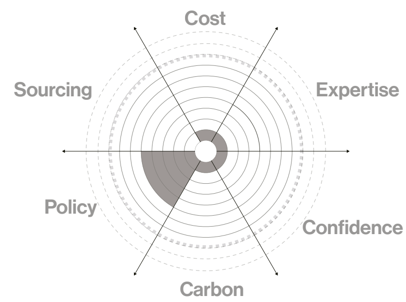
Firms face particular challenges in communicating mass timber's value proposition in ways that resonate with client priorities. While architects and engineers often emphasize carbon sequestration and environmental benefits, these appeals frequently fail to align with clients' primary decision drivers. Several workshops noted that successful mass timber projects typically result when firms lead with business advantages such as accelerated construction timelines, healthier workplaces, or market differentiation opportunities, and position environmental benefits as complementary added value rather than the primary justification. This shift in messaging—focusing first on business outcomes while reinforcing how sustainability supports those goals—has proven more effective than leading with environmental arguments alone.

> *"The primary success factor for mass timber projects is having clients and contractors who are genuinely committed to using mass timber. This commitment typically stems from valuing the environmental benefits of mass timber, as environmentally-focused clients are usually willing to pay the premium costs associated with this material. While aesthetic appeal may attract initial interest, we've found that aesthetics alone rarely sustains a project through completion."*
>
> **- Anonymous Firm**

The inconsistency between stated values and actual priorities extends to how projects are evaluated. Several firms reported that clients rarely include carbon impacts in their formal decision-making frameworks, instead relying on traditional metrics like cost per square foot that disadvantage innovative solutions. This lack of accountability for sustainability commitments makes it especially difficult to advance mass timber solutions, as the environmental advantages aren't properly weighted in the evaluation process.

Values Versus Priorities	Sustainability benefits emphasized by designers often remain secondary to client cost considerations and business realities.					
8/10 WEIGHTED IMPORTANCE	1 Experience	2 Cost	3 Confidence	1 Sourcing	1 Policy	0 Carbon

7. Building Code Modernization



The slow evolution of building codes continues to impede mass timber implementation, creating a significant gap between what's technically achievable and what's legally permissible. Workshop discussions revealed that outdated building codes in many jurisdictions haven't kept pace with advancements in mass timber technology, engineering knowledge, and fire performance research.This code lag also affects carbon reduction efforts, as building codes dictate material usage while some jurisdictions like California, Vancouver, and Denver begin implementing embodied carbon requirements.

This code lag is particularly evident in major urban centers. For example, New York City still operates under the 2015 International Building Code, which predates significant mass timber provisions incorporated in more recent IBC updates. The failure to swiftly adopt these updates creates a substantial barrier for innovative materials that are supported by current research but not explicitly permitted in older codes. Several firms reported spending months pursuing alternative means and methods approvals for design approaches that would be permitted by right under more current codes.

Even where codes have been nominally updated, the implementation of new provisions lags behind. Workshop participants described how building officials frequently default to conservative interpretations of newer mass timber provisions due to unfamiliarity, effectively negating the benefits of code advancements. The novelty of these provisions means that officials often request extensive additional testing and documentation beyond what's technically required, treating mass timber with heightened scrutiny compared to conventional materials.

This temporal disconnect between code development and implementation creates substantial challenges for innovation. Several firms noted that advanced mass timber solutions with proven performance in Europe or Canada often cannot be implemented in North American projects due to code barriers, despite their technical merit. These outdated restrictions limit design possibilities, increase project costs, and delay the broader adoption of sustainable mass timber solutions, effectively anchoring the industry to past practices rather than enabling future innovation.

> *"When evaluating potential construction materials for a project, several factors come into play that could steer our firm away from considering mass timber. First and foremost, local building codes and regulations play a pivotal role. If the codes in a specific area pose restrictions or are not conducive to mass timber applications, it becomes a significant deterrent."*
>
> **- Perkins&Will**

Building Code Modernization	Regulatory framework modernization and adoption lags behind timber construction technology advancement.					
8/10 WEIGHTED IMPORTANCE	1 Experience	1 Cost	1 Confidence	0 Sourcing	5 Policy	0 Carbon

Case Study No. 2

Replicable Tall Timber Infill Housing | Heartwood Project

Heartwood, designed by atelierjones, is the first Type-IV-C timber building completed in the United States, providing innovative 'missing middle' housing in Seattle. Source image:Lara Swimmer Photography courtesy of atelierjones.

Location
Seattle, Washington, USA

Collaborators
atelierjones Architects
DCI Engineers
Skipstone Development
University of Washington
Freres Engineered Wood
Kalesnikoff Mass Timber
Simpson Strong-Tie
Swinerton
Timberlab

Completion Date
2023

Project Type
Type IV-C Residential

Size
8-story, 67,000 SF

Mass Timber Elements
Glulam beams
Glulam columns
5-ply CLT floor panels

Overview

Heartwood is a pioneering 8-story mass timber building providing 126 units of "missing middle" housing for Seattle residents earning 60-100% of Area Median Income. As the first building completed under the new Type IV-C timber code classification in the United States, Heartwood represents both a technical achievement in mass timber construction and a replicable model for addressing urban housing affordability challenges.

"Key Challenges" Addressed

This project addresses a variety challenges captured by our list of 25 challenges.

#14 Building Code Modernization: atelierjones navigated newly adopted tall-wood provisions of the 2021 IBC, with principal Susan Jones directly involved in developing these code changes through her service on the ICC committee, demonstrating how practitioners can help modernize regulatory frameworks.

#15 Public Procurement Policies: The project nearly faltered when site control for the original intended building fell through, but was salvaged by strategically leveraging a $250,000 Wood Innovations Grant from the U.S. Forest Service and developing new partnerships with Community Roots Housing.

#16 Technical Skill Development: The team created an innovative two-hour rated column and beam connection without steel joinery, transferring Japanese joinery techniques to modern mass timber construction and building specialized expertise that can be applied to future projects.

#13 Building Code Modernization: The project required navigating newly adopted tall-wood provisions of the 2021 IBC. Susan Jones, atelierjones' founder, served on the ICC committee that developed these code changes, demonstrating how design practitioners can influence regulatory frameworks.

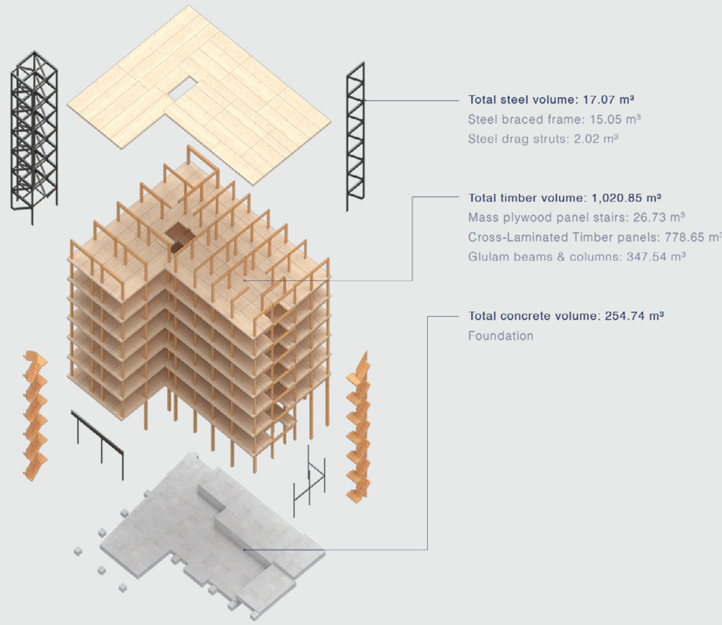
#8 Lack of Product Standardization: Through their proprietary connection system and project execution, Atelierjones developed mass timber details that provide a standardized construction approach adaptable to various workforce housing projects.

#13 Values Versus Priorities: The project successfully aligned environmental goals (carbon reduction) with economic considerations (cost-effective workforce housing) and client needs (biophilic design and efficient construction), proving mass timber can simultaneously address diverse stakeholder priorities.

Heartwood Project - continued

Solutions Implemented

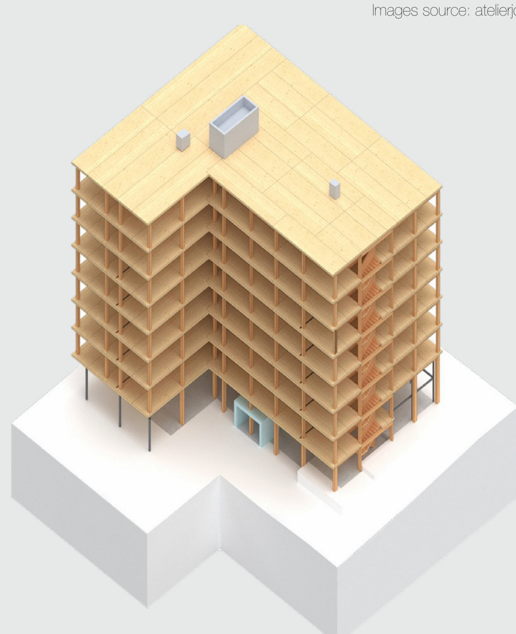
- The team employed a hybrid structural approach combining mass timber with a steel BRBF core to meet seismic requirements while maximizing timber exposure for biophilic benefits.
- Regional sourcing (within 500-mile radius) was prioritized to reduce transportation carbon impacts and support local economies, with sustainability documentation through Environmental Product Declarations.
- Life Cycle Assessment (LCA) was conducted in partnership with the University of Washington to quantify and validate carbon benefits, providing valuable data for future projects.
- The project established a model for residential mass timber construction that can be replicated across the country, with lessons learned being documented and shared through a USFS-funded publication.



Images source: atelierjones, 2022.

Outcomes & Lessons Learned

- The building achieved a 38% reduction in Global Warming Potential compared to an equivalent concrete structure (108% reduction when including sequestered carbon).
- Removing steel from column-to-beam connections reduced structural costs by approximately 11%, demonstrating mass timber's economic feasibility.
- The lighter structure minimized foundation requirements, reducing both costs and environmental impact in challenging soil conditions.
- The project establishes mass timber as viable for workforce housing, addressing both housing affordability and environmental goals simultaneously.

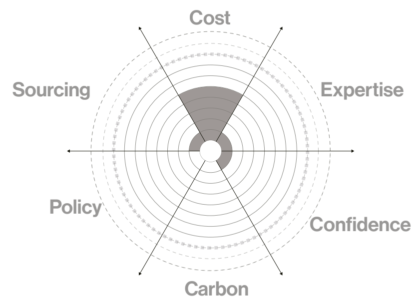


Learn More

Atelierjones has published a number of project pages about Heartwood:

Project Overview
Life Cycle Assessment
Replicability

8. Material Cost Competition



Mass timber's material costs present a persistent barrier to adoption when compared directly with traditional structural systems. Research (Abed et al., 2022) confirms what many workshops revealed: even before contractor premiums are applied, mass timber structural systems typically exceed the base costs of concrete or steel alternatives. This cost disadvantage is especially pronounced in regions with well-established and highly competitive concrete industries.

It is generally understood that project teams should evaluate mass timber's higher upfront frame costs against its potential advantages, like accelerated construction timelines and reduced foundation requirements (see Challenge 2). However, these benefits are difficult to quantify definitively during the critical early project phases when material selections are typically made. Without clear, reliable cost offsets, intense budget pressures often result in mass timber being eliminated before teams can thoroughly explore optimization opportunities.

Geographic factors may further complicate the cost landscape. A Northeastern firm reported dramatic pricing fluctuations based solely on supplier backlog: "Depending on the backlog, a frame package might be priced from $4 million to $11 million." They also noted that some manufacturers will not price projects unless included in the design-assist team, limiting competitive bidding options. On the other hand, several architecture firms observed that European manufacturers leverage their industry experience and production efficiencies to offer competitive pricing despite shipping distances, creating tension between goals for local sourcing and budget constraints.

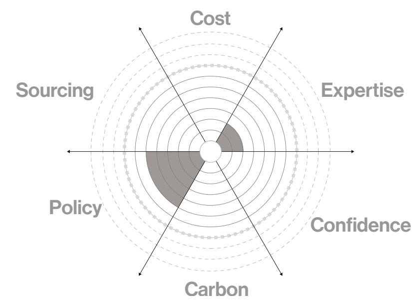
Certification requirements add another dimension. A Southeastern architecture firm reported that FSC-certified timber carried a 15% cost premium over non-certified alternatives, while a Canadian firm paradoxically found European FSC-certified timber less expensive than local options for their project, though with increased logistical risks. These variations in regional pricing, certification premiums, and supplier dynamics create obstacles to reliable cost estimates when decisions about structural systems are being made.

To manage these cost challenges, many firms have found success with hybrid approaches that combine mass timber with steel and concrete. This strategic mixing of materials allows design teams to harness the strengths of each material while optimizing building performance and cost constraints.

> *"Mass timber structural systems typically exceed the base costs of concrete or steel alternatives. Even before contractor premiums are applied, these systems come with a higher upfront price tag. However, the true value lies beyond the initial material cost – in accelerated construction timelines, reduced foundation requirements, and potential long-term benefits that aren't immediately visible on a spreadsheet."*
>
> **- Anonymous Firm**

Material Cost Competition	Mass timber structural systems typically exceed concrete and steel in base material costs.					
8/10 WEIGHTED IMPORTANCE	1 Experience	5 Cost	1 Confidence	1 Sourcing	0 Policy	0 Carbon

9. Regulatory and Permitting Inconsistencies



The geographic inconsistency in how mass timber is regulated and approved across different jurisdictions creates significant challenges for project teams. Workshop discussions revealed that the absence of standardized processes for reviewing and approving mass timber solutions means that experience gained in one location often doesn't transfer to projects elsewhere, requiring redundant efforts and repeated reinvention even for similar building types.

This jurisdictional fragmentation manifests in several ways. Architecture and engineering firms described how the same mass timber design that receives straightforward approval in one city might face months of additional scrutiny or outright rejection in another. Fire departments exercise particularly varied levels of influence over approval committees, with some embracing performance-based solutions while others impose restrictive requirements regardless of technical merit. This inconsistency makes it exceptionally difficult for firms to develop standardized approaches or reliable expectations for project approvals.

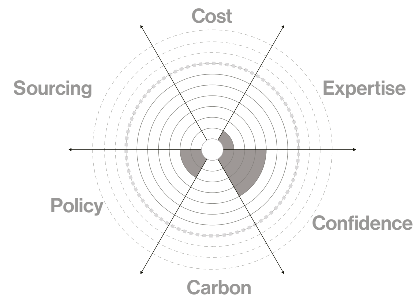
The approval process itself varies dramatically by location. Some firms reported significant differences in how authorities having jurisdiction (AHJs) evaluate engineering judgments for exposed mass timber elements. One Canadian firm specifically noted that in their experience, municipal reviews for mass timber projects can face backlog delays of up to 6 months, attributing this to reviewers' limited experience with the material. Other jurisdictions have developed streamlined review processes for mass timber, creating an uneven competitive landscape where project feasibility depends heavily on location.

Without consistent pathways for demonstrating compliance across jurisdictions, design teams must essentially "reinvent the wheel" for each project location, developing different documentation packages, approval strategies, and design approaches based on local regulatory peculiarities. This geographic inconsistency adds significant time, cost, and uncertainty to mass timber projects, creating a substantial barrier to wider adoption, especially for firms operating across multiple jurisdictions.

> *"There is still a lack of standardization across North America with regard to regulatory adoption of mass timber design. Although the International Building Code has done a great deal to help deliver multiple editions that speak to allowable areas, allowable exposures, and other prescriptive features of mass timber design, it is not uniformly adopted across the country. Some jurisdictions have adopted the latest model codes while others have not even codified the use of mass timber yet. This can introduce risk when working across different jurisdictions.*
>
> **- SERA Architects**

Regulatory & Permitting Inconsistencies	Jurisdictional authorities evaluate performance-based solutions without standardized assessment frameworks.					
7/10 WEIGHTED IMPORTANCE	2 Experience	0 Cost	0 Confidence	0 Sourcing	5 Policy	0 Carbon

10. Fire Safety Perception

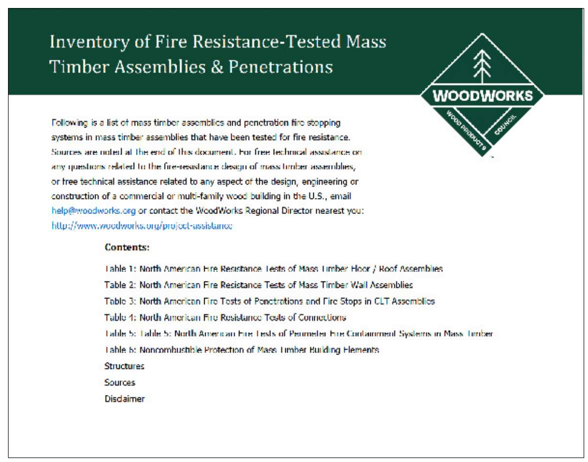


Persistent skepticism from authorities and fire departments regarding mass timber's documented fire performance continues to hinder project approvals. Workshop discussions revealed that emotional responses to wood construction often override technical evidence about mass timber's fire performance, particularly in dense urban environments.

Unlike structural engineering, which follows clear performance-based pathways, fire design often faces constrictive or outdated prescriptive requirements and jurisdictional resistance to alternative solutions. This remains true even when testing data supports mass timber's fire performance. Construction insurance providers compound this challenge by imposing significantly higher premiums for builder's risk insurance coverage for mass timber buildings, mistakenly likening the performance of mass timber to light frame wood construction.

The impact of these perceptions varies significantly by region and jurisdiction. Some firms reported having to fully encapsulate mass timber elements with drywall due to local requirements. This encapsulation not only conceals the natural aesthetic qualities of wood that many clients value, but also adds significant material and labor costs to projects. The additional expense of drywall materials, framing, installation, and finishing directly counteracts one of mass timber's economic advantages - the ability to serve as both structure and finished surface in a single element. Other firms noted that fire officials' concerns about mass timber created additional hurdles in the approval process, even for building types that had been successfully constructed elsewhere, further increasing soft costs through extended review periods and additional documentation requirements.

> *"We are starting to see building insurers adding premiums for their policies to owners who are trying to insure mass timber buildings. This is primarily due to a perceived risk in fire protection, which is likely inaccurate, but nevertheless a challenge we have to face."*
>
> **- Thornton Tomasetti**


Inventory of Fire Resistance-Tested Mass Timber Assemblies & Penetrations

WOODWORKS WOOD PRODUCTS COUNCIL

Following is a list of mass timber assemblies and penetration fire stopping systems in mass timber assemblies that have been tested for fire resistance. Sources are noted at the end of this document. For free technical assistance on any questions related to the fire-resistance design of mass timber assemblies, or free technical assistance related to any aspect of the design, engineering or construction of a commercial or multi-family wood building in the U.S., email help@woodworks.org or contact the WoodWorks Regional Director nearest you: http://www.woodworks.org/project-assistance

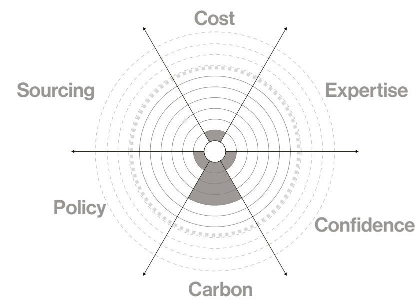
Contents:

Table 1: North American Fire Resistance Tests of Mass Timber Floor / Roof Assemblies
Table 2: North American Fire Resistance Tests of Mass Timber Wall Assemblies
Table 3: North American Fire Tests of Penetrations and Fire Stops in CLT Assemblies
Table 4: North American Fire Resistance Tests of Connections
Table 5: Table 5: North American Fire Tests of Perimeter Fire Containment Systems in Mass Timber
Table 6: Noncombustible Protection of Mass Timber Building Elements
Structures
Sources
Disclaimer

WoodWorks provides a design guide for incorporating fire-resistance requirements into mass timber design.
Source: WoodWorks

Fire Safety Perception 7/10 WEIGHTED IMPORTANCE	Regulatory bodies maintain reservations regarding timber's fire performance despite technical evidence.					
	1 Experience	0 Cost	4 Confidence	0 Sourcing	2 Policy	0 Carbon

11. Not Valuing Carbon



The building industry's failure to properly value carbon reduction creates a significant barrier to mass timber adoption. Workshop discussions revealed that without economic incentives, regulatory requirements, or client mandates to prioritize embodied carbon, the environmental advantages of mass timber are frequently undervalued in project decision-making.

This challenge manifests in several ways. Without carbon pricing mechanisms or regulatory requirements that place tangible value on carbon reduction, teams struggle to translate mass timber's environmental benefits into compelling financial arguments. Several firms noted that carbon benefits remain effectively "invisible" in conventional cost-benefit analyses.

Building codes and policies are beginning to evolve to address this gap. Oregon has developed plans to implement embodied carbon requirements in future building codes, including Whole Building Life Cycle Assessment (WBLCA) requirements for structures over 100,000 square feet, with thresholds intended to decrease over time. While such requirements create a framework for quantifying carbon impacts, they don't yet provide direct economic incentives for lower-carbon solutions. However, green rating systems like Living Building Challenge are creating more immediate economic value by allowing sustainably harvested wood buildings to use stored biogenic carbon as offsets, which is particularly valuable for developers with Scope 3 carbon reduction goals.

The timing of carbon analyses creates another challenge. Several workshops emphasized that early design phases present the best opportunity to influence material selection and system efficiency, which translates to carbon savings. In current practice, detailed carbon analyses often occur later in the design process, following key material decisions. One architecture firm described implementing early-phase carbon modeling as a standard practice to help clients understand the significant carbon advantages of mass timber before they commit to conventional structural systems.

The cost and expertise required for thorough carbon analyses further compounds the challenge. Many firms reported needing to outsource LCA work due to lack of in-house capabilities, adding expense that clients are reluctant to support without clear incentives or requirements.

Several firms noted the contrast between carbon policy approaches in different regions. In areas with carbon taxes, embodied carbon regulations, or procurement preferences for low-carbon materials, mass timber adoption has accelerated significantly. These policies create tangible incentives by attaching real economic value to carbon reduction, effectively leveling the playing field for mass timber solutions that might otherwise appear more expensive in traditional cost comparisons.

> *"Very few people are doing LCAs without having a regulatory 'stick' behind them. The 'carrot' just isn't enticing enough right now. But there are exciting opportunities coming with new incentive programs being developed. Until we have mechanisms that attach actual value to carbon reduction, the environmental benefits of mass timber will remain undervalued in project decisions."*
>
> **- DCI Engineers**

Not Valuing Carbon	Insufficient regulatory mechanisms incentivize comprehensive life-cycle assessment implementation.					
7/10 WEIGHTED IMPORTANCE	0 Experience	0 Cost	0 Confidence	1 Sourcing	2 Policy	4 Carbon

Case Study No. 3

Innovative Solutions for Adaptive Reuse | Amherst College

Location
Amherst, Massachusetts, USA

Collaborators
Herzog & de Meuron Architects
TYLin Structural Engineers
Sasaki Associates Inc
Nordic Structures
Shawmut Design and Construction

Completion Date
In Progress (Topped out February 2025)

Project Type
Type I-A Educational

Size
4-story, 144,000 SF

Mass Timber Elements
Full mass timber structural system
Glulam beams and columns
CLT floor panels

Overview

The Amherst College Student Center & Dining Commons represents an exemplary case of mass timber implementation that balances historic preservation with forward-thinking sustainability. This significant academic project showcases how mass timber can be integrated into campus contexts while addressing complex technical and logistical challenges. The project serves as both a campus hub and a physical manifestation of the college's commitment to sustainability and carbon neutrality by 2030.

"Key Challenges" Addressed

This project addresses a variety challenges captured by our list of 25 challenges.

#2 Holistic Costing Gaps: The project team successfully demonstrated the comprehensive value proposition of mass timber by quantifying both immediate and long-term benefits. By repurposing the foundation of the Merrill Science Building to form the ground and first floors of the new structure, they achieved significant embodied carbon reduction while creating compelling financial arguments for the approach.

#14 Building Code Modernization: Despite being located in a region with relatively limited mass timber precedents, the project team navigated complex fire safety requirements and building code interpretations to secure approvals for this innovative structural system.

#15 Public Procurement Policies: As an institutional project with specific funding requirements, the team successfully aligned mass timber specifications with the college's procurement frameworks, demonstrating how public and institutional projects can overcome traditional barriers to innovative material selection.

#7 Unique Project Delivery Requirements: The team employed a Construction Manager at Risk (CM at Risk) delivery method with Shawmut Design and Construction, creating a framework that appropriately allocated risk while enabling the specialized expertise needed for mass timber implementation.

#25 Expanded Service Requirements: TYLin went beyond traditional structural engineering services to address the unique challenges of mass timber, actively engaging with material sourcing, specification details, and coordination with the mass timber fabricator (Nordic Structures) to ensure successful project delivery.

Amherst College - continued

Solutions Implemented

- Adaptive Reuse Strategy: The project innovatively repurposes the concrete foundation of the former Merrill Science Center, preserving embodied carbon and demonstrating how mass timber can complement existing structures in campus renewal efforts.
- Climate-Responsive Design: The structure incorporates sophisticated sustainable strategies including solar energy, thermal mass, displacement ventilation, and natural ventilation to complement the inherent environmental benefits of mass timber construction.
- Strategic Material Integration: The design balances mass timber with appropriate complementary materials to optimize performance and resiliency, creating a hybrid approach that enhances the building's overall sustainability profile.
- Collaborative Expertise Model: TYLin leveraged their technical excellence and reputation in the industry to assemble specialized collaborators, addressing the common challenge of fragmented expertise in the mass timber supply chain.
- Form-Finding Process Integration: The team employed advanced form-finding techniques to integrate mass timber components with the existing foundation structure, building in appropriate tolerances to manage the precise nature of prefabricated mass timber against the more variable existing conditions.

Outcomes & Lessons Learned

- The project demonstrates how mass timber can be effectively integrated into campus contexts with rigorous sustainability requirements, providing a model for other educational institutions pursuing carbon reduction goals.
- By repurposing existing foundation systems while incorporating mass timber for the primary structure, the project achieves significant embodied carbon reduction while honoring the campus's architectural legacy.
- The design establishes a compelling case for how mass timber can serve both pragmatic sustainability goals and enhance the human experience through biophilic design principles.
- The project creates valuable precedent for how institutions with carbon neutrality commitments can leverage mass timber as a key strategy in their climate action plans.
- TYLin's approach to the project highlights the importance of structural engineers taking an expanded role in mass timber projects, addressing not just structural performance but also sustainability goals, material sourcing, and integrated design.

Rendering of Amherst College dining commons. Source Image: Amherst College.

Image of the mass timber elements installed at Amherst College. Source: Herzog & de Meuron, 2025

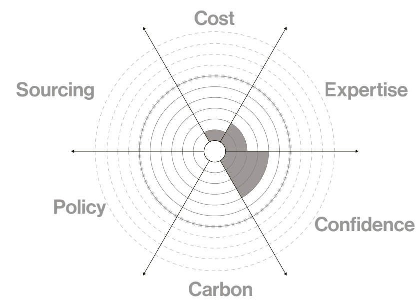
Image of Amherst College after it's topping ceremony in February 2025. Source Image: Herzog & de Meuron, 2025

Learn More

To learn more about the Amherst College Student Center & Dining Commons project:

Herzog & de Meuron Project Page
Amherst College Project Information

12. Designer Inexperience Loop



The architecture and engineering industry faces a self-reinforcing cycle that makes market entry difficult for firms looking to develop mass timber expertise. Workshop discussions revealed that clients seeking mass timber solutions often favor firms with established track records, yet firms struggle to build those portfolios without initial client opportunities. This creates a frustrating "chicken-and-egg" scenario where experience is required to gain experience.

Even large, well-established firms reported difficulties breaking into the mass timber market without previous projects to showcase. Several workshop participants noted they had lost potential mass timber commissions to smaller boutique firms with specialized expertise despite having larger overall portfolios. The situation is particularly challenging in regions where few mass timber projects have been built, as local firms have limited reference projects to demonstrate capabilities.

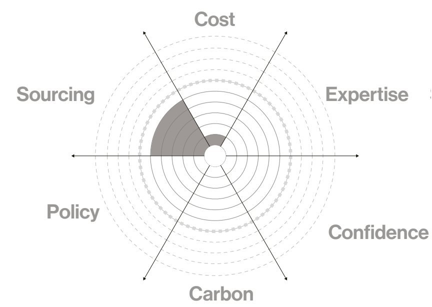
Strategic partnerships have emerged as an effective solution to break this experience loop. Multiple workshops highlighted how firms successfully gained mass timber experience through collaborative partnerships with more experienced organizations. Several architecture firms formed joint ventures with experienced mass timber specialists when competing for large-scale projects, while others collaborated with established industry leaders on high-profile commissions. These partnerships allowed firms to gain practical experience while building their portfolios. Firms recognize that initial projects often require investment that pays off in subsequent work, and partnerships can make that initial investment more accessible. This collaborative approach enables knowledge transfer between firms, shares project risk, and helps build credible portfolios while developing internal capabilities that can be applied to future projects. The partnership strategy has proven particularly effective for firms in regions where mass timber projects remain rare, providing a pathway to overcome the experience barrier without having to secure a mass timber commission independently.

> *" In our field, knowledge sharing is not just beneficial—it's essential. And we achieve this by fostering an environment of collaboration. Industry-wide efforts to share expertise are vital to advancing both our craft and the broader adoption of mass timber innovation."*
>
> **- Michael Green Architects**

Firms also noted the challenges of properly staffing mass timber projects without previous experience. Without dedicated teams who have worked on mass timber projects before, firms struggle to estimate fees, allocate resources appropriately, and navigate the learning curve of these projects. Several workshops revealed that even when firms secured mass timber projects, their lack of experience sometimes led to scope creep, coordination issues, and lower profitability compared to more familiar project types.

Designer Inexperience Loop 7/10 WEIGHTED IMPORTANCE	Emerging firms without demonstrated expertise encounter self-reinforcing barriers to entering the mass timber sector.					
	2 Experience	1 Cost	4 Confidence	0 Sourcing	0 Policy	0 Carbon

13. Geographic Supply Constraints



The uneven distribution of mass timber manufacturing facilities across North America creates logistical challenges and perceived risk for project teams. For many project teams, regional sourcing is viewed as a way to manage procurement risks associated with a prefabricated kit of parts, where damage or delays can significantly impact schedules. Regional sourcing is also often desired as part of a positive environmental narrative, connecting buildings to surrounding forest resources and potentially reducing transportation-related emissions.

However, workshop discussions revealed that the limited geographic distribution of manufacturing capacity often means projects must source mass timber from distant locations, either internationally or across the continent. While this doesn't necessarily result in higher material costs (as some European suppliers can offer competitive pricing despite distance), it does introduce additional logistical considerations that must be managed.

This challenge is particularly evident in certain regions. For example, firms in the Northeast United States reported navigating complex sourcing decisions with limited regional manufacturing options. Even in areas with abundant forests, like Maine, architecture and engineering firms noted that importing timber from Europe was sometimes more economical than sourcing locally due to the limited regional manufacturing infrastructure and production efficiencies of established European suppliers.

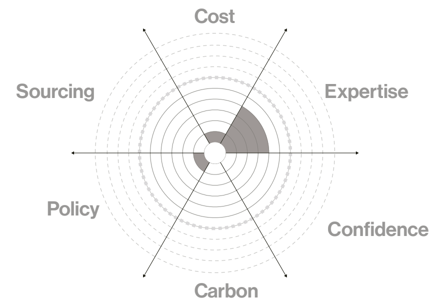
The impact extends beyond basic sourcing decisions to project logistics planning. Long-distance procurement introduces complexities related to shipping schedules, customs clearance for international sources, and more elaborate logistics coordination. Several firms noted that traditional delivery scheduling practices require adaptation when materials travel extended distances, with many successful projects utilizing off-site storage facilities near the construction site rather than relying exclusively on just-in-time delivery.

> *"We were really surprised by the fact that we're doing a project in Maine, which has probably the most forest per square foot in the United States, and yet when we were looking at where we could source our timber, we found options from Finland to Alabama and other places—but nothing in Maine or even regionally. That's problematic because it's actually cheaper for us to get spruce from Finland, ship it across the ocean, than it is to manufacture it here in the US."*
>
> **- Grimshaw**

The limited number of suppliers within reasonable proximity to many project locations also affects project teams' ability to secure competitive bids. Projects in regions with a single nearby manufacturer may find themselves with limited negotiating leverage, while those with access to multiple suppliers (including international options) can often achieve more favorable pricing and terms. This distribution of manufacturing capacity creates regional differences in the ease of implementing mass timber solutions, though creative procurement strategies and logistics planning can address these challenges.

Geographic Supply Constraints	The lack of local production facilities present challenges in material transportation logistics.					
6/10 WEIGHTED IMPORTANCE	0 Experience	1 Cost	0 Confidence	5 Sourcing	0 Policy	0 Carbon

14. Unique Project Delivery Requirements



Traditional project delivery methods are often misaligned with mass timber's unique requirements for early decision-making and coordination and specialized expertise. Workshop discussions revealed that conventional design-bid-build approaches frequently create barriers to successful mass timber implementation, particularly around accurate cost estimation, design efficiency, systems integration, and quality control.

Multiple firms reported that design-bid-build delivery methods led to limited and poor coordination between architects and contractors, resulting in issues like uncoordinated details and unauthorized penetrations that compromised structural integrity.

Several firms have highlighted the value of consistent project teams, noting significant opportunities in working on a pipeline of projects with the same developer, architect, engineer, and general contractor. Finding a good team and continuing to work with them on future projects creates institutional knowledge that helps overcome many liability and delivery challenges. Industry professionals have also identified potential for peer reviewers to verify performance based solutions, suggesting a pathway to address liability concerns through third-party verification.

New types of specification, roles, responsibilities and liabilities may also complicate mass timber delivery. For example exposed timber may be expected to serve as a finished surface, in contrast to contractors' expectation that it can be handled as a structural element where careful and costlier storage and handling is typically not required. Different subcontractors may need to be educated on the entire building system so that their trades can work within new boundaries (such as protecting timber surfaces and using only manufactured penetrations) and take advantage of new efficiencies (such as screwing hangers directly into the underside of a floor slab). Without clear allocation of responsibility and risk, projects can suffer from gaps in quality control, efficiencies, and strategic construction oversight.

> *"The comprehensive systems integration is the architecture in a mass timber building. They are one in the same. We can't think of the process for designing a mass timber building the same way we can for a structural steel building that has finishes everywhere to conceal the lack of coordination, or lack of exposed coordination. Mass timber is not as forgiving for field modifications as, say, structural steel building."*
>
> **- TYLin Group**


Kaiser Borsari Hall was a success story of early engagement between the architect (Perkins Will), engineer (Coughlin Porter Lundeen) and the contractor (Mortenson)
Source: Western Washington University.

Unique Project Delivery Requirements	Conventional project delivery contracts may prove incompatible with timber-specific needs.					
6/10 WEIGHTED IMPORTANCE	4 Experience	1 Cost	0 Confidence	0 Sourcing	1 Policy	0 Carbon

Case Study No. 4

Scaling Low Carbon Construction | NYC Mass Timber Studio

Rendering of the Walter Gladwin Recreation Center in the Bronx, New York. Designed by Marvel Architects with structural engineering by TYLin, this project is being developed for NYC Parks and the NYC Department of Design and Construction as part of the NYCEDC Mass Timber Studio initiative. Source image courtesy of TYLin.

Location
New York City, NY, USA

Lead Organizations
New York City Economic Development Corporation (NYCEDC)

Collaborators
Newlab
Mayor's Office for Climate and Environmental Justice
WoodWorks
NYC Department of Buildings Fire Department of New York
American Institute of Architects New York

Completion Date
Ongoing (First cohort completed, second cohort applications launched in 2025)

Project Type
Technical assistance program for diverse building typologies

Size
Multiple projects across NYC

Overview

The NYC Mass Timber Studio is a pioneering technical assistance program launched by NYCEDC to accelerate the adoption of mass timber construction in New York City. The program brings together design teams, developers, regulatory agencies, and technical experts to overcome implementation barriers for mass timber projects. Through focused collaboration and knowledge-sharing, the Studio has successfully advanced multiple projects toward development while establishing pathways for code compliance and regulatory approval.

"Key Challenges" Addressed

This project addresses a variety challenges captured by our list of 25 challenges.

#14 Building Code Modernization: The program directly addresses code challenges by facilitating collaboration between design teams and regulatory bodies like the NYC Department of Buildings and FDNY, resulting in the publication of the city's first Technical Bulletin on mass timber construction that clarifies specific requirements of Section BC 602.4 of the NYC Building Code.

#10 Fire Safety Perception: By including the Fire Department of New York as a key advisory partner, the Studio creates direct communication channels to address safety concerns and develop appropriate fire protection strategies for mass timber buildings in a dense urban environment.

#15 Public Procurement Policies: The program leverages public resources through NYCEDC to provide technical assistance that might otherwise be cost-prohibitive for project teams, particularly for civic buildings and affordable housing developments that operate under tight budget constraints.

#16 Technical Skill Development: The Studio structure facilitates knowledge transfer between experienced practitioners and those new to mass timber, addressing the skills gap that often prevents wider adoption. Monthly meetings with technical experts from WoodWorks provide targeted training on mass timber design, detailing, and construction.

#13 Values Versus Priorities: By framing mass timber construction as part of New York City's Green Economy Action Plan—projected to create nearly 400,000 "green-collar" jobs by 2040—the program aligns environmental benefits with economic development priorities, helping bridge the gap between different stakeholder values.

#5 : The program demonstrates clear municipal leadership, with support from the highest levels of city government. First Deputy Mayor Maria Torres Springer publicly emphasized that "with widescale adoption of Mass Timber as a safe and durable building material, the City of New York can create jobs and, literally, build a more sustainable future."

Solutions Implemented

- The Studio created a structured program bringing together multiple stakeholders monthly to provide technical assistance on project delivery while advancing design and planning.
- The program facilitated direct collaboration between design teams and regulatory agencies, creating practical pathways for code compliance rather than theoretical discussions.
- Public industry events engaged over 300 attendees both remotely and in-person, sharing knowledge and building awareness beyond the direct program participants.
- The program supported diverse building typologies across multiple boroughs, demonstrating mass timber's versatility across different contexts and scales.
- By establishing a cohort model, the program created a community of practice where teams could learn from each other's challenges and successes.

Outcomes & Lessons Learned

- The Studio created a structured program bringing together multiple stakeholders monthly to provide technical assistance on project delivery while advancing design and planning.
- The program facilitated direct collaboration between design teams and regulatory agencies, creating practical pathways for code compliance rather than theoretical discussions.
- Public industry events engaged over 300 attendees both remotely and in-person, sharing knowledge and building awareness beyond the direct program participants.
- The program supported diverse building typologies across multiple boroughs, demonstrating mass timber's versatility across different contexts and scales.
- By establishing a cohort model, the program created a community of practice where teams could learn from each other's challenges and successes.

Learn More

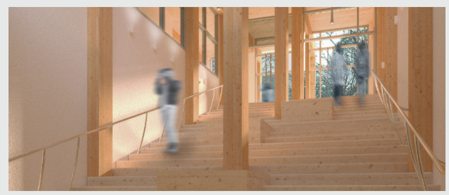
To learn more about the fire testing mentioned in this section, please see:

An Overview of The Tests
The USDA Report
The RISE Report

First Round of Studio Projects

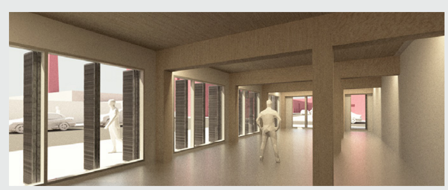
Walter Gladwin Recreation Center - Tremont, Bronx
Marvel, TYLin | Silman Structural Solutions, NYC Parks & Recreation, and NYC Department of Design & Construction

Brooklyn Public Library New Lots - East New York, Brooklyn
Brooklyn Public Library, MASS Design Group, Marble Fairbanks Architects, Envoie Projects, and TYLin | Silman Structural Solutions



Mass Timber in Harlem - Harlem, Manhattan
atelierjones, Magna & York, Sage and Coombe, Swinerton, Timberlab, and DCI Engineers

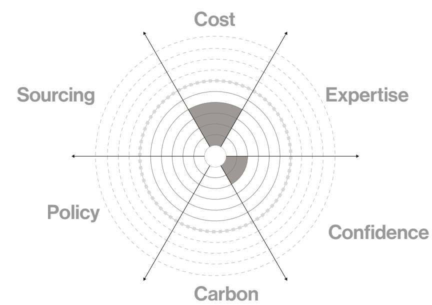
Hillside Ave - Jamaica, Queens
Curtis + Ginsberg Architects, MURAL Real Estate Partners, Buro Happold, and Rodney G. Gibble Consulting Engineers



Hoek Place - Red Hook, Brooklyn
Urban Terrains Lab, BLDGWorks, TYLin | Silman Structural Solutions, Element5, and Veneklasen Associates

1160 Flushing Avenue - Bushwick, Brooklyn
Totem, BEB Capital, dencityworks | architecture, Evergreen Exchange, and A+I

15. General Contractor Resistance

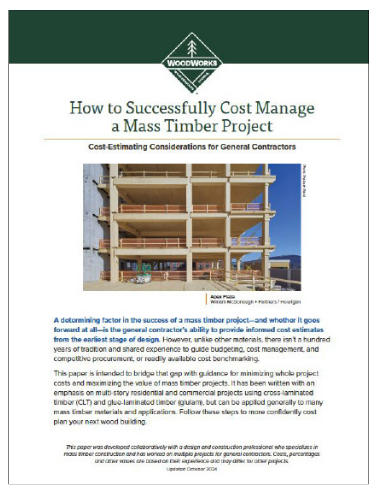


Workshop discussions revealed a recurring barrier in the form of reluctance and resistance from general contractors who traditionally self-perform concrete or steel work. These contractors face inherent financial disincentives to adopt mass timber construction, as it would reduce their ability to utilize their existing labor forces and equipment investments. The issue is particularly pronounced in regions with strong concrete industries, where contractors have built their business models around self-performing concrete work.

This resistance manifests in several ways during project development. Multiple firms reported that self-performing concrete contractors actively steer projects away from mass timber during early design phases by inflating mass timber costs, emphasizing risks, and highlighting uncertainties. Workshop participants described how these tactics often succeed because the contractors get involved during conceptual design stages when teams are still evaluating structural options. Even when mass timber might offer scheduling or other advantages, these contractors may emphasize negative aspects to protect traditional revenue streams tied to their self-performed work.

The challenge is compounded by the limited pool of qualified professionals at both the general contractor and subcontractor levels. Workshop participants noted that in many regions, few general contractors have developed the project management experience needed to successfully coordinate mass timber projects. Simultaneously, the specialized installers and erectors with mass timber experience remain limited in number across most North American markets. This creates a difficult situation where project teams must choose between experienced general contractors who resist mass timber, or those willing to embrace mass timber but lacking the proven track record to execute large or complex projects successfully. This dynamic makes it especially difficult to advance mass timber adoption in regions dominated by concrete construction traditions.

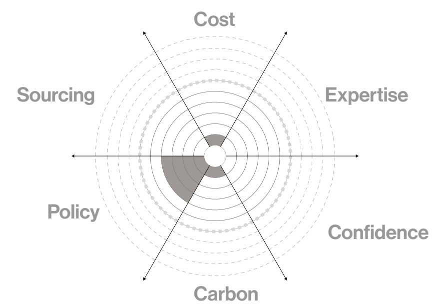
> *"As a transdisciplinary design firm, our team sometimes faces challenges when contractors are unfamiliar with mass timber. The estimating process can lead to higher contingencies for unfamiliar materials, which can push projects toward more conventional solutions during value engineering."*
>
> **- Little Diversified Architectural Consulting**



WoodWorks' guide "How to Successfully Cost Manage a Mass Timber Project" addresses the critical gap in cost estimation knowledge for contractors, covering budgeting, cost management, and competitive procurement strategies for mass timber projects.
Source: WoodWorks, 2024.

General Contractor Resistance	Contractors that self-perform subcontracts like concrete face financial disincentives to transition to timber systems.					
6/10 WEIGHTED IMPORTANCE	0 Experience	4 Cost	2 Confidence	0 Sourcing	0 Policy	0 Carbon

16. Public Procurement Policies



Institutional frameworks and public funding requirements can create barriers to mass timber adoption. Workshop discussions revealed how public procurement policies and funding criteria can impact material selection, particularly in institutional and government projects.

Multiple firms identified competitive bidding protocols as a significant obstacle, particularly when procurement rules demand a minimum number of qualified suppliers. The limited pool of experienced mass timber manufacturers in many geographic areas makes it challenging to satisfy these requirements, especially when compared to well-established concrete and steel supply chains. This procurement barrier disproportionately affects educational and civic buildings—precisely the project types that could showcase mass timber's benefits to the broader community.

Funding evaluation criteria present another obstacle when standardized assessment frameworks prioritize initial capital costs over life-cycle value or environmental benefits. Additionally, emerging carbon-related procurement policies can inadvertently restrict mass timber access when they require product-specific Environmental Product Declarations that many mass timber manufacturers have not yet developed. These evaluation methods may not account for mass timber's accelerated construction timelines, reduced foundation requirements, or long-term operational benefits. Instead, public procurement often relies on simplified unit costing that favors conventional construction approaches. Several firms described how "lowest responsible bidder" requirements make it difficult to justify premium materials or innovative approaches without formal ways to quantify benefits in bid evaluations.

Standard public contracts often include progress payment structures tied to traditional construction sequences that don't align with mass timber's front-loaded manufacturing processes. This misalignment can create insurmountable cash flow challenges for project stakeholders.

Grant funding can be both helpful or hindering. While programs like the Inflation Reduction Act exclude mass timber in favor of 'sustainable concrete' alternatives, specialized programs like Canada's Green Construction through Wood (GCWood) Program and British Columbia's Wood First Act have successfully promoted timber solutions. The GCWood program offers up to CAD $1.4M in non-repayable funds for mass timber innovation, while the Wood First Act requires wood consideration as the primary building material in all new provincially-funded buildings.

> *"Most public projects mandate a minimum of three qualified bids, which can be difficult to achieve given the limited number of mass timber suppliers in many regions. This requirement has forced some projects to abandon mass timber solutions even when they aligned with project goals and budgets. With schools, colleges, universities, and other publicly funded projects, we're essentially constrained by these procurement regulations, regardless of how promising the mass timber solution might be."*
>
> **- Moriyama Teshima Architects**

Public Procurement Policies	Government procurement criteria inadvertently disadvantage alternative structural systems like mass timber.					
6/10 WEIGHTED IMPORTANCE	0 Expertise	2 Cost	0 Confidence	0 Sourcing	4 Policy	0 Carbon

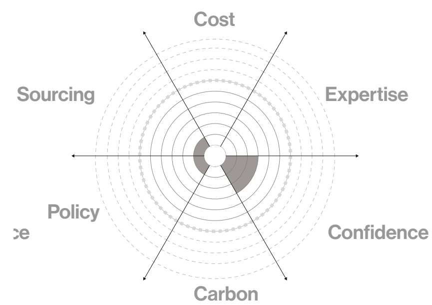
17. Negative Perception Bias

Mass timber faces a significant barrier in overcoming perceived risk concerns that stem from the disproportionate attention given to isolated failures compared to numerous successful implementations. Workshop discussions revealed how negative stories about mass timber projects carry outsized influence, reinforcing skepticism among clients, contractors, and authorities.

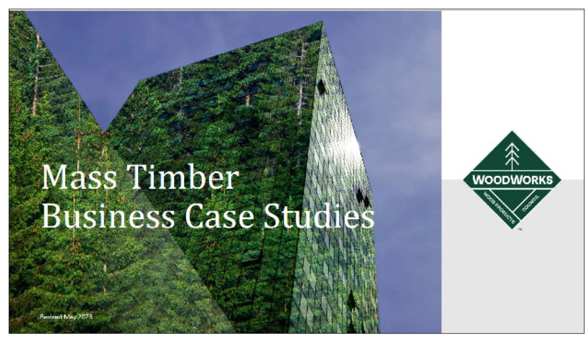
Several firms noted that stories about construction issues, moisture damage, or budget overruns tend to spread quickly throughout the industry, while successful projects receive less attention. This negative perception bias supports confirmation biases held by those already skeptical about mass timber's viability. Multiple workshops highlighted how conventional thinking and competitive industry lobbying efforts amplify negative stories while downplaying successes.

Public perceptions about moisture issues being a bigger problem for mass timber than other materials was frequently cited as a significant challenge, highlighting how perception can override technical reality. Despite evidence showing proper detailing and construction methods can effectively manage moisture, the perception of risk remains disproportionate to actual performance data.

The challenge is compounded by mass timber's relative novelty in many markets. Without a long track record of successful buildings, individual failures can cast doubt on the entire building system. Several firms reported having to repeatedly address the same misconceptions with different clients based on widely-shared negative examples, even when those examples represented anomalies rather than typical outcomes.



> *"One critical challenge involves the risk aversion of various stakeholders, which typically occurs due to concerns about cost or installation logistics. This risk aversion can impede the realization of bold design visions and hinder the exploration of mass timber's full potential."*
>
> **- Perkins&Will**

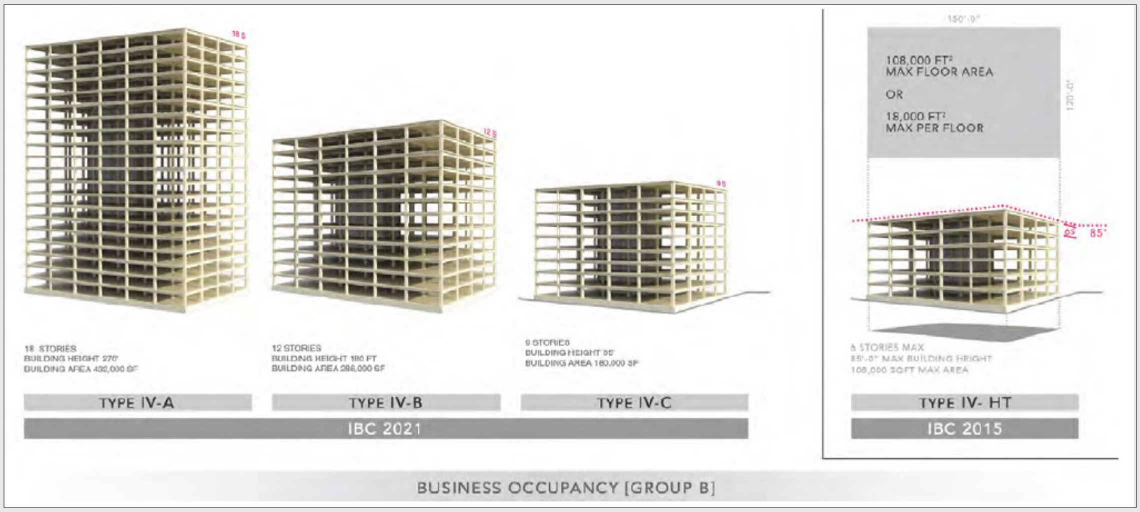


WoodWorks' Mass Timber Business Case Studies document financial performance and qualitative factors contributing to successful mass timber developments, helping teams understand real-world costs and benefits. Image Source: WoodWorks, 2023

Negative Perception Bias	Isolated implementation failures receive disproportionate attention relative to successful applications.					
4/10 WEIGHTED IMPORTANCE	0 Experience	0 Cost	3 Confidence	0 Sourcing	2 Policy	0 Carbon

Case Study No. 5

Controlled Burns to Update Fire Codes | ICC Protocols



During the 2018 International Code Council (ICC) code development cycle, the ICC membership approved 14 code changes proposed by its Ad Hoc Committee on Tall Wood Buildings (TWB) based on several years of studying the science of tall wood buildings. The ICC and TWB committees collectively introduced three new building types of mass timber construction for the 2021 International Building Code (IBC). Image Source: American Wood Council

Overview

Susan Jones (atelierjones) led pioneering fire testing initiatives that directly informed the development of building codes for tall mass timber structures. Through rigorous scientific testing at facilities in the U.S. and Sweden, the team demonstrated mass timber's capacity to withstand and contain compartment fires, providing the evidence-based foundation needed to advance regulatory frameworks for mass timber construction worldwide.

Location
Washington, D.C., USA

Collaborators
Susan Jones (atelierjones)
International Code Council
American Wood Council
USDA Forest Service
Research Institute of Sweden, RISE

Completion Date
Completed
ICC Tests 2017
RISE Tests 2020

Project Type
Mass Timber Fire Testing

Size
2-story, ~2,000 SF

Mass Timber Elements
5-ply CLT panelspanels

"Key Challenges" Addressed

This project addresses a variety challenges captured by our list of 25 challenges.

#10 Regulatory & Permitting Inconsistencies: By generating standardized performance data through controlled testing, the program created a prescriptive regulatory code for jurisdictional authorities to evaluate mass timber fire performance, helping to overcome the inconsistent evaluation methods that had previously forced design teams to "reinvent the wheel" for each jurisdiction.

#10 Fire Safety Perception: The testing program directly confronted skepticism from fire protection engineering community and authorities having jurisdiction regarding mass timber's fire resistance capabilities by conducting full-scale compartment fire tests under real-life conditions without sprinkler systems or fire department intervention.

#14 Building Code Modernization: The test results were a pivotal turning point for the committee, forming part of the scientific basis and overcoming perceptual hurdles that had prevented widespread adoption of tall mass timber buildings. This breakthrough enabled historic code changes in the International Building Code (IBC), expanding the potential applications for mass timber buildings up to 18 stories tall.

#24 Negative Perception Bias: The highly successful results that met or exceeded modeling expectations provided concrete evidence to counter misconceptions about mass timber's performance in fire scenarios, helping shift the narrative from skepticism to recognition of timber's inherent fire-resistant properties.

#16 Technical Skill Development: The testing protocols and subsequent data analysis expanded the industry's technical knowledge regarding mass timber fire performance, creating a foundation for architectural and engineering firms to develop specialized expertise in fire-safe mass timber design.

Solutions Implemented

- The team designed a series of five fire tests at the ATF facility in 2017 to evaluate mass timber's capacity to withstand and contain compartment fires under real-life conditions.
- The 2020 testing in Sweden with the RISE Institute built upon earlier work with even more rigorous protocols, including sustained four-hour fires without sprinkler or fire department intervention.
- Test structures included various opening configurations to emulate both office and residential environments, ensuring results would be applicable across different building types.
- The testing was designed to verify or challenge predictive modeling, with four out of five tests outperforming the modeling efforts, providing valuable calibration data for future fire safety engineering.
- Results were made publicly available through published reports by the US Forest Service and the RISE Institute, ensuring transparent access to the scientific findings.

Outcomes & Lessons Learned

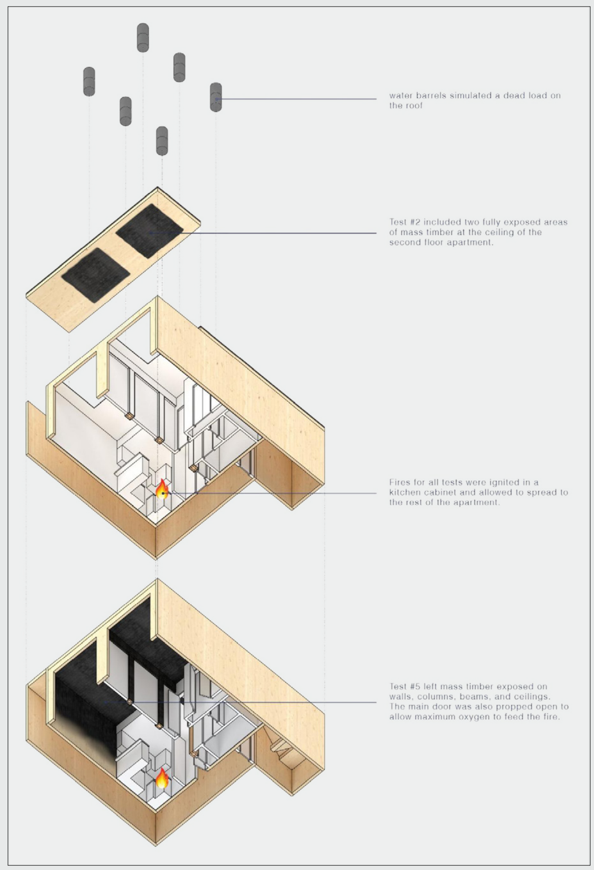
- The testing program directly informed the ICC Tall Wood Building Codes that were ratified in early 2019, creating a regulatory pathway for mass timber buildings up to 18 stories.
- The 2020 RISE test results led to further code updates in 2022, including changes to the Type IV-B provisions that increased the allowable percentage of exposed wood ceilings and beams from 20% to 100%.
- The research demonstrated that despite conservative testing protocols and facility limitations, mass timber structures can meet or exceed fire safety requirements when properly designed.
- These code changes have enabled pioneering projects like Heartwood (Type IV-C) and created a foundation for future mass timber innovation in the building industry.

Learn More

To learn more about the fire testing mentioned in this section, please see:

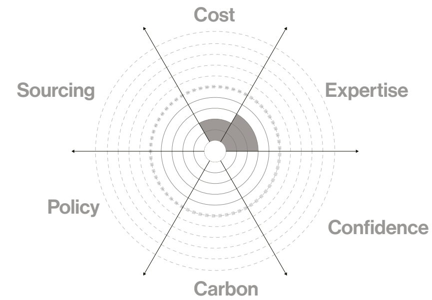
An Overview of The Tests
The USDA Report
The RISE Report

Compartment fire testing of a two-story mass timber building as part of the 2017 ATF fire tests in Washington D.C. Image Source: American Wood Council



Susan Jones helped write the ICC Fire Test Protocols as part of the Fire Test Committee. Five fire tests were designed to test the capacity of mass timber to withstand and restrain compartment fires in real-life fire conditions. Image Source: atelierjones, 2022.

18. Technical Skill Development



Architecture and engineering firms face challenges in building, retaining, and distributing specialized mass timber knowledge throughout their organizations. Workshop discussions revealed a complex set of barriers to developing the technical capabilities needed for confident mass timber implementation.

A key challenge identified by several architecture firms involves maintaining organizational knowledge continuity across projects. Even after successful mass timber implementation, the experience gained typically remains concentrated within the specific project team rather than being effectively institutionalized and shared across the organization. This siloing effect creates inconsistent capabilities and prevents firms from leveraging past experiences to streamline future projects.

The technical complexity of mass timber requires new knowledge in multiple areas. Firms highlighted connection detailing, moisture management, acoustical performance, and fire protection strategies that differ significantly from those used in conventional construction. Several engineering firms noted that these skills demand substantial investment in training, specialized software, and direct experience that is difficult to acquire without dedicated resources.

Many firms are addressing these challenges by creating internal mass timber working groups or centers of excellence. One international architecture firm described establishing a dedicated mass timber "incubator" team that develops standardized solutions, conducts research, and serves as internal consultants to other project teams. Similarly, a structural engineering firm has invested in proprietary design tools and parametric modeling capabilities specifically for mass timber projects. However, workshop discussions revealed that such investments are often difficult to justify without a reliable stream of mass timber projects to amortize the development costs.

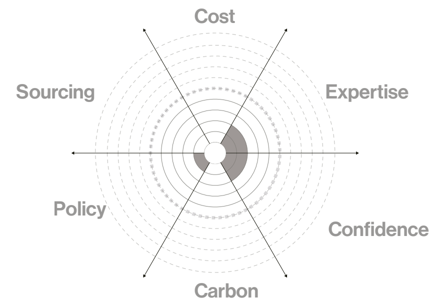
Several firms also highlighted the value of participatory learning through manufacturer collaborations, factory visits, and construction site experiences. These hands-on opportunities provide technical staff with critical understanding of manufacturing constraints, construction sequencing, and coordination requirements that can't be gained through traditional professional education. Yet access to these learning opportunities may be limited by cost and geography.

> *"One major challenge that we have faced has involved confronting the learning curve required to take on mass timber projects. New systems require time and financial investment in self education and knowledge sharing, which is generally pro-bono, unfunded, and unpaid work."*
>
> **- Moriyama Teshima Architects**

The experience gap extends to specialized design and analysis tools. Multiple engineering firms reported developing custom calculation tools, connection libraries, and standard details to efficiently design mass timber structures. Without these specialized resources, teams face significant inefficiencies in design development and documentation, further discouraging mass timber adoption. Several workshops emphasized that these technical tools and methods require ongoing refinement through actual project implementation, creating barriers for firms without established mass timber experience.

Technical Skill Development	Professional development in mass timber requires substantial knowledge acquisition investment and direct experience.					
5/10 WEIGHTED IMPORTANCE	3 Experience	2 Cost	0 Confidence	0 Sourcing	0 Policy	0 Carbon

19. Gatekeeping Knowledge

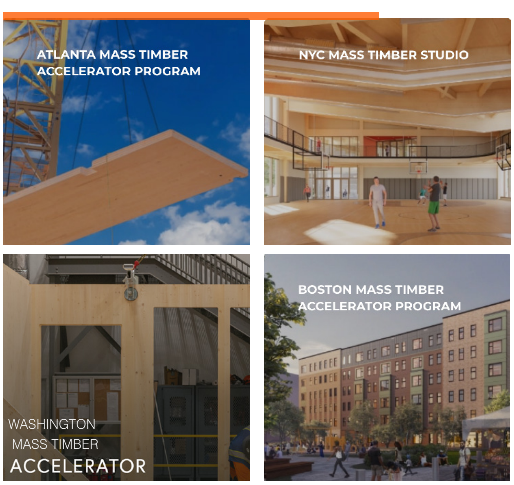


The competitive protection of information within the mass timber industry creates barriers to widespread advancement and adoption. Workshop discussions revealed tension between firms' desires to maintain competitive advantages and the industry's need for broader knowledge sharing to advance mass timber adoption.

Several firms reported internal disagreement over how much proprietary mass timber knowledge should be shared with third parties. Some team members worry that sharing detailed information could reduce their firm's leverage in securing future projects. This protective attitude extends to successful design solutions, cost data, and procurement strategies that could benefit the broader industry if shared more openly.

The challenge manifests both within and between organizations. Some workshops revealed that even within individual firms, mass timber expertise often remains siloed due to concerns about maintaining competitive edge between teams or offices. This knowledge hoarding can slow the development of mass timber experience across the industry and limit opportunities for collective learning from both successes and failures.

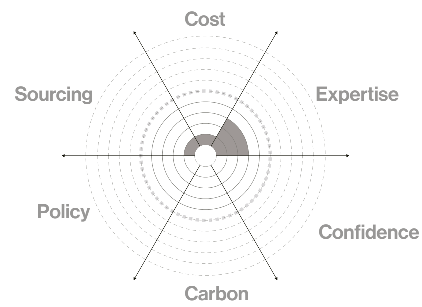
> *" We've occasionally encountered pockets of knowledge hoarding in the mass timber space. Recently, I spoke with a contractor who mentioned they were doing innovative prefabricated mass timber work, but when I asked for specifics, they were reluctant to share details—treating it like proprietary 'secret sauce.' We've experienced this in technical collaborations too; when conducting LCA analysis for mass timber housing typologies, a partner would only provide high-level summaries, refusing to share their detailed data. At SERA, we believe in an open-book approach where sharing knowledge advances the entire industry. When we're not learning together, everyone has to reinvent solutions separately, which dramatically slows adoption across the sector."*
>
> **- SERA Architects**



Mass Timber Accelerator Programs across the Eastern United States aim to establish a coordinated initiative uniting cities, federal agencies, and lumber industry organizations to drive innovation and adoption in mass timber construction.

Gatekeeping Knowledge	Protecting market advantages restrict industry-wide knowledge dissemination and collaborative advancement.					
5/10 WEIGHTED IMPORTANCE	2 Experience	0 Cost	2 Confidence	0 Sourcing	1 Policy	0 Carbon

20. Expanded Service Requirements



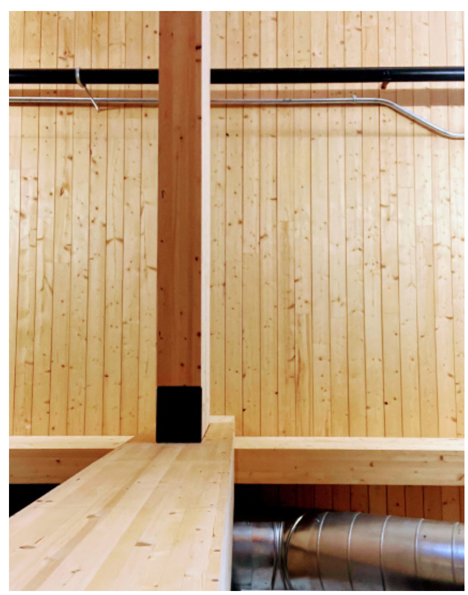
Architecture and engineering firms increasingly find themselves forced to handle material sourcing and specification responsibilities that extend well beyond traditional professional scope. Workshop discussions revealed that mass timber projects often require teams to develop expertise in areas like forestry practices, supply chain logistics, and manufacturing capabilities that weren't previously part of standard services.

Several firms reported that effective mass timber implementation requires deeper engagement with material sourcing than conventional projects. While standard practice for materials like concrete or steel might involve general performance specifications, mass timber often requires teams to specify exact panel sizes, connection details, and even source locations to ensure project success. This expanded scope comes without corresponding fee increases, putting additional pressure on already tight project budgets.

The divide between design expertise and forestry expertise emerged as a consistent theme across workshops. Many architects and engineers emphasized that forestry questions should be addressed at higher levels (rating systems, standard development, or regional policy) since design professionals aren't trained in forest management practices. Nevertheless, they often find themselves needing to make or defend decisions about forestry-related specifications without adequate support frameworks.

The challenge is particularly pronounced for smaller firms with limited resources for developing specialized experience. Multiple workshops noted that clients expect firms to navigate complex sourcing and specification issues without recognizing the additional work involved. Several firms reported spending significant unbillable time researching and coordinating mass timber sourcing and specifications, further straining project profitability.

> *"While manufacturing of mass timber seems strong, the coordination capacity to actually supply prefabricated solutions does not always meet the demand. This often requires special coordination, timeline management and earlier bid packages to meet lead times or limited fabrication ability. Finding additional fabrication solutions to alleviate the fabrication bottleneck may help streamline the supply chain process."*
>
> **- Coughlin Porter Lundeen**



The Minwamon Building of the Canadian Nuclear Laboratories.
Source: Pilot Projects, 2025.

Expanded Service Requirements	Architecture and engineering firms are forced to expand their services beyond the traditional professional scope.					
3/10 WEIGHTED IMPORTANCE	1 Expertise	0 Cost	0 Confidence	2 Sourcing	0 Policy	0 Carbon

Case Study No. 6

Creating a Zero Carbon STEM Building | Kaiser Borsari Hall

Rendering of Kaiser Borsari Hall at Western Washington University. Designed by Perkins&Will with structural engineering by Coughlin Porter Lundeen. Source image: Kevin Scott, 2024.

Location
Bellingham, Washington, USA

Firms
Perkins&Will Architects
Coughlin Porter Lundeen Structural Engineers
Mortenson
Kalesnikoff
Western Washington University

Status
Completed 2024

Project Type
Type III-B Educational

Size
4-story, 53,345 SF

Mass Timber Elements
Glulam beams and columns
Cross-Laminated Timber (CLT) panels

Overview

Kaiser Borsari Hall at Western Washington University (WWU) stands as the first higher education STEM building in the U.S. tracking Zero Energy and Zero Carbon certification through the International Living Future Institute (ILFI). Designed to house WWU's electrical engineering and computer science departments, the mass timber structure features an advanced battery system for on-site energy storage, advancing the university's vision to become Washington's first carbon net-neutral collegiate campus. The project's sustainability achievements earned it the Bronze Award from the Holcim Foundation for the North American region – the only award given globally to a higher education building.

"Key Challenges" Addressed

This project addresses a variety challenges captured by our list of 25 challenges.

#15 Public Procurement Policies: The project created a groundbreaking pathway in Washington State for publicly funded projects to pursue Living Futures' NZE and NZC programs instead of the state-mandated LEED Silver certification. This regulatory innovation paves the way for future public projects to prioritize carbon performance over conventional certification systems helping to meet an institution's carbon commitments.

#18 Not Valuing Carbon: The project demonstrates how to effectively prioritize carbon reduction in public sector decision-making. By quantifying both embodied carbon savings (63% reduction) and operational carbon impacts (net zero), the team created a compelling value proposition that resonated with institutional stakeholders.

#14 Building Code Modernization: The design team successfully navigated building code requirements while creating spaces that showcase exposed mass timber. They strategically addressed vibration concerns by locating sensitive laboratory equipment on the ground floor while positioning research and office spaces on the timber-framed upper stories.

#13 Values Versus Priorities: Kaiser Borsari Hall successfully aligned multiple stakeholder priorities, including educational excellence, carbon reduction, and fiscal responsibility. The project eliminated a costly basement (saving $2.1M and 226 tCO2) while developing design-for-disassembly solutions that enhance both sustainability and future adaptability.

#24 Negative Perception Bias: The project's success has created a powerful positive example that counters skepticism about mass timber's viability for technical educational facilities. WWU's commitment to target mass timber for all future projects demonstrates how successful implementations can reshape institutional perceptions and policies.

Solutions Implemented

- A simple mass timber structure employs contrasting wood finishes, with warm interiors set against dark shou sugi ban exterior cladding.
- Comprehensive carbon modeling guided design decisions, allowing the team to reduce embodied carbon by 63% compared to conventional construction while also achieving operational net zero performance.
- Strategic optimization of the building footprint eliminated the originally planned basement level, simultaneously reducing costs by $2.1M and reducing carbon emissions by 226 tCO2.
- The design addresses common vibration concerns for technical equipment by strategically locating robotics and energy labs on the ground floor while positioning research and office spaces on the upper mass timber levels.
- The all-electric building operates independently from campus steam systems, leveraging WWU's PSE Green Direct program for 100% renewable wind and solar energy. Roof-mounted solar panels cover more than 75% of the roof area, providing significant on-site energy generation.
- The mass timber structure is deliberately exposed throughout the interior, connecting students and faculty to natural elements while serving as a "living laboratory" for sustainable building practices.

Outcomes & Lessons Learned

- The project achieved an impressive 82% energy use reduction below the baseline for similar buildings and includes a comprehensive on-site renewable energy strategy covering 75% of the roof area.
- The success of Kaiser Borsari Hall has directly influenced Western Washington University's sustainability policies – the university now mandates that all future projects utilize mass timber construction and pursue net-zero certification as part of their carbon neutrality goal for 2035.
- The project demonstrates how mass timber can effectively integrate with advanced technologies in educational settings, including specialized robotics labs, energy research facilities, and high-tech learning environments.
- The project creates a powerful precedent for other publicly funded STEM buildings by proving that zero carbon mass timber solutions can effectively serve technical education needs while remaining within public project budgets.
- Beyond its environmental achievements, the building functions as an educational tool itself – a "living laboratory" where engineering students can learn directly from the building's innovative materials and systems.

Image of Kaiser Borsari's black shou sugi ban siding, ribbon windows, and natural wood panels. Source: Perkins&Will, 2024.

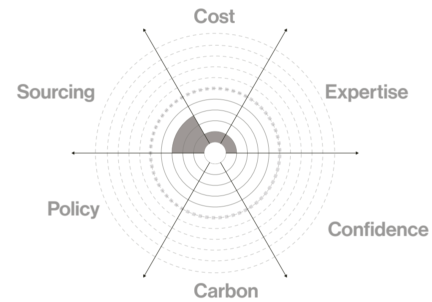
The building encourages students to collaborate with flexible furniture layouts and writeable surfaces in the learning labs and makerspaces. Source: Perkins & Will, 2024.

Learn More

For more information about Kaiser Borsari Hall, please see:

Project Page
WoodWorks Innovation Network
Project Profile
Holcim Award Announcement

21. Procurement and Installation Timelines



The coordination of mass timber delivery and assembly presents unique timeline challenges that impact project feasibility. Workshop discussions revealed that procurement lead times for mass timber typically extend to 6-8 months, substantially longer than many conventional materials. This extended timeline stems from several factors specific to mass timber production.

A significant portion of this lead time is consumed by the labor-intensive shop drawing process. Workshop participants described how mass timber requires detailed shop drawings and precise manufacturing specifications, similar to structural steel but with different considerations. While steel fabrication has established protocols and industry standards, mass timber often involves newer coordination methods and unfamiliar tolerances that many teams are still adapting to. This shop drawing phase alone can require 2-3 months of collaboration between the design team and manufacturer, particularly for teams without established mass timber detailing processes.

Scheduling challenges with mass timber often relate more to logistical coordination than manufacturing capacity constraints. While smaller projects can struggle to secure priority in production schedules, most North American manufacturers are currently operating below full capacity (around 50% according to some estimates). The challenges instead stem from the limited number of manufacturers serving large geographic regions, leading to complex logistics planning rather than true capacity limitations. This creates a perception of scarcity despite available production capacity, as the timeline constraints relate more to transportation, sequencing, and coordination than actual manufacturing limitations.

The geographic distribution of suppliers compounds these timeline challenges. Workshop participants described how projects in regions without local manufacturers face extended lead times due to transportation distances. The need to coordinate shipments across state or national boundaries adds layers of logistics complexity and potential for delays, particularly for projects requiring precise scheduling or phased deliveries.

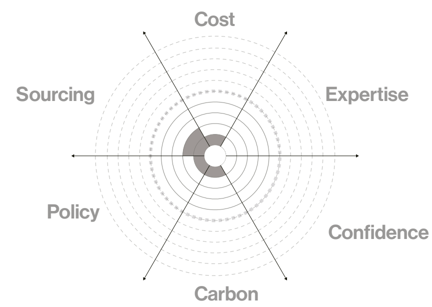
> *"Finding time in mass timber manufacturing lines for smaller projects continues to be a challenge, but it also presents an opportunity for smaller mass timber operators to come online."*
>
> **- atelierjones**

Workshop participants also emphasized how procurement timeline challenges affect overall project sequencing and coordination. Unlike conventional construction where material availability is relatively predictable, mass timber projects require more extensive early planning and commitment to material decisions. Several firms noted that the need to lock in orders months in advance limits flexibility during design development and makes it more difficult to accommodate client-requested changes.

These procurement and installation timeline challenges collectively create additional project management complexity that can deter teams unfamiliar with mass timber construction. Without experience navigating these unique timeline considerations, project teams may view mass timber as creating unacceptable schedule risks compared to more familiar construction methods.

Procurement & Installation Timeline	Extended material acquisition periods complicate construction sequencing and project scheduling.					
5/10 WEIGHTED IMPORTANCE	1 Experience	1 Cost	0 Confidence	3 Sourcing	0 Policy	0 Carbon

22. Achieving Green Building Certifications



The requirements of various building certification systems can sometimes create unexpected barriers to mass timber implementation. Workshop discussions revealed how certification criteria can discourage practical and sustainable approaches to timber sourcing and use.

A primary challenge emerges from forest product certification requirements within green building rating systems. These certifications often limit supplier options and add significant cost premiums. FSC certification can add 15% to material costs while contributing only marginally to certification points—a premium difficult to justify when requirements prevent teams from pursuing potentially more sustainable but non-certified local options.

Several firms reported challenges with rigid certification requirements creating competing priorities. Living Building Challenge requirements for both FSC certification and local sourcing often conflict in regions where forests aren't FSC-certified. While exceptions theoretically exist, workshop participants reported they were rarely granted, forcing teams to choose between certification compliance and potentially more sustainable local sourcing.

The challenge extends beyond wood sourcing to broader certification structures. The point-based systems in many green building certifications can lead to counterproductive trade-offs. Teams may prioritize other certification criteria (such as bicycle storage or other point-earning features) to achieve minimum thresholds or point targets, depleting project budgets that could otherwise overcome the mass timber cost premium. This structure means that certification pursuit can sometimes work against mass timber adoption rather than supporting it, despite mass timber's inherent sustainability benefits.

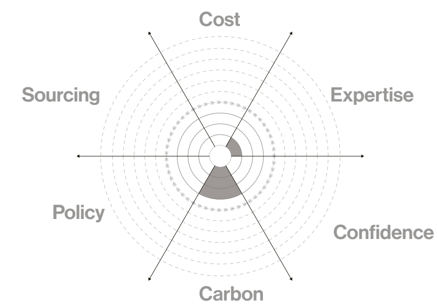
Multiple workshops noted instances where pursuit of certification points may have led to increased overall environmental impact. For example, teams might ship FSC-certified timber from distant sources rather than using locally sourced materials, increasing transportation emissions and undermining regional economic development. Workshop participants suggested greater flexibility in green building rating systems to allow for context-specific approaches.

This complexity creates a challenging dynamic for project teams committed to both certification achievement and mass timber implementation. Without certification systems that better align with the practical realities of regional mass timber sourcing and acknowledge the inherent sustainability benefits of mass timber construction, projects may continue to face unnecessary barriers to wood adoption despite shared environmental goals.

> *"The Living Building Challenge requires both FSC certification and local sourcing, but these requirements often conflict in the Southeast. On one project, FSC-certified European timber was $100k cheaper despite logistical risks. We were penalized for using non-FSC local wood, highlighting certification inflexibility. We ultimately prioritize regional sourcing over certification, even if it means not achieving certification status."*
>
> **- Anonymous Firm**

Achieving Building Certifications	Environmental certification requirements occasionally conflict with local sourcing desires and regional material availability.					
5/10 WEIGHTED IMPORTANCE	0 Experience	1 Cost	0 Confidence	2 Sourcing	1 Policy	1 Carbon

23. Carbon Calculation Complexity

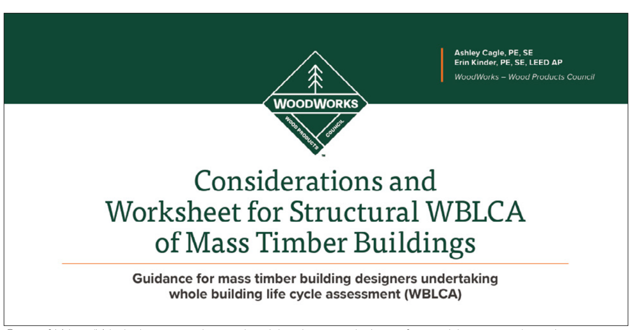


The lack of standardized methods for measuring and verifying embodied carbon presents a challenge for mass timber adoption. Workshop discussions revealed ongoing uncertainty around how to account for biogenic carbon storage and end-of-life considerations in mass timber projects.

Several firms noted the challenge of inconsistent approaches to carbon accounting. While some include biogenic carbon storage in their calculations, others exclude it due to uncertainties about end-of-life scenarios. This lack of standardization makes it difficult to compare projects or make compelling carbon reduction arguments to clients. One firm specifically noted that they take the conservative approach of excluding biogenic carbon from their calculations to avoid potential overstatement of benefits.

Industry professionals have raised important concerns about the accuracy of default values in Life Cycle Assessment tools, noting they often fail to reflect the realities and specific conditions of manufacturing and transportation. Firms reported using TallyLCA, AthenaIE, One Click LCA and SimaPro, each with their own assumptions and calculation methods. This lack of standardization creates challenges in verifying carbon claims and communicating benefits to stakeholders. Several workshops highlighted the need for industry-wide standards for carbon accounting in mass timber projects.

> *"The trap people can fall into, particularly in an LCA world, is acting as an accountant. You design something, then calculate how much carbon it costs, rather than being part of the design process from the start. Instead of saying 'here's this magic dust that will give us the carbon reduction at the end,' we should be asking 'what if we can reduce the volume of material used in the first place?' This automatically leads to structural efficiency in elements, and lowers the total carbon of the design. That's a slightly different thought process, but it's the one we try to encourage projects to adopt. Using less stuff from the very beginning is a more powerful approach."*
>
> **- Equilibrium Consulting Inc.**



One of WoodWorks' many released guides is a worksheet for architects and engineers about performing WBLCA during design projects. Image Source: WoodWorks

Carbon Calculation Complexity	Biogenic carbon assessment methodologies lack standardization across platforms, standards, policies and rating systems.					
4/10 WEIGHTED IMPORTANCE	1 Experience	0 Cost	0 Confidence	0 Sourcing	0 Policy	3 Carbon

Case Study No. 7

Advancing Mass Timber Innovation | Fast + Epp's Concept Lab

Image of tests conducted by Fast + Epp on CLT minor strength axis moment connections in their Concept Lab.
Source image: Fast + Epp, 2024.

Location
Vancouver, B.C, Canada

Firm
Fast + Epp Structural Engineers

Status
Active (Established 2021)

Project Type
Research & Development Facility

Size
Occupies entire first floor and half of the second floor of Fast + Epp headquarters

Overview

Fast + Epp's Concept Lab is a pioneering research and development space dedicated to advancing structural design and propelling architectural imagination in mass timber construction. Located in Fast + Epp's mass timber hybrid headquarters in Vancouver, the facility combines physical testing capabilities with digital innovation to transform conceptual ideas into validated structural solutions. The lab serves as a collaborative hub for design professionals, academics, and industry partners to test, validate, and refine mass timber systems and components.

"Key Challenges" Addressed

This project addresses a variety challenges captured by our list of 25 challenges.

#23 Structural Analysis Tools: The Concept Lab directly addresses limitations in existing structural analysis tools through its development of web applications for early-phase design and specialized software for mass timber analysis. These tools fill critical gaps in the current software landscape that often cannot adequately model or analyze mass timber's unique properties.

#16 Technical Skill Development: Through its systematic testing programs and publicly shared research findings, the lab builds industry capacity by developing specialized expertise in mass timber design, connection detailing, and performance optimization. This knowledge development extends beyond Fast + Epp to benefit the broader engineering community.

#5 Product and Assembly Standardization: Concept Lab's research on point-supported CLT systems, minor axis moment connections, and other mass timber components accelerates the development of standardized mass timber products and assemblies. Their comprehensive testing of various materials, configurations, and connection types builds the foundation for more systematic product standardization.

#17 Carbon Calculation Complexity: The lab's development of digital tools like the Embodied Carbon Calculator addresses the complexity of calculating carbon impacts in early design stages, providing architects and engineers with accessible methods to quantify environmental benefits of mass timber.

#8 Structural Contractor Resistance: By documenting and demonstrating the structural efficiency, reparability, and adaptability of mass timber systems, the lab provides contractors with evidence-based assurance about mass timber's performance, helping overcome resistance based on unfamiliarity.

#24 Negative Perception Bias: Research findings on the reparability of CLT panels and the non-brittle failure modes of mass timber connections provide concrete evidence to counter misconceptions about mass timber's durability and safety, helping shift industry perception.

Solutions Implemented

- The Concept Lab combines physical and digital infrastructure including fabrication facilities, testing equipment, and software development capabilities to provide comprehensive research capabilities.
- A dedicated full-time team led by Fast + Epp's research and development director ensures consistent progress and focus on industry-relevant challenges.
- Extensive testing protocols with multiple repetitions and variables (180 tests for point-supported CLT alone) generate statistically significant data that can inform building codes and design standards.
- Public sharing of research findings through publications, code committee submissions, and industry events ensures knowledge dissemination beyond the firm.
- Digital tools and web applications developed by the lab make complex structural analysis more accessible to the broader design community, accelerating early adoption of mass timber solutions.

Model of Fast + Epp's Hive project taken in their Concept Lab. Source: Pilot Projects, 2024.

Outcomes & Lessons Learned

- Testing of point-supported CLT demonstrated that damaged CLT panels repaired with fully threaded reinforcing screws can restore most, if not all, of the strength and stiffness of a panel where shear failure at columns has occurred.
- Research on CLT shearwalls for seismic zones established performance data for 27 different wall configurations, expanding the applicability of mass timber in earthquake-prone regions.
- Parametric design tools developed by the lab have enabled significant material optimization in structural frames, reducing costs while enhancing sustainability.
- The lab's integration of digital and physical research capabilities has demonstrated the value of bridging the traditional divide between design and construction through shared knowledge and technology.
- The development of educational resources like the "Wood Use in British Columbia Schools" guide has expanded mass timber's adoption in the educational sector.

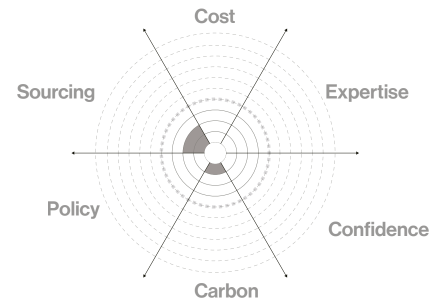
An example of the mass timber wood sample "library" found in Fast + Epp's Concept Lab. Source: Pilot Projects, 2024.

Learn More

To learn more about the Concept Lab, please see:

The Lab Overview Page
The Digital Lab Page

24. Supply Chain Verification



Ensuring sustainable sourcing practices and documenting environmental impacts throughout the timber supply chain presents significant challenges for design professionals. Workshops revealed that firms often struggle to obtain detailed information about wood sources and verify environmental claims, particularly regarding forestry practices and carbon impacts.

Several firms reported difficulties in obtaining transparent sourcing information from manufacturers. While forest management certification systems provide some assurance, they don't always offer the level of detail firms need to validate specific sustainability claims or carbon calculations. Environmental Product Declarations (EPDs) for wood products often contain very general information about forestry practices, making it difficult to assess true sustainability impacts.

One approach that has proven effective for many firms is establishing direct communication with intended suppliers about their wood sourcing and forest management practices. Several workshops highlighted how building relationships with suppliers has helped teams make more informed decisions based on relevant forest management details, and to develop local and specific narratives about their materials that resonate with clients. This direct engagement approach typically wins out over generic certification claims when teams need to make difficult sourcing decisions.

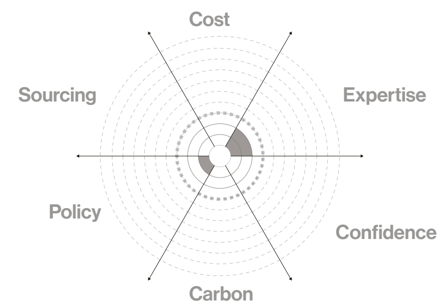
The issue of forestry expertise gaps has emerged as a related issue. Multiple firms expressed that forest management questions should be addressed at higher levels - either at the rating system, standards development, or regional regulatory level. They acknowledged that engineers and architects are not forestry experts and should be able to trust information from relevant authorities, provinces, regions, and the forestry industry. This points to a critical gap in the current supply chain verification system, where design professionals must make decisions about forestry practices without adequate experience or verification frameworks while also navigating varying levels of trust in information provided by the forestry industry.

> *"For us, supply chain verification isn't just about certifications on paper. We've built years of trust with local suppliers like Pioneer Forest, where we've witnessed their sustainable practices firsthand. These long-standing relationships give us confidence in their stewardship that goes beyond formal certification. When you know your suppliers personally—when you've walked their forests and seen their commitment to responsible management—you develop a level of trust that's difficult to replicate with documentation alone."*
>
> **- Hellmuth + Bicknese Architects**

The challenge extends to carbon calculations and Life Cycle Assessments (LCAs), which require detailed data about forestry practices, transportation distances, and manufacturing processes to accurately assess environmental impacts. Firms report that establishing these direct supply chain relationships not only improves verification but can also lead to better material outcomes by ensuring alignment between design intent and material specifications.

Supply Chain Verification	Lack of supply chain transparency presents challenges in verifying environmental claims.					
3/10 WEIGHTED IMPORTANCE	0 Experience	0 Cost	0 Confidence	2 Sourcing	0 Policy	1 Carbon

25. Structural Analysis Tools



The limitations of current structural analysis software and performance evaluation tools create a challenge for engineers trying to assess the structural, seismic, and fire performance of mass timber systems. Workshop discussions revealed that many commonly used analysis programs lack appropriate parameters for accurately modeling mass timber behavior.

Several firms noted that Authorities Having Jurisdiction (AHJs) often rely on structural analysis software that is less effective for evaluating mass timber systems. While specialized firms have developed experience with tools that better accommodate mass timber properties, these programs aren't always accepted by reviewing authorities who prefer familiar, traditional analysis software. This mismatch creates barriers when seeking approvals for innovative mass timber solutions.

Multiple engineering firms highlighted concerns about the accuracy of default material property values in structural analysis software. These default values for mass timber elements often don't reflect the specific properties of the products actually being used in projects, as they may vary by manufacturer, wood species, and panel configuration. Some firms have resorted to conducting extensive physical testing to validate computational models since the available software often inadequately represents mass timber's unique structural properties and connection behaviors.

The challenge extends beyond structural analysis to other performance metrics including fire resistance, seismic performance, acoustics, thermal comfort, and vibration. Firms reported that existing tools often lack accurate data on mass timber's performance characteristics, making it difficult to model and predict behavior with the same confidence as traditional materials. This technical uncertainty creates additional barriers for firms trying to optimize mass timber designs or demonstrate compliance with performance requirements.

This gap in analysis capabilities creates a compounding challenge: without reliable software tools, firms must invest in additional physical testing and custom modeling approaches. This increases design costs and extends timelines compared to conventional materials with well-established analysis methods. The lack of standardized, widely accepted analysis tools particularly impacts smaller firms without resources to develop proprietary methods or fund extensive physical testing programs.

> *"Many structural analysis software tools commonly used by Authorities Having Jurisdiction, such as SAP2000 from the CSI suite, are not well-suited for mass timber testing. These programs are often considered default analyzers for structural analysis but are less effective for mass timber structures. In contrast, we use RFEM for our analysis, a tool not widely accepted by AHJs. This mismatch creates significant challenges in gaining approval for innovative mass timber designs, as we're essentially speaking different technical languages when trying to validate our solutions."*
>
> **- Fast + Epp**

Structural Analysis Tools	Performance analysis software typically used for regulatory compliance requires calibration for mass timber's distinctive material properties.					
3/10 WEIGHTED IMPORTANCE	2 Experience	0 Cost	0 Confidence	0 Sourcing	1 Policy	0 Carbon

Concluding Thoughts & Recommendations

The growing demand for new buildings, building expansion, and building repurposing will remain a significant global reality in the coming decades. This surge in construction will be a major contributor to climate emissions, intensifying the challenges of global warming. While North American construction represents only a modest share of global new buildings, the responsibility for leadership in low-carbon solutions is significant. With North America's strong economies, abundant forest resources, and history of construction innovation—including extensive experience with timber—there is little excuse for inaction. Instead, North America should help lead the way in leveraging sustainable and renewable materials like timber to shape the future of our cities, both on this continent and globally.

As the Mass Timber Tipping Point has demonstrated, North American architects and engineers are highly motivated to drive this transition. However, they continue to face significant challenges. While the adoption of next-generation mass timber solutions is slowly increasing, it has not yet reached a critical mass—despite two decades of growing recognition. This study aims at shedding light on why this is the case by contributing to the body of research supporting mass timber's role in a more sustainable future.

The Imperative for Change

Our research revealed two distinct yet interconnected decision points in mass timber implementation: whether to employ mass timber elements in a project, and subsequently, where to source these materials. The former represents the more consequential decision point, as material sourcing considerations become relevant only after the initial commitment to mass timber has been made. Notably, we found no instances where concerns about environmental claims of material sourcing directly prevented a project from utilizing mass timber elements.

Perhaps the most significant barrier identified in our study is the considerable knowledge and risk tolerance disparity between the design community and the construction industry. While some design firms are actively investing in developing mass timber expertise within traditional fee structures, and some contractors have been willing to underwrite their learning curve, the limited number of experienced practitioners in both disciplines creates a knowledge gap that often results in risk premiums being passed to clients—sometimes pushing project budgets beyond feasibility.

An Integrated Approach to Solutions

While we found it essential to present challenges with great specificity (as outlined in our 25 Challenges), it became equally clear that solutions will emerge through integrated actions—projects, policies, initiatives, and movements that address multiple challenges simultaneously. This offers a promising outlook for designers, who excel at integrative thinking, as demonstrated by the case studies in this report.

The following recommendations are organized by key industry group, recognizing that mass timber adoption requires coordinated action across the entire building ecosystem. Each recommendation targets specific challenges while acknowledging the interconnected nature of these barriers, and is supported by specific resources to help stakeholders take effective action. Rather than embedding detailed resources within the recommendations themselves, key resource lists have been included at the end of each industry group section to offer practical pathways for implementing these strategies. These resources range from technical guides and training programs to policy frameworks and cost analysis tools, ensuring that stakeholders have the specific support needed to move from recommendation to action.

Recommendations by Industry Group

Architects & Engineers

1. Demonstrate Cost Competitiveness

Addresses Challenges: #1 Holistic Costing Gaps, #3 Contractor Cost Inflation, #8 Material Cost Competition

Mass timber can be cost competitive when approached strategically, but architects and engineers must understand and communicate the full economic picture to clients and contractors. The industry faces persistent misconceptions about cost premiums that often stem from incomplete analysis and contractor unfamiliarity.

a. Push design teams toward cost-effective solutions: Mass timber does not have to cost more than conventional construction methods when teams design buildings that are optimized for timber rather than accepting cost premiums as inevitable.

- Consider hybrid approaches that strategically combine mass timber with steel and concrete to optimize both performance and cost while gaining experience with timber systems
- Focus on designing buildings that are cost-effective in timber rather than forcing timber into designs optimized for other materials
- Recognize that there are examples across North America of mass timber buildings that cost equivalent to or less than concrete and steel alternatives

b. Present comprehensive value propositions: Help clients understand that timber building assessment should focus on return on investment rather than just bottom-line construction costs.

- Address holistic costing gaps by evaluating mass timber's total impact beyond just the structural system, including reduced foundation sizes, finishing requirements, erection times, and accelerated project schedules that enable earlier occupancy
- Emphasize how faster construction provides reduced financing periods and earlier revenue generation, while demonstrating enhanced property values, faster leasing, healthier workplaces, and competitive market positioning that translate environmental benefits into compelling business outcomes

c. Build contractor confidence through education: Address contractor cost inflation by helping contractors understand the true costs and benefits of mass timber construction.

- Support contractor learning through facility visits and project tours that demonstrate assembly processes and realistic construction timelines
- Share accurate cost data and performance information to counter risk-averse pricing based on unfamiliarity
- Advocate for early contractor engagement through project delivery methods that reduce uncertainty and enable more accurate cost estimation

2. Build Deep Material Understanding

Addresses Challenges: #5 , #12 Designer Inexperience Loop, #18 Technical Skill Development

Success requires architects and engineers to develop genuine expertise rather than superficial familiarity. The industry faces a critical shortage of practical expertise, with firms struggling to secure mass timber projects without demonstrated experience, yet unable to build experience without projects.

a. Invest in comprehensive material education: Teams should understand how mass timber works structurally, how it's manufactured, and how it performs in different applications. This knowledge builds the confidence needed for effective client advocacy.

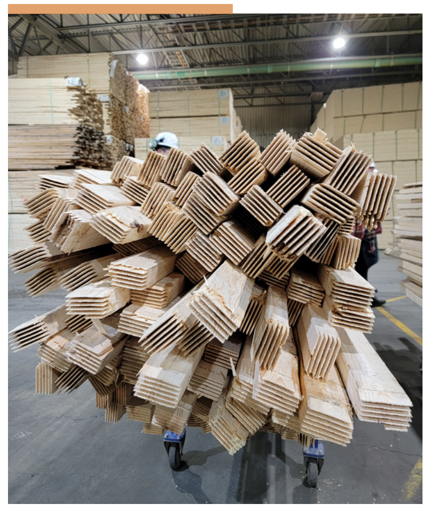
- Build internal mass timber working groups or centers of excellence that develop standardized solutions, conduct research, and serve as internal experts to other project teams
- Develop understanding of connection detailing, moisture management, acoustical performance, and fire protection strategies that differ

b. Commit to partnering with experienced firms: Break the inexperience loop through strategic collaboration rather than attempting to develop expertise in isolation.

- Form joint ventures or collaborative partnerships with more experienced firms when competing for projects, allowing knowledge transfer while sharing project risk
- Recognize that initial projects often require investment that pays off in subsequent work, and partnerships can make that initial investment more accessible
- Develop consistent project teams across multiple projects with the same developer, architect, engineer, and general contractor to create institutional knowledge

c. Develop risk mitigation expertise: Be prepared to address client concerns about code issues, insurance implications, and material supply by having thorough knowledge of these topics.

- Understand building code pathways, fire safety requirements, and jurisdictional variations. Potential challenges can be managed through early consideration
- Build relationships with suppliers and understand procurement timelines, material specifications, and supply chain logistics
- Diversify and replicate organizational knowledge across projects rather than allowing expertise to remain siloed within specific project teams



Finger joints for lamination at the Nordic Structures plant in Chibougamou, Quebec.. *Source:* Pilot Projects, 2023.

3. Design in Timber from the Beginning

Addresses Challenges: Challenge #5 - , Challenge #6 - Values Versus Priorities, Challenge #14 - Unique Project Delivery Requirements

Mass timber requires a fundamentally different design approach than conventional materials. Rather than designing a building and then selecting materials, architects should design in timber from the outset. This early commitment enables optimization that dramatically impacts both cost and performance. Architects and engineers should:

a. Consider timber from project inception: Teams should understand how mass timber works structurally, how it's manufactured, and how it performs in different applications. This knowledge builds the confidence needed for effective client advocacy.

- Integrate timber considerations into fundamental building decisions such as construction type selection, which directly influences fire-resistance requirements, member sizing, structural efficiency, and overall project feasibility
- Recognize the cascading impact of early decisions where choices about construction type affect fire ratings, which influence member sizes, which determine efficient spans, which shape optimal grids, which impact MEP integration strategies
- Avoid the "material substitution" approach where teams develop designs in steel or concrete and later attempt to replace the structure with timber, which typically results in suboptimal performance and unnecessary cost premiums

b. Foster true architect-engineer collaboration: Unlike concrete or steel construction where architects can hand drawings to engineers for structural resolution, mass timber requires closer collaboration from concept design to achieve optimal cost and material efficiency.

- Begin collaboration during the conceptual design phase rather than delegating engineering after the design is set. Many successful mass timber projects result from early partnership between architects with vision and engineers who understand timber's unique characteristics
- Engage structural engineers as design partners who provide guidance on spans, column grid layouts, and connection strategies that inform rather than constrain architectural decisions
- Create integrated conversations that address material efficiency, construction sequencing, and client opportunities simultaneously rather than treating these as separate optimization exercises

c. Engage contractors earlier through collaborative project delivery methods: Mass timber's coordination requirements are best served through project delivery methods that bring contractors into design phases rather than traditional design-bid-build approaches.

i. Advocate for Early Contractor Involvement (ECI) or Integrated Project Delivery (IPD) that enable contractors to provide holistic cost feedback, constructability input, and timeline guidance while designs can still be optimized for mass timber feasibility and cost-effectiveness.

ii. Establish early pricing protocols for obtaining contractor cost feedback during schematic and design development phases, enabling informed decision-making about mass timber approaches before significant design investment.

iii. Help clients understand how collaborative delivery methods lead to better mass timber project outcomes, including more accurate cost estimates, reduced change orders, and shorter construction schedules. Position upfront coordination as an investment that yields significant downstream savings and risk reduction.

4. Integrate Carbon Analysis into Early Decision-Making

Addresses Challenges: #11 Not Valuing Carbon, #23 Carbon Calculation Complexity

Carbon performance can become a standard part of the design process rather than an academic exercise conducted after key decisions are made. The industry struggles with standardization and verification challenges, but increased practice can build trust and move toward better methodologies.

a. Make LCA standard practice: Conduct carbon assessments during schematic design when design and material selections are still flexible, rather than treating environmental analysis as post-design documentation.

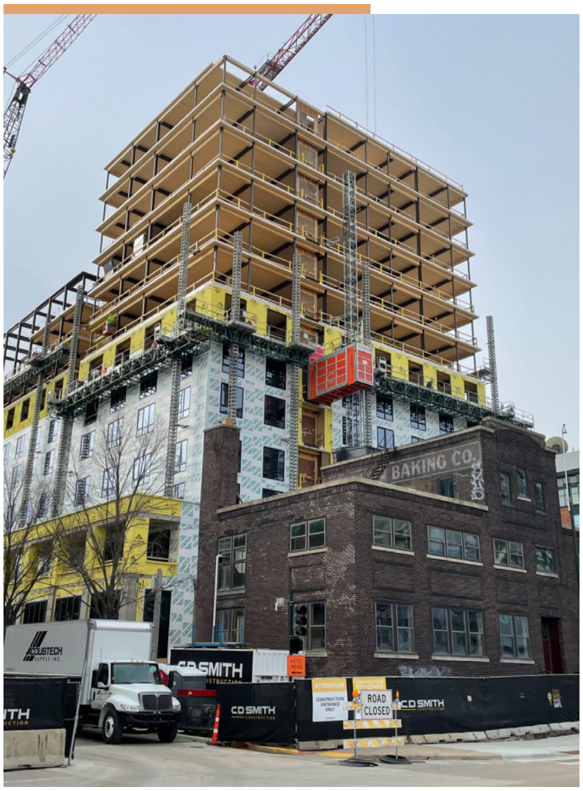
- Integrate carbon analysis into early design decision-making so that it actually influences material choices and structural approaches, rather than treating it as an afterthought or compliance exercise conducted after key decisions are made.

b. Build trust through increased practice: The more practitioners engage with carbon analysis, the more the industry will develop toward standardization and improved methodologies.

- Increase the number of teams conducting early-phase carbon assessments to generate more conversation and move the industry toward standardization
- Share carbon analysis results and methodologies openly to build collective understanding and advance industry-wide practices
- Treat carbon assessment as a design tool that informs decisions rather than simply a reporting requirement

c. Focus on design efficiency first: Reducing material quantities from the beginning of the design process often provides more significant carbon benefits than attempting to optimize after design decisions are made.

- Pursue material sufficiency from the beginning by using carbon considerations to drive design optimization and asking "what if we can reduce the volume of material used in the first place?" rather than treating carbon reduction as an afterthought to predetermined design decisions.



The Bakers Place project is a 14-story building consisting of a 3-story concrete podium and 11 stories of mass timber-steel hybrid construction with a primarily residential program above it.
Source: The Neutral Project and Michael Green Architecture.

Key Resources for Architects & Engineers to:

1. Demonstrate Cost Competitiveness

a. How to Successfully Cost Manage a Mass Timber Project (WoodWorks) - Practical guide covering budgeting, holistic cost evaluation, and competitive procurement strategies.

b. Mass Timber Business Case Studies (WoodWorks) - Collection of real project cost data and financial performance analysis demonstrating cost competitiveness.

c. Case Study Collections - Business-focused project examples including Commercial Projects That Pencil Out (Think Wood) and Top 10 Projects of 2024 (Think Wood) showcasing successful financial outcomes.

d. 2025 International Mass Timber Report (Trifecta Collective) - Annual market analysis including pricing trends, manufacturing cost analysis, and market data supporting cost competitiveness arguments.

e. WoodWorks Cost Effectiveness Database of Resources - WoodWorks

f. Mass Timber Cost and Design Optimization Checklists - Practical checklists for all phases of design process to optimize design and control costs.

g. Key Design Considerations for Mass Timber Projects - Discusses construction type, fire ratings, panel thickness, member sizes, and occupancy considerations in order to achieve cost-effective designs.

h. Creating Efficient Structural Grids in Mass Timber Buildings - Creating the most efficient structural layouts specific to mass timber sizing and manufacturing capabilities.

i. How Can a Developer/Owner Get Started with Mass Timber? - Brief discussion of the benefits of mass timber, including cost considerations.

j. Mass Timber: The Optimal Solution for Multi-Family High-Rise Construction - Overview of mass timber's value proposition for multi-family high-rise buildings, including developer insights.

k. Creating Efficient Structural Grids in Mass Timber Buildings - Creating to most efficient structural layout specific to mass timber sizing and manufacturing capabilities.

l. Review case studies of completed projects - WoodWorks

2. Build Deep Material Understanding

a. Online Education Platforms - Comprehensive learning opportunities through The Wood Institute Continuing Education Courses and Wood University Courses (APA) offering specialized mass timber training modules.

b. Fire Safety and Code Resources - Code compliance guidance including Fire Design of Mass Timber Members: Code Applications, Construction Types and Fire Ratings (WoodWorks) and Understanding the Tall Mass Timber Code Changes (Wood Aware), providing comprehensive coverage of fire safety design and tall mass timber code provisions essential for building confidence in mass timber applications.

c. Mass Timber Installation Training Curriculum (WoodWorks) - Training curriculum and educational modules designed to build comprehensive mass timber expertise across project teams.

d. Technical Design Guides - See previous resources under "Design in Timber from the Beginning"

e. Online Database Of Mass Timber Resources - WoodWorks

f. Free Webinars Showcasing Wood And Mass Timber Construction Topics - WoodWorks

g. Online Database Of Designed/Completed Mass Timber Projects, Manufacturers And Supplies, And Experts With Mass Timber Experience - WoodWorks Innovation Network (WIN)

h. What is mass timber? - Overview of mass timber products, applications, and sources

i. Creating Efficient Structural Grids in Mass Timber Buildings - Creating to most efficient structural layout specific to mass timber sizing and manufacturing capabilities.

j. Design for Two-Way Spanning Cross-Laminated Timber - Considerations for utilizing CLT in two-way spanning applications.

k. Shaft Wall Requirements for Tall Mass Timber Buildings - In-depth look at shaft enclosure requirements, including materials, noncombustible protection, fire resistance ratings and more.

Key Resources for Architects & Engineers to:

2. Build Deep Material Understanding - continued

l. CLT Layups and Basis of Design for Gravity Load Applications - Using CLT layups defined in ANSI/APA PRG 320 as the basis of design.

m. CLT Diaphragm Design for Wind and Seismic Resistance - Highlights SDPWS provisions for using CLT as a diaphragm.

n. CLT Diaphragm Design Guide - Guidance for the design of CLT diaphragms.

o. CLT Shear Wall Options in the US - Covers CLT and light-frame wood shear wall systems.

p. Mass Timber Fire & Acoustic Database - Find fire and acoustically-rated assemblies, connections, and penetrations in this evolving database.

q. Acoustics and Mass Timber: Room-to-Room Noise Control - Covers key aspects of mass timber acoustical design.

r. Designing Mass Timber Floor Assemblies for Acoustics - Designing mass timber floors to meet acoustic performance expectations.

s. Demonstrating Fire-Resistance Ratings for Mass Timber Elements in Tall Wood Structures - Discusses how to achieve fire resistance ratings for mass timber construction.

t. Fire Design of Mass Timber Members: Code Applications, Construction Types and Fire Ratings - Focusing on how to meet fire-resistance requirements for mass timber construction.

u. Using Char Methods to Demonstrate Fire Resistance of Exposed Wood Members - How to calculate the fire resistance of exposed wood members.

v. Fire Design of Gypsum Wall Board over Mass Timber - Fire-resistance rating of mass timber members achieved by a combination of gypsum wallboard and timber char.

w. U.S. Mass Timber Floor Vibration Design Guide - Synthesizes current design procedures and recommendations for mass timber floor vibration design.

x. Specifying Appearance for CLT, NLT and Glulam - Information on specifying the desired appearance of mass timber materials.

y. Architectural Finishes and Mass Timber: A Primer - Covers coatings, protective treatments, finishes, best practices for protecting wood and maintenance cycles.

3. Design in Timber from the Beginning

a. Mass Timber Design Manual – Volume 2 (WoodWorks and Think Wood) - Comprehensive design manual covering structural design principles from project inception and system integration strategies.

b. Wood Works - Free Project Support (WoodWorks) - Technical assistance service providing design guidance and early-phase consultation to help integrate timber from project beginning.

c. Technical Design Guides - Multiple manufacturer-specific design resources including Element5 Design Guide, Kalesnikoff Design Guide, Mercer Mass Timber Design Guide, Smartlam North America Design Guide, and Nordic Structures Technical Documents Library providing detailed technical specifications for different mass timber systems.

d. Parametric Design Tools - Advanced design platforms including Generate Platform (Generate) and Fast + Epp Design Apps (Fast + Epp Structural Engineers) enabling early-phase design exploration, optimization, and testing of mass timber structures.

e. Online Database Of Mass Timber Resources - WoodWorks

f. Key Design Considerations for Mass Timber Projects - Discusses construction type, fire ratings, panel thickness, member sizes, and occupancy considerations in order to achieve cost-effective designs.

g. Creating Efficient Structural Grids in Mass Timber Buildings - Creating to most efficient structural layout specific to mass timber sizing and manufacturing capabilities.

h. Comparing Tall Timber Building Size Limits to Other Construction Types - Discusses tall mass timber construction size limits compared to size limitations for other structural materials.

Key Resources for Architects & Engineers to:

3. Design in Timber from the Beginning - continued

i. Using Podiums in Tall Wood Buildings - Covers strategies for utilizing podiums in mass timber construction to maximize the number of wood stories.

j. Exterior Walls in Mass Timber Buildings - Part 1: Code Requirements and Commonly Used Materials - Provides information on construction types, material allowances, fire-resistance rating requirements, and common exterior wall materials for mass timber buildings.

k. Accommodating MEP in Exposed Mass Timber Buildings - Options for incorporating MEP in floor and wall panels of mass timber buildings.

l. Mass Timber in Affordable Multi-Family Housing - Design steps, code compliance options, and material optimization strategies for utilizing mass timber in affordable housing projects.

m. Mass Timber: The Optimal Solution for Multi-Family High-Rise Construction - Overview of mass timber's value proposition for multi-family high-rise buildings, including developer insights.

n. Delegated Design vs. Design Assist for Mass Timber Structures - Examines common collaboration strategies and how each adds value to the design process.

4. Integrate Carbon Analysis into Early Design Decision-Making

a. Digital Carbon Analysis Tools - Comprehensive suite including WoodWorks Carbon Calculator, BEAM Estimator (Builders for Climate Action), Corgan's Carbon Calculator, and EC3 (Building Transparency) for various stages of carbon assessment.

b. Carbon Impact Research - Technical guidance including Understanding the Role of Embodied Carbon in Climate Smart Buildings Report (Think Wood) and Understanding Real CO2e Emissions in Mass Timber Production (Corgan) providing framework for carbon-conscious design decision-making and transparent environmental impact assessment.

c. LCA Software Options - Professional tools including Tally, One Click LCA, and Athena for comprehensive life cycle assessment integration.

d. Online Mass Timber And Wood Sustainability Resources - WoodWorks Sustainability

e. Introduction to Whole Building Life Cycle Assessment: The Basics - Provides overview of WBLCA as it relates to building construction.

f. Biogenic Carbon Accounting in WBLCA Tools - Discusses how the various WBLCA tools account for mass timber's biogenic carbon.

g. Carbon Accounting Tools for Structural Systems - Overview of WBLCA tools and carbon calculators available to building designers.

h. Developing a Functionally Equivalent Design for Comparative WBLCA - Identify what is required for two or more building designs to be compared to each other.

i. Considerations & Worksheet for Structural WBLCA of Mass Timber Buildings - Guidance for mass timber building designers undertaking WBLCA.

j. Mass Timber Comparative Life Cycle Assessment Series - Series of four building studies comparing the embodied carbon impacts and cost of mass timber building to functionally equivalent buildings.

k. Meeting Sustainability Objectives with Wood Buildings - Insights from developers showing wood's benefits.

Building Contractors

1. Adapt Cost Management and Procurement Approaches

Addresses Challenges: #1 Holistic Costing Gaps, #3 Contractor Cost Inflation, #8 Material Cost Competition

Mass timber construction integration and cost management requires different approaches than conventional construction due to limited industry benchmarking data and the material's unique procurement characteristics. Contractors can overcome risk-averse pricing and build competitive advantages by developing systematic approaches to cost estimation and supplier relationships.

a. Build comprehensive supplier and subcontractor knowledge: Rather than applying broad risk premiums, invest time in understanding the mass timber supply ecosystem and developing relationships with qualified partners.

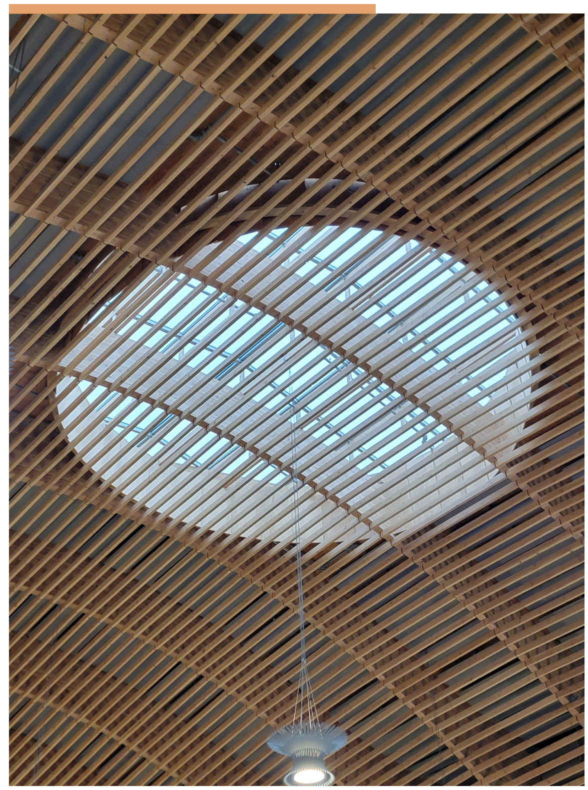
- Vet potential suppliers systematically by asking about manufacturing capabilities, services provided, lead times, and ideal project parameters
- Understand procurement model options since they can impact timber package pricing by as much as 30%
- Build ongoing partnerships with qualified mass timber suppliers rather than treating each project as an isolated procurement exercise

b. Implement detailed cost tracking and benchmarking systems: Move beyond generic square-foot pricing to develop granular understanding of mass timber cost drivers that enables accurate project estimation.

- Track key performance metrics including volume efficiency ratios, cost basis, piece count ratios, and steel weight/connector ratios
- Require suppliers to provide detailed line-item costs for CLT, glulam, connectors, shipping, and installation
- Track material supply and installation costs independently to understand cost drivers and maintain procurement flexibility

c. Advocate for procurement-friendly design: Mass timber's extended lead times and material price volatility benefit from design approaches that maintain procurement flexibility. Contractors can help inform the design teams from the beginning.

- Advise design teams on specification flexibility by recommending mid-grade panel specifications
- Track commodity pricing trends and consider separate contingencies for material cost fluctuations
- Plan for extended procurement timelines (6-8 months lead time with 2-3 months for shop drawings)



The Mass Timber roof at the Portland International Airport by ZGF Architects, KPFF Consulting is a testament to the material's potential.
Source: Pilot Projects, 2025.

2. Invest in Direct Experience

Addresses Challenges: #2 Limited Expert Contractors, #3 Contractor Cost Inflation, #15 General Contractor Resistance, #17 Negative Perception Bias, #21 Procurement & Installation Timeline

Direct hands-on experience with mass timber construction can change perceptions and build confidence. Multiple project teams reported that contractor attitudes shifted dramatically after seeing mass timber assembly in person, moving from resistance to enthusiasm once they understood the actual construction processes.

a. Visit manufacturing facilities: Tours of mass timber manufacturing facilities provide valuable insight into production processes, quality control, and material capabilities.

- Take trips to the closest mass timber manufacturing facility to see what's actually being produced and understand the precision and quality of mass timber elements
- Witness the manufacturing process firsthand to understand material capabilities, tolerances, and production timelines that inform more accurate project cost estimation

b. Study completed buildings and active construction sites: Visiting existing mass timber projects helps contractors understand assembly processes, construction sequences, and real-world performance outcomes.

- Attend site visits to see how easy mass timber assembly actually is, which consistently changes contractor perceptions about complexity and feasibility
- Observe construction sequencing and coordination requirements to understand how mass timber projects differ from conventional construction
- Learn from completed projects to understand long-term performance and address misconceptions about durability or maintenance

c. Engage with industry education: Participating in mass timber conferences, workshops, and training programs offers opportunities to learn from experienced practitioners and stay current with evolving best practices.

- Attend mass timber conferences and similar industry events to build networks and learn from experienced contractors
- Review available resources from organizations like WoodWorks that provide construction management guides and cost management resources specifically for mass timber projects
- Sign up for specialized training programs that address mass timber construction management, scheduling, and coordination requirements

3. Embrace Collaborative Project Delivery Methods

Addresses Challenges: #3 Contractor Cost Inflation, #14 Unique Project Delivery Requirements, #15 General Contractor Resistance

Mass timber projects benefit significantly from early contractor engagement and collaborative approaches that enable better coordination, holistic pricing, and optimized construction sequencing. Contractors who actively support these methods can help overcome traditional barriers while building competitive advantages.

a. Be receptive to early engagement opportunities: When project teams propose Early Contractor Involvement (ECI) or Integrated Project Delivery (IPD) approaches, recognize these as opportunities to influence project success rather than additional coordination burdens.

- View ECI and IPD as chances to provide meaningful input during design phases when changes can still optimize cost and constructability, rather than being handed predetermined designs that may not leverage mass timber's advantages.
- Commit appropriate resources to design-phase engagement, understanding that upfront coordination investment typically yields better project outcomes and reduced risk compared to traditional bid-build approaches.
- Provide constructability input, realistic timeline guidance, and market intelligence about supplier capabilities and material availability to help design teams make informed decisions about mass timber approaches.

b. Advocate for collaborative approaches when appropriate: Use your influence to promote delivery methods that set mass timber projects up for success, particularly when you have established relationships with clients or project teams.

- When engaged early in project planning, advocate for ECI or IPD approaches for sophisticated mass timber projects that would benefit from sustained coordination between all team members.
- Share examples from successful projects showing how collaborative approaches led to better cost control, reduced change orders, and improved construction efficiency compared to traditional delivery methods.

The Student Union building, AMS Nest at the University of British Columbia campus pushes the boundaries of what a mass timber building is capable of doing structurally. *Source: Pilot Projects, 2025.*

Key Resources for Architects & Engineers to:

1. Adapt Cost Management and Procurement Approaches

a. How to Successfully Cost Manage a Mass Timber Project (WoodWorks) - Practical guide covering budgeting, holistic cost evaluation, and competitive procurement strategies.

b. Mass Timber Cost and Design Optimization Checklists (WoodWorks) - Practical checklists ensuring successful project delivery and cost control throughout the construction process

c. U.S. Mass Timber Construction Manual (Trifecta Collective) - Annual market analysis including pricing trends, manufacturing cost analysis, and market data supporting cost competitiveness arguments.

d. Reach Out Directly To Manufacturers And Suppliers - WoodWorks Innovation Network (WIN)

e. Delegated Design vs. Design Assist for Mass Timber Structures - Examines common collaboration strategies and how each adds value to the design process.

f. CLT Layups and Basis of Design for Gravity Load Applications - Using CLT layups defined in ANSI/APA PRG 320 as the basis of design.

2. Invest in Direct Experience

a. Mass Timber Installation Training Curriculum (WoodWorks) - Training curriculum and educational modules designed to build comprehensive mass timber expertise across project teams.

b. Insurance and Risk Management Resources - Comprehensive guidance including A Guideline for Insuring Timber in Canada (WoodWorks & Canadian Wood Council), Mass Timber Insurance Playbook – U.S. Edition (WoodWorks), and Mass Timber Project Questionnaire for Builder's Risk Insurance (WoodWorks) addressing risk mitigation and insurance considerations essential for contractor confidence.

c. Construction Management Checklists - Practical project guidance including Mass Timber Construction Success Checklist (WoodWorks BC & Seagate Mass Timber) and Mass Timber Cost and Design Optimization Checklists (WoodWorks) ensuring successful project delivery and cost control.

d. Technical Design Guides - Manufacturer resources including DowelLam Design Guide (StructureCraft), Freres Mass Ply Design & Construction Guide, and others providing detailed installation and construction guidance.

e. Reach Out Directly To Manufacturers And Suppliers - WoodWorks Innovation Network (WIN)

f. Delegated Design vs. Design Assist for Mass Timber Structures - Examines common collaboration strategies and how each adds value to the design process.

g. Online Database Of Designed/Completed Mass Timber Projects, Manufacturers And Supplies, And Experts With Mass Timber Experience - WoodWorks Innovation Network (WIN)

h. Free Webinars Showcasing Wood And Mass Timber Construction Topics - WoodWorks

i. Insurance for Mass Timber Construction: Assessing Risk and Providing Answers - Addresses insurance barriers to mass timber projects.

3. Embrace Collaborative Project Delivery Methods

a. Primer on Project Delivery (AIA-AGC) - Comprehensive guide to alternative project delivery methods including Early Contractor Involvement (ECI) and design-build approaches that support mass timber project coordination requirements

b. Integrated Project Delivery For Public and Private Owners (AGC) - Detailed guidance on IPD implementation for both public and private projects, addressing the collaborative approaches that optimize mass timber construction outcomes.

c. Building Trust for a Stronger Construction Industry (ResearchGate) - Research analysis examining trust-building mechanisms and collaborative relationships essential for successful integrated project delivery in construction.

d. Reach Out Directly To Manufacturers And Suppliers - WoodWorks Innovation Network (WIN)

e. Delegated Design vs. Design Assist for Mass Timber Structures - Examines common collaboration strategies and how each adds value to the design process.

Mass Timber Supply Chain

1. Support Product Standardization Efforts

Addresses Challenges: #4 Lack of Product Standardization, #13 Geographic Supply Constraints

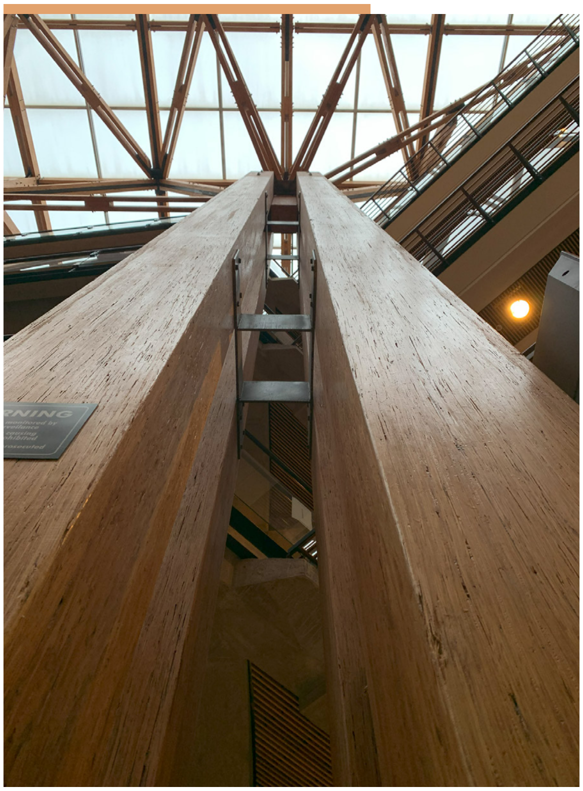
While individual manufacturers make their own product decisions, industry coordination could help reduce project costs and design complexity.

a. Collaborate on industry standards: Work toward standardized panel dimensions, connection details, and assembly systems that could reduce the need for project-specific customization.

- Participate in industry-wide discussions about standardizing common panel sizes and connection approaches
- Develop standardized connection details that work across multiple manufacturer systems
- Create assembly systems that reduce project-specific engineering and design requirements

b. Develop product interchangeability: Enable designers to specify mass timber systems before selecting specific manufacturers, reducing procurement risk.

- Work toward specifications that allow for competitive bidding among multiple qualified suppliers
- Develop products that can be substituted between manufacturers without requiring significant design changes
- Support procurement processes that maintain competition while ensuring technical compatibility



The Heavy Timber used in the Faculty of Forestry building at University of British Columbia.
Source: Pilot Projects, 2024.

2. Optimize Production and Material Efficiency

Addresses Challenges: #8 Material Cost Competition, #13 Geographic Supply Constraints

Supply chain stakeholders can address fundamental cost competitiveness through production optimization and strategic material sourcing.

a. Develop closer sawmill relationships: Rather than taking standard framing lumber and converting it to mass timber products, manufacturers can work directly with sawmills to obtain the specific fiber they need for optimal production efficiency.

- Form partnerships with sawmills to secure lumber specifications optimized for mass timber rather than adapting standard framing lumber
- Work collaboratively to develop supply agreements that ensure consistent access to appropriate fiber for mass timber production
- Establish vertical integration opportunities that provide better control over material quality and costs
- Learn from European manufacturing approaches that achieve better cost efficiency through optimized material inputs

b. Enhance production efficiency: Focus on optimizing production processes and material utilization rather than geographic expansion, particularly given current capacity utilization levels.

- Improve manufacturing processes and equipment utilization to reduce production costs and increase throughput
- Optimize material usage and minimize waste throughout the production process

3. Enhance Industry Access and Education

Addresses Challenges: #2 Limited Expert Contractors, #18 Technical Skill Development

Supply chain stakeholders can play a valuable role in building industry knowledge and confidence across the AEC community.

a. Expand facility tour programs: Provide regular opportunities for architects, engineers, and contractors to visit manufacturing facilities and understand production processes.

- Open doors to the entire AEC community through organized educational visits and hands-on learning opportunities
- Demonstrate manufacturing precision and quality that helps address misconceptions about mass timber

b. Invest in technical support capacity: Provide engineering and technical support to assist project teams with design and implementation.

- Hire engineering and technical support staff who can assist project teams with connection design, detailing guidance, and implementation support
- Follow successful examples of manufacturers who provide specialized technical assistance to design teams
- Offer design-assist services that help optimize projects for efficient mass timber use

4. Strengthen Supply Chain Transparency

Addresses Challenges: #5 , #24 Supply Chain Verification

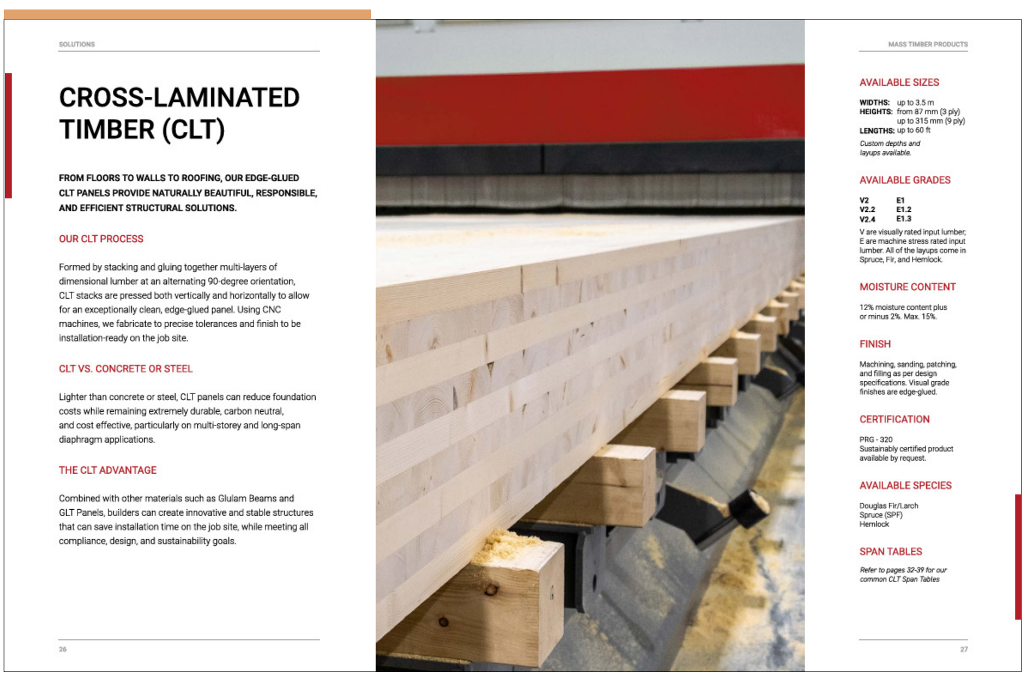
Clear documentation supports design teams in developing compelling sourcing narratives and addressing client environmental goals.

a. Document sourcing practices: Provide accessible information about wood sources, forest management practices, and transportation impacts.

- Create transparency about supply chains that includes specific sourcing stories - whether from local forests, community forestry operations, tribal lands, or other specific sources - giving project teams the detailed information they need to develop compelling sourcing narratives for their clients
- Share information about forest management practices of wood sourcing locations to support project sustainability narratives
- Document transportation impacts and logistics to help project teams understand and communicate environmental considerations

b. Make environmental documentation accessible: Ensure Environmental Product Declarations and other environmental information are easily available to support design team decision-making.

- Provide clear, accessible environmental documentation that design teams can use for project certification and client reporting
- Share sustainability stories and environmental benefits in formats that architects and engineers can easily communicate to clients
- Support project teams' sustainability goals by providing verified environmental data and documentation



SOLUTIONS

CROSS-LAMINATED TIMBER (CLT)

FROM FLOORS TO WALLS TO ROOFING, OUR EDGE-GLUED CLT PANELS PROVIDE NATURALLY BEAUTIFUL, RESPONSIBLE, AND EFFICIENT STRUCTURAL SOLUTIONS.

OUR CLT PROCESS

Formed by stacking and gluing together multi-layers of dimensional lumber at an alternating 90-degree orientation, CLT stacks are pressed both vertically and horizontally to allow for an exceptionally clean, edge-glued panel. Using CNC machines, we fabricate to precise tolerances and finish to be installation-ready on the job site.

CLT VS. CONCRETE OR STEEL

Lighter than concrete or steel, CLT panels can reduce foundation costs while remaining extremely durable, carbon neutral, and cost effective, particularly on multi-storey and long-span diaphragm applications.

THE CLT ADVANTAGE

Combined with other materials such as Glulam Beams and GLT Panels, builders can create innovative and stable structures that can save installation time on the job site, while meeting all compliance, design, and sustainability goals.

26

MASS TIMBER PRODUCTS

AVAILABLE SIZES

WIDTHS: up to 3.5 m
HEIGHTS: from 87 mm (3 ply) up to 315 mm (9 ply)
LENGTHS: up to 60 ft

Custom depths and layups available.

AVAILABLE GRADES

V2 **E1**
V2.2 **E1.2**
V2.4 **E1.3**

V are visually rated input lumber; E are machine stress rated input lumber. All of the layups come in Spruce, Fir, and Hemlock.

MOISTURE CONTENT

12% moisture content plus or minus 2%. Max. 15%.

FINISH

Machining, sanding, patching, and filling as per design specifications. Visual grade finishes are edge-glued.

CERTIFICATION

PRG - 320
Sustainably certified product available by request.

AVAILABLE SPECIES

Douglas Fir/Larch
Spruce (SPF)
Hemlock

SPAN TABLES

Refer to pages 32-39 for our common CLT Span Tables

27

Kalesnikoff's Technical Design Guide.
Source: Kalesnikoff, 2025.

Key Resources for Mass Timber Supply Chain to:

1. Support Product Standardization Efforts

a. Technical Design Guides - Collection of manufacturer-specific guides including Nordic, Element5, Kalesnikoff, Mercer, and Smartlam design guides demonstrating standardized approaches that could inform industry-wide efforts.

b. Canadian CLT Handbook (FPInnovations) - Technical resource supporting standardized approaches to CLT design and specification.

c. Reach out directly to manufacturers and suppliers - WoodWorks Innovation Network (WIN)

d. Key Design Considerations for Mass Timber Projects - Discusses construction type, fire ratings, panel thickness, member sizes, and occupancy considerations in order to achieve cost-effective designs.

e. What is mass timber? - Overview of mass timber products, applications, and sources

f. CLT Layups and Basis of Design for Gravity Load Applications - Using CLT layups defined in ANSI/APA PRG 320 as the basis of design.

2. Optimize Production and Material Efficiency

a. Canadian Mass Timber Roadmap (The Transition Accelerator, FPAC, CWC, EFL) - Strategic roadmap analyzing vertical integration opportunities, supply chain optimization, and material efficiency improvements.

b. Forest Supply Chain Analysis Series (Olifant) - Research series providing regional analyses of supply chain dynamics and production optimization opportunities.

3. Enhance Industry Access and Education

a. WoodWorks Manufacturers & Supplier Contact List (WoodWorks) - Directory facilitating connections between supply chain partners and design professionals.

b. Online Database Of Mass Timber Resources - WoodWorks

c. Free Webinars Showcasing Wood And Mass Timber Construction Topics - WoodWorks

d. Online Database Of Designed/Completed Mass Timber Projects, Manufacturers And Supplies, And Experts With Mass Timber Experience - WoodWorks Innovation Network (WIN)

e. Free project support - WoodWorks provides free technical assistance on projects.

4. Strengthen Supply Chain Transparency

a. Understanding Real CO2e Emissions in Mass Timber Production (Corgan) - White paper providing framework for transparent environmental impact documentation.

b. 2025 International Mass Timber Report (Trifecta Collective) - Annual report providing transparency into supply chain dynamics and manufacturing capacity across the industry.

c. American Wood Council's Wood Sourcing Tool (AWC) - Online tool providing transparency into wood product sourcing and sustainability practices based on mill grade stamps and regional data.

d. Online mass timber and wood sustainability resources - WoodWorks Sustainability

e. Carbon Accounting Tools for Structural Systems - Overview of WBLCA tools and carbon calculators available to building designers.

f. Developing a Functionally Equivalent Design for Comparative WBLCA - Identify what is required for two or more building designs to be compared to each other.

g. Considerations & Worksheet for Structural WBLCA of Mass Timber Buildings - Guidance for mass timber building designers undertaking WBLCA.

h. Mass Timber Comparative Life Cycle Assessment Series - Series of four building studies comparing the embodied carbon impacts and cost of mass timber building to functionally equivalent buildings.

Key Resources for Mass Timber Supply Chain to:

4. Strengthen Supply Chain Transparency - continued

i. Meeting Sustainability Objectives with Wood Buildings - Insights from developers showing wood's benefits.

j. Current EPDs for Wood Products - List of EPDs available for wood products

k. How to Use Environmental Product Declarations - Addresses the limitations of using EPDs alone to determine the environmental impact of construction products.

l. Understanding the Carbon Numbers in a Wood EPD - Guidance on how GWP and biogenic carbon are reported in North American EPDs.

Sorting felled trees in the Chantiers-Chibougamou plant of Nordic Structures.
Source: Pilot Projects, 2023.

Government Agencies

1. Lead Through Direct Procurement

Addresses Challenges: #14 Unique Project Delivery Requirements,#16 Public Procurement Policies, #21 Procurement & Installation Timeline

Public procurement represents the most effective policy lever for advancing mass timber adoption. Substantial mass timber growth has occurred in jurisdictions where governments specify timber buildings themselves.

a. Specify public buildings in mass timber: Government entities can drive market transformation by directly commissioning their own buildings in mass timber.

- Follow successful examples from governments where procurement drives mass timber construction
- Recognize that when preferences for mass timber are established, market actors will find ways to meet those targets, creating innovation and developing capacity

b. Create market signals through government procurement preferences: Giving preference to mass timber in public projects sends strong signals that create market response.

- Establish clear government procurement preferences that signal to the market that mass timber is not going away, causing contractors and suppliers to invest in developing capabilities
- Set targets that encourage market transformation, knowing that someone in the market will find ways to be the game changer who can meet those requirements
- Adapt competitive bidding requirements to accommodate the limited number of qualified mass timber suppliers while maintaining transparency and fair competition

c. Support collaborative project delivery methods: Adopt public purchasing policies that enable the early engagement and integrated project delivery approaches that mass timber requires.

- Modify standard public tendering processes to allow for early contractor engagement and design-assist approaches that optimize mass timber projects
- Establish project delivery frameworks that support the collaborative relationships between architects, engineers, and contractors while enabling the specialized coordination and early decision-making that mass timber construction requires

2. Modernize Regulatory Frameworks

Addresses Challenges: #7 Building Code Modernization, #9 Regulatory & Permitting Inconsistencies, #10 Fire Safety Perception, #16 Public Procurement Policies

Streamlined and updated regulatory approaches can reduce uncertainty and facilitate more widespread mass timber adoption.

a. Develop consistent approval processes: Create standardized review procedures across jurisdictions to reduce the need for project teams to develop location-specific approaches.

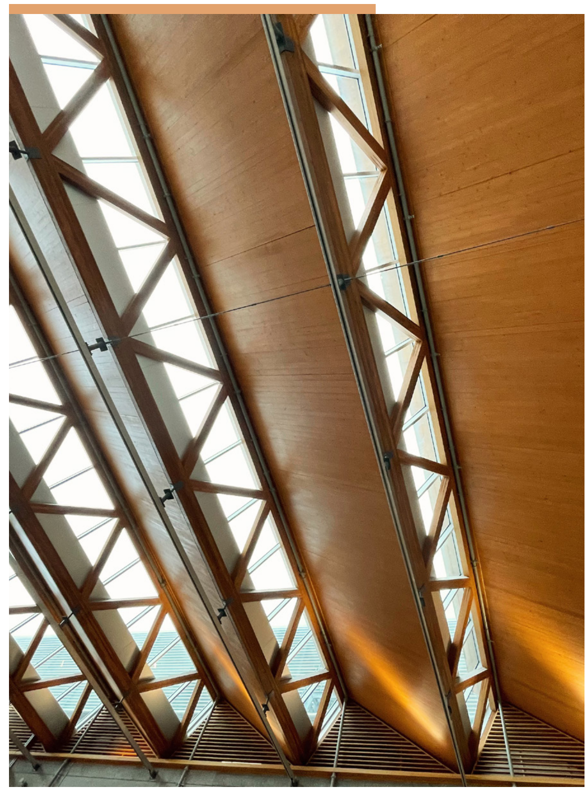
- Create predictable approval pathways that allow firms to develop standardized approaches rather than reinventing solutions for each location
- Encourage third-party peer review of alternate means and methods proposals and collect, catalogue, and publicize approved solutions. Since clients pay for third-party peer review, authorities having jurisdiction should create incentives for them to share approval documentation publicly, helping others understand what alternative mass timber solutions have been approved and reducing guesswork in future approval processes.

b. Accelerate code adoption: Ensure building departments adopt current International Building Code (IBC) provisions for mass timber construction to reduce regulatory uncertainty.

- Update local building codes to reflect current IBC provisions that enable taller mass timber buildings and expanded applications
- Provide training and resources to help building officials understand and implement updated mass timber provisions
- Eliminate the code adoption lag time where major cities operate under outdated codes that predate significant mass timber advancements

c. Allow jurisdictional learning: Enable building departments to adopt successful approaches from neighboring jurisdictions rather than requiring each to develop independent expertise.

- Create mechanisms for jurisdictions to reference and adopt approval processes that have been successfully implemented elsewhere
- Reduce redundant review requirements when similar projects have been approved in comparable jurisdictions
- Facilitate knowledge sharing between building departments to accelerate regulatory acceptance



The Student Union building, AMS Nest at the University of British Columbia campus also utilizes a stepped roof with mass timber lattice structures.
Source: Pilot Projects, 2024.

3. Expand Beyond Carbon to Multiple Benefits

Addresses Challenges: #10 Fire Safety Perception, #17 Negative Perception Bias

Public sector mass timber advocacy can emphasize diverse benefits beyond sustainability while addressing fire safety concerns and negative perceptions.

a. Promote construction quality benefits: Mass timber offers advantages that address practical municipal concerns beyond environmental considerations.

- Emphasize building adaptability and long-term flexibility that mass timber construction can provide for evolving public facility needs
- Highlight clean and quiet construction methods that reduce disruption in urban environments and address community concerns about construction impacts
- Demonstrate faster construction timelines that can accelerate delivery of needed public facilities and services

b. Address practical urban challenges: Mass timber's characteristics can help solve common municipal construction and infrastructure challenges.

- Promote mass timber's lighter weight and reduced foundation requirements that help with urban construction challenges and below-ground infrastructure conflicts
- Emphasize reduced delivery requirements and prefabrication capabilities that minimize traffic disruption and construction site impacts
- Position mass timber as a solution to urban noise issues and construction logistics challenges that affect residents and businesses

c. Get fire marshals and building officials on board: Work directly with local authorities to address persistent misconceptions about mass timber performance.

- Provide training opportunities for fire marshals and building officials based on current research and testing data
- Share performance evidence that demonstrates mass timber's fire safety capabilities and addresses emotional responses to wood construction
- Create direct communication channels between fire departments and mass timber project teams to address safety concerns through education and collaboration

4. Develop Carbon and Sustainability Incentives

Addresses Challenges: #6 Values Versus Priorities, #11 Not Valuing Carbon, #23 Carbon Calculation Complexity

Policy frameworks can help create economic value for carbon reduction and establish clear standards for environmental performance.

a. Implement embodied carbon policies: Create building regulations that require or incentivize low-carbon materials to level the playing field for sustainable construction.

- Create building regulations that require or incentivize low-carbon materials through life cycle assessment requirements, carbon performance thresholds, or frameworks for evaluating and comparing material choices

b. Create economic incentives: Develop mechanisms that translate carbon reduction into economic value for developers and contractors.

- Implement density bonuses, tax incentives, or other economic mechanisms that reward carbon reduction in construction projects
- Create performance specifications that give economic advantages to projects demonstrating superior carbon performance

c. Support carbon accounting standardization: Establish clear requirements for how carbon impacts should be calculated and reported in public projects.

- Set clear standards for how carbon impacts should be calculated and reported in public projects, including consistent methodologies for biogenic carbon evaluation, standardized approaches for both project-level and material-level assessment, and frameworks that reduce complexity while ensuring meaningful environmental evaluation

The BCIT Tall Timber Housing project (Fast + Epp, Perkins& Will) received provincial support through the British Columbia Wood First Act.
Source: Fast + Epp

Key Resources for Government Agencies to:

1. Lead Through Direct Procurement

a. AMM Guide (AWC) - Technical guidance for authorities having jurisdiction on mass timber code provisions and tendering considerations for public projects.

b. Government Policy and Funding Programs - Successful models including B.C.'s Wood First Program, BC Mass Timber Demonstration Program (MTDP), and Green Construction through Wood (GCWood) Program demonstrating effective public project specification strategies. Additional examples include Quebec's Policy for the Integration of Wood in Construction and Quebec's Wood Construction Innovation Program, which provide frameworks for provincial-level mass timber promotion and financial support. The proposed Mass Timber Federal Buildings Act 2025, while not yet adopted, represents a positive step forward for federal government leadership in mass timber procurement, demonstrating growing policy momentum for public sector mass timber adoption across North America.

2. Expand Beyond Carbon to Multiple Benefits

a. Biophilic Design LookBook (Think Wood) - Design guide demonstrating health, wellness, and quality benefits beyond environmental considerations.

b. Mass Timber LookBook (Think Wood) - Case study collection showcasing diverse applications and benefits across multiple project types.

c. Mass Timber Fire & Acoustic Database - Find fire and acoustically-rated assemblies, connections, and penetrations in this evolving database.

d. Demonstrating Fire-Resistance Ratings for Mass Timber Elements in Tall Wood Structures - Discusses how to achieve fire resistance ratings for mass timber construction.

e. Fire Design of Mass Timber Members: Code Applications, Construction Types and Fire Ratings - Focusing on how to meet fire-resistance requirements for mass timber construction.

f. Using Char Methods to Demonstrate Fire Resistance of Exposed Wood Members - How to calculate the fire resistance of exposed wood members.

g. Fire Design of Gypsum Wall Board over Mass Timber - Fire-resistance rating of mass timber members achieved by a combination of gypsum wallboard and timber char.

3. Modernize Regulatory Frameworks

a. AWC Code Adoption Map (AWC) - Interactive tool tracking building code updates across jurisdictions, identifying modernization opportunities.

b. Alternative Solutions Guide (CWC) (WoodWorks/CWC)) - Framework for performance-based code compliance supporting innovative mass timber solutions.

c. American Wood Council Design and Construction Manuals (AWC) - Technical standards providing foundation for code-compliant construction and regulatory development.

d. AMM Guide (AWC) - Technical guidance for authorities having jurisdiction on mass timber code provisions and regulatory framework implementation.

e. Getting to Yes: Making Effective Use of the Alternate Means Process (WoodWorks) - Comprehensive guide for using IBC Section 104.11 alternative materials and methods requests, with application processes and project examples for performance-based code compliance.

f. Comparing Tall Timber Building Size Limits to Other Construction Types - Looks at height and area limits for the new tall timber construction types compared to Types I-A and I-B construction.

g. Status of Building Code Allowances for Tall Mass Timber in the IBC - Jurisdictions that have adopted the tall mass timber code provisions in the 2021 and/or 2024 IBC.

h. Tall Wood Buildings in the 2021 IBC - Up to 18 Stories of Mass Timber - Looks at the proposals used to incorporate tall wood buildings into the 2021 IBC.

i. Tall Mass Timber Trends and Exposed Timber Allowances - Looks at changes from the 2021 to 2024 IBC allowing for larger areas of exposed mass timber.

Key Resources for Governments to:

4. Develop Carbon and Sustainability Incentives

a. Understanding the Role of Embodied Carbon in Climate Smart Buildings Report (Think Wood) - Policy and technical report providing framework for municipal carbon policy development.

b. Digital Carbon Tools - Municipal-applicable tools including EC3 (Building Transparency) and other carbon calculators supporting standardized assessment for public projects.

c. Carbon Credits for Mass Timber Construction (USDA Forest Products Laboratory) - Technical analysis of carbon credit opportunities and frameworks for mass timber construction, providing governments with mechanisms to create economic value for carbon sequestration and storage in wood buildings.

d. Buy Clean Policy Programs - Successful models including Buy Clean California, the Denver Green Code, and the proposed federal Clean Future Act (which passed its first committee in January 2025), demonstrating how procurement policies can prioritize low-carbon materials in public construction projects. If adopted, the Clean Future Act would establish a federal Buy Clean Program promoting low-carbon materials use, providing a framework for governments to create market demand for sustainable construction materials including mass timber.

e. Online mass timber and wood sustainability resources - WoodWorks Sustainability

f. Introduction to Whole Building Life Cycle Assessment: The Basics - Provides overview of WBLCA as it relates to building construction.

g. Calculating the Carbon Stored in Wood Products - Shows how to determine the amount of biogenic carbon stored in wood.

h. When to Include Biogenic Carbon in an LCA - An overview of biogenic carbon accounting practices as defined by international standards.

i. How to Include Biogenic Carbon in an LCA - Specifics on biogenic carbon accounting at each stage of the material life cycle.

j. Biogenic Carbon Accounting in WBLCA Tools - Discusses how the various WBLCA tools account for mass timber's biogenic carbon.

k. Carbon Accounting Tools for Structural Systems - Overview of WBLCA tools and carbon calculators available to building designers.

l. Developing a Functionally Equivalent Design for Comparative WBLCA - Identify what is required for two or more building designs to be compared to each other.

m. Considerations & Worksheet for Structural WBLCA of Mass Timber Buildings - Guidance for mass timber building designers undertaking WBLCA.

Recommendations by Industry Group: Industry Influencers

1. Scale Contractor Education and Training Programs

Addresses Challenges: #1 Holistic Costing Gaps, #2 Limited Expert Contractors, #3 Contractor Cost Inflation, #15 General Contractor Resistance, #18 Technical Skill Development

Current contractor-focused education programs could be expanded significantly to serve the growing need for mass timber expertise and address the critical shortage of qualified contractors.

a. Scale construction management training: Expand existing contractor education capacity to meet industry needs.

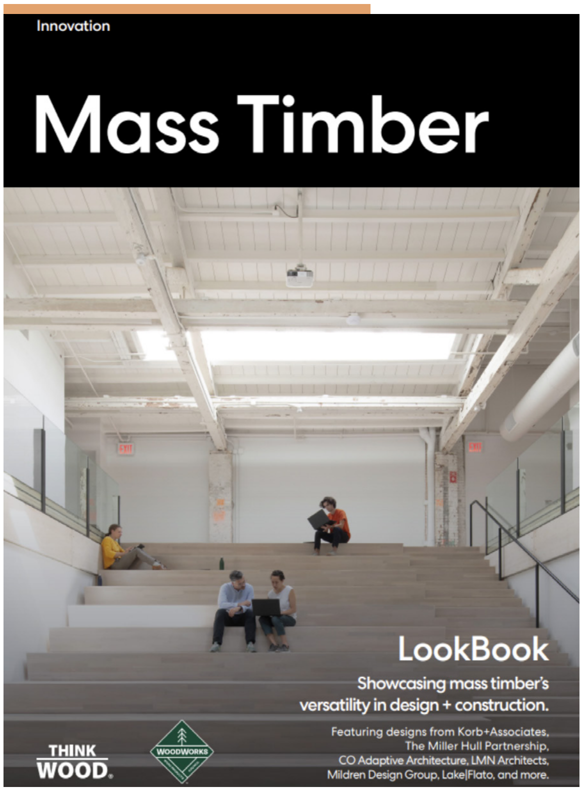
- Increase construction management training programs beyond current levels, recognizing that existing programs cover the entire United States with limited staffing
- Develop specialized regional-focused training programs that address mass timber construction management, scheduling, and coordination requirements that build practical expertise in mass timber project delivery

b. Develop comprehensive cost education: Create resources that help contractors understand the full economic picture of mass timber construction.

- Provide education about holistic costing that includes schedule benefits and system efficiencies rather than just material costs
- Help contractors understand realistic timelines, assembly processes, and coordination requirements that enable more accurate cost estimation
- Share regional cost data and performance information that counters risk-averse pricing based on unfamiliarity with mass timber construction

c. Coordinate with supply chain education: Work with manufacturers to create more multi-pronged educational opportunities.

- Increase facility tours and hands-on learning opportunities by coordinating with manufacturers to provide regular educational access that combines classroom learning with practical facility visits and construction site experiences



Source: WoodWorks, 2024.

2. Strengthen Partnerships with Public and Educational Institutions

Addresses Challenges: #5 , #12 Designer Inexperience Loop, #18 Technical Skill Development, #19 Gatekeeping Knowledge

There is significant scope for expanding partnerships between industry organizations and institutions that influence industry development, including educational establishments and public authorities.

a. Support public-private collaboration: Build stronger partnerships with government entities to create coordinated advancement strategies.

- Develop and maintain a database of regionally-specific, pre-approved mass timber projects that successfully achieved performance pathway compliance through alternate means and methods, providing firms with clarity on what has been approved between code cycles and reducing redundant engineering analysis
- Work more closely with local city halls and public authorities, recognizing that successful mass timber advancement requires partnership with the levers that shape policy and practice
- Learn from successful mass timber growth in regions that demonstrate the power of combined government and industry backing
- Develop partnerships that leverage both public policy tools and industry resources, particularly around government tendering which has proven to be the most effective policy lever

b. Rebalance industry focus across stakeholder groups: Expand educational efforts beyond current architect- and engineer-focused programs to serve broader industry needs.

- Consider that significant investment has been made in architect and engineering education, and there may be opportunities to redirect some focus to contractors, manufacturers, public officials, and the insurance industry

c. Expand educational institution partnerships: Follow examples from other industries to develop deeper partnerships with universities and educational institutions.

- Develop partnerships similar to the concrete industry, which sponsors sustainability centers at institutions like MIT, creating long-term research and education capacity
- Recognize that introducing a new material into such an established industry requires partnership with educational institutions that shape professional knowledge

Key Resources for Industry Influencers to:

1. Scale Contractor Education and Training Programs

a. Mass Timber Installation Training Curriculum (WoodWorks) - Existing training curriculum providing framework for scaling contractor education programs.

b. Online Education Platforms - Established educational infrastructure through The Wood Institute and Wood University that could be expanded to serve broader contractor training needs.

c. WoodWorks Innovation Network Directory (WoodWorks) - Professional network facilitating knowledge sharing that could be leveraged for expanded contractor education.

d. Reach out directly to manufacturers and suppliers - WoodWorks Innovation Network (WIN)

e. Delegated Design vs. Design Assist for Mass Timber Structures - Examines common collaboration strategies and how each adds value to the design process.

f. CLT Layups and Basis of Design for Gravity Load Applications - Using CLT layups defined in ANSI/APA PRG 320 as the basis of design.

g. WoodWorks Cost Effectiveness database of resources - WoodWorks

h. Mass Timber Cost and Design Optimization Checklists - Practical checklists for all phases of design process to optimize design and control costs.

i. Key Design Considerations for Mass Timber Projects - Discusses construction type, fire ratings, panel thickness, member sizes, and occupancy considerations in order to achieve cost-effective designs.

j. U.S. Mass Timber Construction Manual - Reference for all members of a mass timber project team.

2. Strengthen Partnerships with Public and Educational Institutions

a. Mass Timber Accelerator Programs - Successful models including the New York Timber Studio (NYC Economic Development Corporation and Newlab) Boston Mass Timber Accelerator (BPDA/BSA), Georgia Mass Timber Accelerator (Georgia Forestry Foundation), and Washington Mass Timber Accelerator demonstrating effective public-private partnerships.

Looking Ahead

Mass timber stands at a critical juncture - a potential tipping point. It is poised to play a transformative role in shaping sustainable construction and storing carbon in our built environment, if its use can be scaled-up to meet this opportunity. The challenges to achieving this are real and specific, and the potential for positive impact are even greater. The findings of this report reinforce that architects and engineers are eager to innovate, collaborate, and drive change—but they cannot do it alone. This shift will demand new levels of awareness, coordination and skills across all of the stakeholders and sectors delivering our built environment.

The road ahead requires additional commitments: builders willing to invest in new means and methods, manufacturers committed to standardization and transparency, governments creating supportive policies and frameworks, and industry organizations scaling education and support programs. Each stakeholder group has specific actions they can take, but success will come through coordinated efforts that address multiple barriers simultaneously.The successful examples documented in this report show what's possible when motivations and incentives are aligned, and when stakeholders work together to overcome barriers. By implementing these recommendations, North America has the potential to lead the world in sustainable, low-carbon building practices.

Future Research Opportunities

This research represents a significant milestone in understanding mass timber adoption challenges, but it is designed as one phase of ongoing work meant to be continued and refined by others. The comprehensive methodology developed through this study—including the workshop framework, assessment tools, and analytical approaches - provides a turnkey foundation that can be leveraged by additional research teams and industry partners to deepen understanding across the mass timber ecosystem.

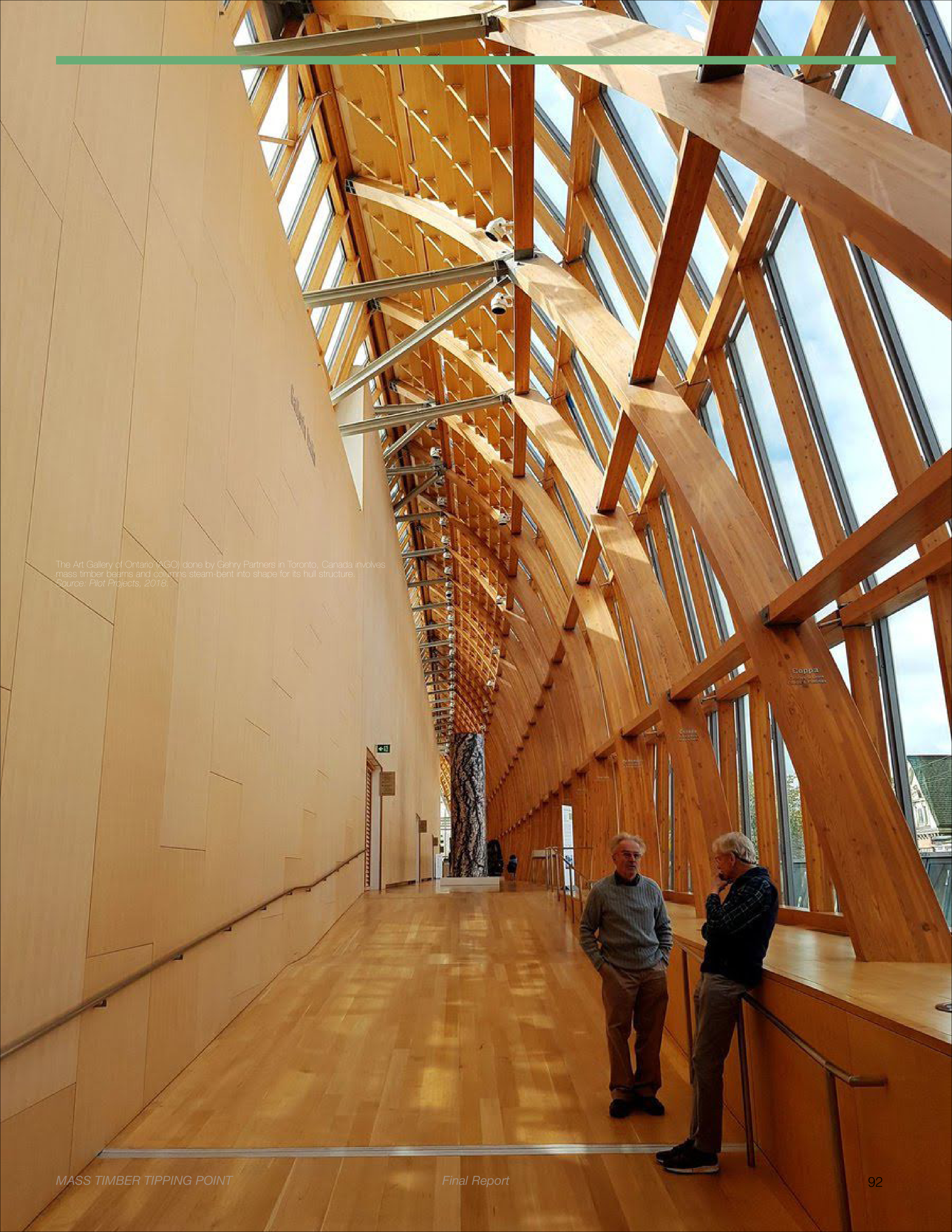
While this study successfully captured the perspectives of architects and engineers, it represents one subset of voices within the broader mass timber community.

Future research should prioritize targeted engagements with building contractors and developers—two critical stakeholder groups whose perspectives are essential for understanding the full spectrum of implementation challenges and opportunities. These groups, who are trusted within their respective industry partnerships, should be empowered to articulate their unique challenges and solutions rather than having their needs interpreted through the lens of design professionals.

Additionally, deeper engagement with mass timber supply chain partners—including manufacturers, forestry operators, and specialized subcontractors—would provide valuable insights into production capacity, material standardization opportunities, and supply-side barriers that impact project feasibility and cost.

The time for action is now. Mass timber adoption will not reach its tipping point through individual efforts alone—it requires the collective commitment of the entire building industry to embrace this transformative opportunity.

Image Source: Michael Southwood, 2024.



The Art Gallery of Ontario (AGO) done by Gehry Partners in Toronto, Canada involves mass timber beams and columns steam-bent into shape for its hull structure.
Source: Pilot Projects, 2018.

Appendix

Methodology

This report synthesizes research findings from survey results, extensive workshops, and interviews with leading architecture and engineering firms across North America, identifying 25 key issues that currently impact mass timber implementation. Our analysis draws from detailed case studies, successful project outcomes, and documented barriers across various market contexts and building types. Through a mixed-methods approach combining quantitative survey data and qualitative workshop insights, the research examines each challenge through six distinct but interconnected lenses: Expertise, Cost, Confidence, Sourcing, Policy, and Carbon. This framework provides a structured approach for understanding both barriers and opportunities in the mass timber sector, while offering insights into the current state of implementation across the North American

Research Design and Approach

The research began with a comprehensive literature review and environmental scan of the mass timber industry, examining existing research, industry reports, case studies, and thought leadership. This initial exploration established the foundational understanding that informed subsequent data collection efforts. Building on this knowledge base, the study employed a sequential explanatory mixed-methods design, beginning with quantitative survey data collection followed by qualitative workshops to provide deeper context and explanation of the survey findings. This approach was selected to leverage the complementary strengths of both quantitative and qualitative methods - the survey providing breadth of understanding across the industry, while the workshops offered depth of insight into specific challenges and opportunities.

A mixed-methods approach was particularly appropriate for this research given the complexity of mass timber implementation challenges, which span technical, economic, regulatory, and cultural dimensions. This methodology enabled triangulation of findings across multiple data sources, strengthening the validity and reliability of the conclusions.

Literature Review

1. Our literature review constituted a critical foundation for the Mass Timber Tipping Point project, providing essential context for primary research activities. The review process was conducted systematically throughout the project timeline, with initial intensive exploration at project inception and ongoing targeted reviews as specific knowledge gaps emerged during survey and workshop phases.

2. The literature review encompassed multiple source types to ensure comprehensive understanding of mass timber implementation across North America:

3. **Academic Research:** We examined peer-reviewed journal articles across disciplines including architectural engineering, forestry management, construction technology, and sustainability science. Key academic databases were systematically searched using structured query terms related to mass timber implementation, cross-laminated timber performance, and sustainable construction practices.

4. **Industry Reports:** Technical documents from organizations such as WoodWorks, the American Wood Council, Canadian Wood Council, Think Wood, and industry consortia provided valuable insights into market trends, technical specifications, and case studies. These reports offered practical perspectives on implementation challenges and solutions that complemented the theoretical frameworks found in academic literature.

5. **Regulatory Documentation:** Building codes, standards, and policy frameworks were reviewed to understand the current regulatory landscape affecting mass timber adoption across various North American jurisdictions.

6. **Case Studies:** Examinations of completed mass timber projects provided crucial insights into real-world implementation challenges and solutions. We analyzed documented case studies from across North America, representing diverse building typologies, scales, and regional contexts.

1. **Industry Blogs and Knowledge Platforms:** To capture emerging trends and practitioner perspectives, we monitored key industry blogs, forums, and knowledge-sharing platforms throughout the project duration. These sources offered timely insights into evolving market conditions and practical implementation issues that might not yet be reflected in formal literature.

This comprehensive review established a solid foundation for the development of our survey instruments and workshop protocols, ensuring that our primary research activities were grounded in current understanding while addressing critical knowledge gaps in mass timber implementation.

Survey Implementation

The initial research phase centered on a comprehensive industry survey, developed through collaboration between Arch2030, Pilot Projects, and leading industry experts. The survey instrument underwent rigorous pilot testing with a panel of industry professionals, resulting in refinements to question clarity, response options, and survey flow.

The survey targeted 167 architectural and engineering firms across North America, representing a diverse cross-section of the industry. Firms were selected using stratified purposive sampling to ensure representation across geographic regions, firm sizes, and varying levels of mass timber experience. To ensure thorough and representative responses, firms received both digital access through the Survey Monkey platform and printable versions, enabling collaborative input across departments and office locations. This approach proved effective, achieving a 26% response rate with 43 firms participating, collectively representing 409 North American offices and studios.

Survey response data were collected over a six-week period between August and September 2024. The survey consisted of 42 questions covering firm demographics, mass timber experience, project outcomes, implementation barriers, and future outlook. Questions included a mix of multiple-choice, Likert scale, ranking, and open-ended formats to capture both quantitative metrics and qualitative insights.

Survey analysis followed a rigorous three-stage process. The initial examination utilized Survey Monkey's native analytics tools to establish baseline patterns and descriptive statistics, including response frequencies, cross-tabulations, and central tendency measures. This was followed by a comprehensive data standardization phase, where responses were coded into a unified dataset to ensure consistency across question types and respondent groups. The final stage employed advanced analysis through two sophisticated tools - PowerDrill AI and Claude AI - enabling deeper insight into emerging patterns and industry trends.

Workshop Design and Implementation

Building on the survey findings, the research team conducted twelve in-depth, in-person workshops during Q4 2024. These sessions engaged more than 80 architecture, engineering, and construction professionals, accumulating over 100 hours of direct industry engagement. Workshop participants were strategically selected from survey respondents to ensure representation across organizational sizes, geographic locations, and varying levels of mass timber expertise.

Workshop design incorporated several methodological considerations to maximize data quality and participant engagement:

- **Pre-workshop preparation:** Participants received contextual materials one week prior to their session, including anonymized survey findings relevant to their region and sector, and a structured reflection guide to encourage preliminary consideration of key issues.
- **Physical environment:** Workshops were conducted in neutral, professional settings with appropriate tools for collaborative ideation, including writable wall surfaces, digital visualization capabilities, and physical modeling materials when relevant to mass timber discussions.
- **Facilitation protocols:** Each workshop was led by a primary facilitator with expertise in both architectural practice and collaborative research methods, supported by a secondary facilitator focused on documentation and participant engagement. This dual-facilitator model

ensured consistent implementation of the research protocol while maintaining adaptability to group dynamics.

The workshops employed a spiral learning model, an iterative approach pioneered by Jerome Bruner that builds upon participants' direct experiences to deepen understanding of complex topics. Each workshop progressed through four distinct phases:

1. **Experience sharing:** Participants described their direct experiences with mass timber implementation, focusing on concrete examples rather than generalizations.

2. **Reflection and analysis:** Guided reflection on these experiences to identify patterns, contradictions, and underlying factors.

3. **Conceptualization:** Collaborative development of frameworks and models to explain observed patterns and challenges.

4. **Application:** Testing of these conceptual models against additional case examples to refine understanding.

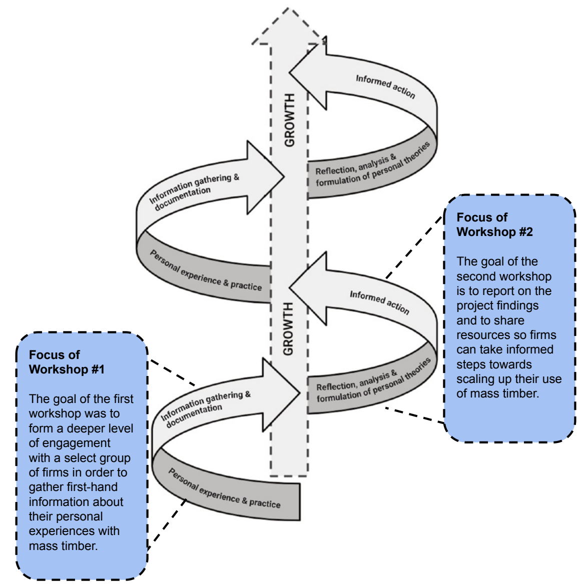
This methodology was specifically chosen for its effectiveness in producing actionable outcomes rather than reinforcing existing practices. The spiral learning approach also mitigated potential research biases by grounding discussions in specific experiences before moving to broader interpretations.

Virtual Debriefing Workshops

Several measures were employed to ensure the validity and reliability of the challenge identification and assessment process:

1. **Triangulation:** Challenges were validated through multiple data sources, with priority given to those appearing consistently across survey responses, workshop discussions, supplementary interviews, debriefing workshops, and case examples. This comprehensive triangulation approach significantly strengthened the credibility of identified challenges.

2. **Expert validation:** A panel of industry experts not involved in the primary data collection reviewed the challenge framework and assessment, providing feedback that was incorporated into the final analysis.



Spiral learning Model applied to our Workshop methodology.

3. **Participant verification:** Draft findings were shared with workshop participants through the debriefing workshops, providing a structured opportunity for practitioners to verify the accuracy and completeness of the challenge identification, and contribute to the prioritization of the most significant issues.

4. **Negative case analysis:** The research team actively sought and examined contradictory evidence for each identified challenge, ensuring robust support for inclusion in the final report. This included deliberate examination of dissenting perspectives expressed in supplementary interviews and debriefing sessions.

These validation measures strengthen the credibility of the findings while acknowledging the inherent limitations of the research methodology.

Supplementary Primary Research

In addition to the survey and workshops, supplementary primary research was conducted through structured interviews with firms that were unable to participate in the main data collection activities but expressed interest in contributing to the project. These interviews ensured broader representation across the industry and captured valuable perspectives that might otherwise have been excluded from the research.

The interview process followed a standardized protocol:

1. **Interview Structure:** Each interview lasted approximately 90 minutes and was conducted by a team of two researchers from Pilot Projects and Architecture 2030. The interviews followed a semi-structured format, utilizing core questions aligned with the survey and workshop themes while allowing flexibility to explore firm-specific experiences and insights.

2. **Data Collection:** Detailed notes were taken by the project team during these sessions, and audio recordings were made with participant consent. These recordings were subsequently transcribed using Tactiq AI to generate comprehensive text records of each conversation.

3. **Data Analysis:** Transcripts were analyzed for relevance using Claude AI, with particular attention to identifying new challenges, solutions, and contextual factors not previously captured in the survey and workshop data. This analysis followed the same coding framework used for the primary data sources to ensure consistency in categorization and interpretation.

4. **Validation:** Results from the interview analysis were fact-checked by the project team and reviewed by industry experts consulting on the project to ensure accuracy of technical content and appropriate interpretation of specialized terminology.

These supplementary interviews yielded valuable insights that both reinforced patterns observed in the primary data and introduced nuanced perspectives on region-specific challenges and emerging opportunities. The interview data was fully integrated into the overall analysis, contributing to the identification and assessment of the 25 key challenges presented in this report.

Identification and Assessment of Key Challenges

The identification and assessment of the 25 key challenges presented in this report followed a systematic, multi-phase analytical process designed to ensure both breadth and depth of understanding. This process integrated quantitative and qualitative data sources while employing rigorous validation techniques to establish the significance and impact of each identified challenge.

	Identified Challenges
1.	**Contractor Cost Inflation:** Construction firms apply substantial risk premiums when undertaking mass timber projects.
2.	**Material Cost Competition:** Mass timber elements typically exceed concrete and steel in base material costs.
3.	**Holistic Costing Uncertainty:** Limited precedent leads to conservative budgeting and elevated insurance provisions.
4.	**Limited Expert Contractors:** The scarcity of qualified timber installers creates significant implementation constraints.
5.	**Product & Assembly Standardization:** Non-uniform timber components impede efficient design specification and procurement processes.
6.	**Inexperience Loop:** Emerging firms encounter barriers entering the mass timber sector without demonstrated expertise.
7.	**Project Delivery & Liability:** Conventional construction methodologies prove inadequate for timber-specific requirements.
8.	**Structural Contractor Resistance:** Traditional concrete specialists face financial disincentives when transitioning to timber systems.
9.	**Regulatory Approval Inconsistency:** Jurisdictional authorities evaluate performance-based solutions without standardized assessment frameworks.
10.	**Fire Safety Perception:** Regulatory bodies maintain reservations regarding timber's fire performance despite technical evidence.
11.	**Procurement & Installation Timeline:** Extended material acquisition periods complicate construction sequencing and project scheduling.
12.	**Value Priority Misalignment:** Sustainability benefits emphasized by designers often remain secondary to client cost considerations.
13.	**Building Code Modernization:** Regulatory framework modernization lags behind timber construction technology advancement.
14.	**Insufficient Leadership Advocacy:** Design professionals demonstrate hesitancy promoting timber solutions during client consultations.
15.	**Public Funding Limitations:** Government procurement criteria inadvertently disadvantage alternative structural systems like mass timber.
16.	**Technical Skill Development:** Professional adaptation to mass timber systems requires substantial knowledge acquisition investment.
17.	**Carbon Calculation Complexity:** Biogenic carbon assessment methodologies lack standardization across environmental analysis platforms.
18.	**Carbon Analysis Incentives:** Insufficient regulatory mechanisms incentivize comprehensive life-cycle assessment implementation.
19.	**Geographic Supply Constraints:** Material transportation logistics present challenges for sites distant from production facilities.
20.	**Achieving Building Certifications:** Environmental certification requirements occasionally conflict with optimal timber implementation strategies.
21.	**Gatekeeping Knowledge:** Proprietary information practices restrict industry-wide knowledge dissemination and collaborative advancement.
22.	**Supply Chain Verification:** Documentation of sustainable forestry practices presents verification challenges throughout the supply chain.
23.	**Structural Analysis Tools:** Performance analysis software requires calibration for mass timber's distinctive material properties.
24.	**Negative Perception Bias:** Isolated implementation failures receive disproportionate attention relative to successful applications.
25.	**Expanded Service Requirements:** Design professionals must extend services beyond traditional scope into material sourcing considerations.

Table 1: 25 Unique Challenges

Challenge Identification Process

The challenge identification process began with comprehensive coding of all data sources using a grounded theory approach. This involved:

1. **Open coding:** Initial review of survey responses, workshop transcripts, supplementary interview records, and documentation to identify emergent themes without predetermined categories. This generated approximately 35 preliminary challenge codes.
2. **Axial coding:** Systematic organization of these preliminary codes into related clusters based on causal relationships, contexts, and consequences. This process reduced the 35 initial codes to 30 distinct challenge categories.
3. **Selective coding:** Final refinement and integration around core categories, resulting in the 25 key challenges presented in this report. This final selection prioritized challenges that appeared across multiple data sources and geographic contexts, with particular attention to those emphasized during the debriefing workshops as most critical to industry practitioners.

The coding process was conducted independently by the project team, with regular consensus meetings to resolve discrepancies and refine the coding framework. This approach enhanced analytical rigor while minimizing potential researcher bias in the identification process.

The final analysis phase integrated findings from all research components—survey data, workshop insights, supplementary interviews, and debriefing workshop feedback—to create a comprehensive understanding of the mass timber landscape. This integrated approach enabled the identification of 25 key challenges impacting mass timber implementation, examined through six interconnected lenses: Expertise, Cost, Confidence, Supply Chain, Policy, and Carbon. Throughout the analysis, strict protocols were maintained to ensure participant anonymity while preserving the depth and authenticity of the collected insights.

Assessment Framework Development

To enable systematic assessment of the identified challenges, the research team developed a multi-dimensional evaluation framework. This framework emerged from both the data itself and relevant theoretical constructs identified in our literature review of sustainable construction practices. The six assessment lenses - Expertise, Cost, Confidence, Sourcing, Policy, and Carbon - were selected based on their prominence in the data and their ability to capture distinct yet interconnected dimensions of the mass timber implementation landscape, as repeatedly confirmed across all data collection methods.

For each lens, specific evaluation criteria were established:

1. **Expertise lens:** Assessed challenges based on knowledge requirements, skill gaps, and capacity for knowledge transfer within organizations. The criteria for this lens were refined through supplementary interview insights from firms with varying levels of mass timber experience.

2. **Cost lens:** Evaluated the financial implications of challenges, including direct costs, risk premiums, and life-cycle economic impacts. The literature review provided critical context for understanding the economic frameworks most relevant to mass timber implementation.

3. **Confidence lens:** Measured impacts on stakeholder trust, decision-making certainty, and risk perception. Debriefing workshop feedback was particularly valuable in refining these criteria based on real-world practitioner experiences.

4. **Sourcing lens:** Examined supply chain implications, material availability, and procurement challenges, with evaluation criteria informed by both academic literature and practitioner experiences captured in supplementary interviews.

5. **Policy lens:** Assessed regulatory barriers, code compliance issues, and policy opportunities. The diverse geographic representation across all data sources helped ensure these criteria captured regional variations in regulatory frameworks.

6. **Carbon lens:** Evaluated impacts on embodied carbon reduction potential and climate performance, with criteria developed in alignment with current academic understanding of carbon accounting methodologies identified in the literature review.

This multi-lens approach enabled a comprehensive assessment of each challenge while acknowledging the interconnected nature of barriers in the mass timber ecosystem.

Validation and Reliability Measures

To determine the relative significance of each challenge, a mixed-methods weighting process was employed, incorporating both quantitative metrics and qualitative assessment:

1. **Frequency analysis:** Quantitative measurement of challenge mentions across survey responses and workshop transcripts, with frequency indices normalized by data source.

2. **Impact assessment:** Qualitative evaluation of the severity of each challenge's impact on project outcomes, based on case examples provided by participants.

3. **Cross-sectional analysis:** Examination of how challenges manifested differently across geographic regions, firm sizes, and project types.

4. **Solution feasibility:** Assessment of the actionability and potential pathways to address each challenge, informed by participant-generated solution concepts.

These four dimensions were integrated into a composite significance score for each challenge, enabling their relative prioritization in the final report. Challenges were then categorized into three tiers of significance:

- **Tier 1** (High Significance): Challenges with high frequency, severe impact, broad cross-sectional relevance, and actionable solution pathways.

- **Tier 2** (Moderate Significance): Challenges with moderate frequency, notable impact, specific contextual relevance, and identifiable solution pathways.
- **Tier 3** (Emerging Significance): Challenges with lower frequency but indications of growing importance, or those with high potential impact but limited current prevalence.

This tiered approach provides readers with a clear understanding of each challenge's relative importance while acknowledging the dynamic nature of the mass timber implementation landscape.

Validation and Reliability Measures

Several measures were employed to ensure the validity and reliability of the challenge identification and assessment process:

1. **Triangulation:** Challenges were validated through multiple data sources, with priority given to those appearing consistently across survey responses, workshop discussions, and case examples.
2. **Expert validation:** A panel of five industry experts not involved in the primary data collection reviewed the challenge framework and assessment, providing feedback that was incorporated into the final analysis.
3. **Participant verification:** Draft findings were shared with workshop participants, who provided feedback on the accuracy and completeness of the challenge identification.
4. **Negative case analysis:** The research team actively sought and examined contradictory evidence for each identified challenge, ensuring robust support for inclusion in the final report.

These validation measures strengthen the credibility of the findings while acknowledging the inherent limitations of the research methodology.

Integration and Analysis

The final analysis phase integrated findings from all research components to create a comprehensive understanding of the mass timber landscape. This integrated approach enabled the identification of 25 key challenges impacting mass timber implementation, examined through six interconnected lenses: Expertise, Cost, Confidence, Supply Chain, Policy, and Carbon.

The integration process employed a convergent parallel design, where each data stream—quantitative survey data, qualitative workshop insights, supplementary interview findings, and debriefing workshop feedback—was analyzed separately before being merged for comprehensive interpretation. This approach preserved the integrity of each methodological strand while enabling rich, contextual understanding of the findings. Supplementary interviews provided particularly valuable depth on selected topics, while debriefing workshops offered critical validation and refinement of preliminary patterns.

Data visualization techniques, including thematic networks, causal loop diagrams, and geospatial mapping, were employed to explore relationships between challenges and their contextual factors across all data sources. These visualization approaches revealed important interconnections and feedback loops within the mass timber implementation ecosystem that might otherwise remain obscured in linear analysis.

Throughout the analysis, strict protocols were maintained to ensure participant anonymity while preserving the depth and authenticity of the collected insights. All data was anonymized during processing, with demographic information maintained only at the aggregate level necessary for meaningful analysis. Participating firms provided informed consent for the use of their insights in this report, with the understanding that specific attributions would be made only with explicit permission.

Limitations and Methodological Considerations

While robust in design and execution, this research methodology carries several limitations that should be acknowledged:

1. **Self-selection bias:** Survey respondents and workshop participants may represent firms with greater interest in mass timber, potentially overrepresenting progressive perspectives within the industry. The supplementary interviews partially mitigated this limitation by including firms that were unable to participate in the primary data collection activities.

2. **Temporal limitations:** The research captures a snapshot of the mass timber landscape during a period of rapid evolution in North America, and some findings may have limited longevity as the sector continues to mature.

3. **Geographic concentration:** Despite efforts to ensure broad representation, certain regions (particularly the Pacific Northwest and Northeast) had higher participation rates, potentially influencing the prominence of region-specific challenges. The supplementary interviews helped address some geographic gaps, but regional imbalances remain a consideration in interpreting findings.

4. **Firm-level perspective:** The methodology prioritized organizational perspectives, potentially underrepresenting the views of individual practitioners or end-users of mass timber buildings.

5. **Reduced debriefing scope:** Due to funding constraints, only half of the planned debriefing workshops were completed. While the completed sessions provided valuable validation and refinement of findings, the reduced scope may have limited the breadth of feedback on the preliminary challenge identification.

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