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Tony Evers, Governor
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VIRTUAL/TELECONFERENCE
MASS TIMBER TASK FORCE
Virtual, 4822 Madison Yards Way, Madison
Contact: Brad Wojciechowski (608) 266-2112
October 31, 2024

The following agenda describes the issues that the Task Force plans to consider at the meeting. At the time of the meeting, items may be removed from the agenda. Please consult the meeting minutes for a record of the actions of the Task Force.

AGENDA

9:00 A.M.

OPEN SESSION – CALL TO ORDER – ROLL CALL

A. Adoption of Agenda (1-2)

B. Approval of Minutes of June 11, 2024 (3)

C. Introductions, Announcements and Recognition

D. Reminders: Scheduling Concerns

E. Administrative Matters
1) Department, Staff and Task Force Updates

F. Administrative Rules Matters – Discussion and Consideration

G. Alternative Procedures for Design of Mass Timber Tall Buildings – Discussion and Consideration *Additional Materials*
1) Developing Content for Alternative Procedures for Mass Timber Guidebook
2) ICC Performance Code for Buildings and Facilities Review
3) Relating Mass Timber to Other Alternative Building Procedures

H. Public Comments

ADJOURNMENT

NEXT MEETING: MARCH 4, 2025

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MEETINGS AND HEARINGS ARE OPEN TO THE PUBLIC, AND MAY BE CANCELLED WITHOUT NOTICE.

Times listed for meeting items are approximate and depend on the length of discussion and voting. All meetings are held virtually unless otherwise indicated. In-person meetings are typically conducted at 4822 Madison Yards Way, Madison, Wisconsin, unless an alternative location is listed on the meeting notice. In order to confirm a meeting or to request a complete copy of the board's agenda, please visit the Department website at https:\\dsps.wi.gov. The board may also consider materials or items filed after the transmission of this notice. Times listed for the commencement of any agenda item may be changed by the board for the convenience of the parties. The person credentialed by the board has the right to demand that the meeting at which final action may be taken against the credential be held in open

session. Requests for interpreters for the hard of hearing, or other accommodations, are considered upon request by contacting the Affirmative Action Officer or reach the Meeting Staff by calling 608-267-7213.

An Alternate Procedure for the Design and Permitting of (Tall) Mass Timber Buildings

September 2, 2024

An Alternative Procedure for the Design and Permitting of (Tall) Mass Timber Buildings

2024 Edition

A consensus document developed by the Wisconsin Mass Timber Task Force

Task Force Active Members:

Richard Paur, Chairperson

Justin Gavin

Wisconsin Department of Safety and Professional Services Representative

Laura E. Hasburgh

Jordan T. Komp

Jason P. Korb

Marco T. Lo Ricco

Michael C. Mazmanian

Erich J. Roden

Alexander R. Timmer

About the Mass Timber Task Force

The Mass Timber Task Force was created under Wis. Stat. § 227.13 to advise the Department and the Commercial Building Code Council on matters relating to development of mass timber guidelines.

The agency utilized informal conferences and consultations to obtain the viewpoint and advise of interested persons with respect to contemplated rule making. The agency appointed a committee of experts, interested persons or representatives of the public to advise it with respect to any contemplated rule making. The committee shall have advisory powers only.

Members:

Paur, Richard (Chairperson)

Hasburgh, Laura

Komp, Jordan

Korb, Jason

Lo Ricco, Marco

Mazmanian, Michael

Roden, Erich

Timmer, Alexander

Gavin, Justin

1. Intent, Scope, and Justification

1.1 Intent

The intent of the guidebook is to provide a framework for design professionals to work with permitting officials to facilitate the approval of (tall) Mass Timber structures, utilizing a performance-based design approach. The alternative design methods and materials described in this guidebook must provide, at a minimum, an equivalent level of quality, strength, fire resistance, durability, and safety, as buildings of similar height, occupancy, and area; as they relate to the Wisconsin Commercial Building Code, with references to the International Building Code.

1.2 Scope

The scope of this guidebook is to identify a methodology for the design, review, and approval of mass timber or composite mass timber buildings beyond the prescriptive provisions of IBC Type IV construction.

1.3 Justification

The Wisconsin Commercial Building Code (CBC) and the International Building Code (IBC) have existing provisions for alternative building materials, as well as the use of a performance-based design approach, both in lieu of a standard prescriptive code approach.

Alternate Building Materials

SPS 361.03 (6): *"Nothing in chs. SPS 361 to 366 is intended to prohibit or discourage the design and utilization of new building products, systems, components, or alternate practices, provided written approval from the department is obtained first."*

SPS 361.50 (2): *"Materials, equipment, and products that meet the intent of chs. SPS 361 to 366 and which are not approved under sub. (1) shall be permitted if approved in writing by the department.*

Approval of materials, equipment, and products shall be based on sufficient data, tests, and other evidence that prove the material, equipment, or product meets the intent of the standards specified in chs. SPS 361 to 366.

Tests, compilation of data, and calculations shall be conducted by a qualified independent third party."

Performance Based Design

IBC 2021 – Appendix O: *"Appendix O provides an optional design, review and approval framework for use by the building official. Typical uses would include cases of alternate methods in Chapter 1, select areas of the code that require a rational analysis such as Section 909 and elsewhere. It simply extracts the relevant administrative provisions from the ICC Performance Code into a more concise, usable appendix format for a jurisdiction confronted with such a need. Currently there are multiple, varying jurisdictional rules and procedures in many communities regarding procedure and none in even more. The building official is often left alone to reach decisions not just on the merits of a design, but must first also decide on the submittal and review process. As an appendix, the provisions herein are entirely optional to a jurisdiction. This appendix can be adopted, adopted with local modifications, or even used on a case-by-case basis as part of a Memorandum of Understanding or similar legal agreement between the jurisdiction and the owner/design team. It simply represents another tool for the jurisdiction to reach for in cases of need; it neither encourages nor creates any additional opportunity for performance-based design."*

The utilization of alternative building materials and design methods are contingent on approvals from the Wisconsin Department of Safety and Professional Services (DSPS). This guidebook outlines practices that have been used prior to the establishment of the Task Force, focusing on their implementation with respect to (tall) Mass Timber structures.

This guide would recommend the mass timber design align with the performance objectives utilized by the Ad Hoc Committee on Tall Wood Buildings (TWB) in providing guidance on the development of future code change proposals, primarily:

1. *No collapse under reasonable scenarios of complete burnout of fuel without automatic sprinkler protection being considered.*
2. *No unusually high radiation exposure from the subject building to adjoining properties to present a risk of ignition under reasonably severe fire scenarios.*
3. *No unusual response from typical radiation exposure from adjacent properties to present a risk of ignition of the subject building under reasonably severe fire scenarios.*
4. *No unusual fire department access issues*
5. *Egress systems designed to protect building occupants during the design escape time, plus a factor of safety.*
6. *Highly reliable fire suppression systems to reduce the risk of failure during reasonably expected fire scenarios; the degree of reliability should be proportional to evacuation time (building height) and risk of collapse.*

2. Permitting and Variance Process

For projects utilizing the alternate design methods and materials outlined in this guide, the following permitting and variance process in recommended.

2.1 Preliminary Meeting

A preliminary meeting, likely occurring in the Concept/Schematic Design phase of the project, to introduce the project to the Authority Having Jurisdiction (AHJ), including the following items:

1. Project Location
2. Project Parameters (Height, Number of Stories, Material Exposure…)
3. Project Timeline
4. Unique/critical project details
5. Design Team Proposed Variance Path (e.g. utilizing this guide)
6. Preliminary AHJ/Fire Department Questions
7. Schedule Next Steps

It is recommended the following parties are in attendance:

1. Authority Having Jurisdiction
2. Fire Department
3. Ownership
4. Architect on Record (A.O.R.)
5. Engineer on Record (E.O.R.)
6. Fire Engineer (if on-board)
7. Contractor (if on-board)
8. Peer Reviewer (if on-board)

2.2 Process Approval

Based on the introductory meeting, and initial feedback from the AHJ/Fire Department, the design team should formally propose a Variance/Permitting Approval Process (e.g. the Alternate Materials provision, the use of this guide…), including what, if any, supplemental testing, reports, or documentation will be provided in the formal variance.

After reviewing the proposal, the AHJ should formally approve or reject the variance **process**, including any required modifications or supplement documentation to the design team proposal.

2.3 Petition for Variance

Based on the previously accepted variance process, the design team/ownership should formally issue a "Petition for Variance" (or potentially multiple variances depending on the project).

The petition should include the following:

1. The code section(s) being petitioned
2. The variance request
3. The intent of the code section being petitioned
4. Petitioner's comments, including what supplemental documentation (e.g. letters, reports, test results, peer reviews, fire engineering) will be provided with the future issuance of the Permit Documents

If deemed acceptable, the AHJ should provide "Conditional Approval" of the Petition for Variance, noting any specific conditions of approval (e.g. the petitioner carrying out all items noted in the original petition).

If deemed unacceptable, the AHJ should clarify why the petition was rejected, or note what modifications would be required for approval.

2.4 Issuance of Permit Documents

It is recommended the following permit documents (at a minimum) should be issued to the AHJ, as well as the previously approved Independent third-party peer reviewer, if applicable (refer to Section 3.4 for additional information regarding the peer review process)

1. Design Narrative
    a. Justification to the AHJ and Independent third-party peer reviewer for use of proposed mass timber design/construction. Including code references, recommended design methodology, and associated code design factors and equations.
        i. If the team is proposing the use of mass timber elements or hardware sourced outside the United States, it is recommended the design team provide supplement documentation demonstrating design equivalency between Eurocode (or other foreign code) serviceability and strength parameters, with those documented in the applicable United States design standards (e.g. NDS and ANSI). The

design team shall justify to the AHJ and Peer Reviewer, the use of the design recommendations, factors, and equations provided by these codes, in accordance with American Standards.

   b. Description of each mass timber component (structural and non-structural), delineating primary and secondary framing members

2. Construction Documents (e.g. drawings and specifications for all disciplines/trades)
   a. Structural: Typical Mass Timber framing schedules, material properties, and assumed loading (e.g. loading diagrams)
   b. Architectural: XXXXXXXX
   c. MEPFP: XXXXXXX
   d. Other: XXXXXXX?
3. Structural Calculations
   a. Standard strength and serviceability calculations, both for Mass Timber and non-Mass Timber elements. These calculations should consider both standard design scenarios (load combinations) as well as the fire safety scenario(s), in the event the members are relying on encapsulation or charring of the structure to meet a prescribed endurance rating.
   b. Should the team consider sourcing material (timber/hardware) outside of the United States, it is recommended the team provide an additional equivalent Eurocode design for the controlling members/designs. The peer reviewer (where applicable) should review and comment on the conversion factors from codes outside the United States to NDS parameters/values.
4. Additional Documentation
   a. Additional information required to supplement standard code previsions, design drawings, and structural calculations; which could include material or member certifications, such as:
      i. Glulam fire test reports (e.g. char rates beyond 2 hours)
      ii. CLT compliance with PRG-320 (2018 or beyond) to avoid heat delamination
      iii. CLT un-restrained load-bearing floor/ceiling assembly fire test results, in compliance with ASTM E119-16a *Standard Test Methods for Fire Tests of Building Construction and Materials*

iv. Connection load-bearing fire-test(s) in compliance with ASTM E119-16a, or supplemental fire engineering per IBC 2021, Section 2304.10.1

v. Proprietary component testing/ICC reports/documentation/calculations

vi. Documentation for provisions and standards associated with materials (timber/hardware) sourced outside of the United States (or not in accordance with typical US testing/standards).

2.5 **Permit Approval**. Prior to formal issuance of the permit, all AHJ and third party peer review comments, questions, and clarifications shall be addressed to the satisfaction of the AHJ.

3.0 Structural Design

The structural design should follow, at a minimum, the requirements of the National Design Specification referenced by the current version of the Wisconsin Commercial Building Code. The structural calculations provided to the AHJ should include calculations for both the standard design scenario and for any scenario that is based on performance-based design. A fire design scenario, where members rely on charring of the structure, for example, should be included in the performance-based design review.

3.1.1 Checking standards for updates regarding mass timber construction: Since the 2018 edition of the NDS added information pertaining to mass timber construction, the design team should check the most recent edition of this code-referenced standard for updates. The Special Design Provisions for Wind and Seismic (SDPWS), a companion reference to the NDS, provides both general and specific information for the design of prequalified mass timber lateral force-resisting systems.

3.1.2 Classification of structural components: Generally, structural components are categorized as part of the gravity or lateral force-resisting systems, but many components dual as members of both gravity and lateral load transfer. The design team should indicate the functions (gravity, lateral, or both) of mass timber structural components to facilitate

review. To date, few mass timber lateral systems have been prequalified for seismic design, making use of alternative means and methods more likely for mass timber lateral systems. In addition, critical gravity system components, such as columns supporting multiple levels, should be identified for evaluation of structural and fire performance criteria if aspects of the design are beyond the scope of standard code provisions.

3.1.3 Determining need for performance-based structural design: In the context of mass timber buildings, there may be many reasons to implement a performance-based design. One common scenario pertains to fire safety, such as when exposed wood and the insulative char layer are used to justify the fire endurance of the structure in lieu of the prescriptive encapsulation requirements of the standard code provisions. Other reasons may include use of mass timber components in lateral systems that have yet to be prequalified by code reference standards.

3.1.4 Identifying the model code used for design: Model codes, such as the International Performance Code for Buildings and Facilities (ICCPC), are designed to complement the standard IBC when the alternative means and methods provisions apply. The model used for performance-based design should be referenced to provide the peer reviewer and AHJ with a framework to evaluate the structural design methods.

3.1.5 Performance objectives: The level of performance and model code used for performance-based design should be clearly defined at the outset of a project. The design team should clearly communicate to reviewers the intent and criteria of performance-based design scenarios.

3.1.6 Levels of performance: In all scenarios, the design shall perform at least equivalent to the standard safety objectives of the code. Often, performance-based design is implemented to achieve performance objectives that are higher than code minimums. Whether the performance objectives meet or exceed the standard code design objectives should be clearly communicated in the introduction to the structural design. Generally, life safety and collapse prevention are the most common fundamental concerns, but project stakeholders may agree to higher safety or serviceability objectives than what is required by code.

3.1.7 Structural Fire-Resistance: The design team shall provide clear documentation of what structural elements are considered exposed, protected with non-combustible materials, and/or partially protected. The design team shall clearly identify the required minimum fire resistance rating of each element per current prescriptive requirements and clearly outline the methods used to meet or exceed the minimum prescriptive fire resistance requirements.

For elements where the fire protection is provided by a combination of a non-combustible material and charring layer, the contribution of each toward the overall fire rating should be documented; with the contribution of the non-combustible materials (where applicable)

providing a minimum of 2/3 of the overall required fire rating. For additional information on non-combustible protection, see Section 3.2.5.

The utilization of NDS provisions and calculations for the determination of char rates is a well-established and industry recognized procedure. For the scope of this guideline, the following additional items shall be considered:

- Load and resistance factor design (LRFD) Fire Factors: Fire Design Specification (FDS) for Wood Construction has included additional Fire Factors (not currently covered in NDS) for the use of Fire Factors with LRFD provisions.
- Extreme Event Loading: For loading in a fire scenario, the designer is referenced to the most current edition of the Fire Design Specification (FDS) for Wood Construction.

For exposed timber members (without non-combustible material) requiring fire ratings beyond the current provisions, the design team shall provide specific testing results to verify the char rates utilized for design. The char rates shall not be reduced beyond those calculated based on extrapolation of the current char rate models.

3.2 Minimum Fire-Resistance Ratings (FRR's)

Primary Structural Frame:

Buildings up to 180'-0" or 12 stories: 2 hours[1]

Buildings taller than 180'-0" or 12 stories: 3 hours[1, 2]

[1.] Roof support rating is permitted to be reduced by one hour where supporting a roof only (not including additional occupancies/loading)

[2.] For buildings not greater than 420 feet in building height, the fire-resistance rating of floor framing elements (e.g. CLT slabs and glulam beams) shall be permitted to be reduced to 2 hours.

Bearing Walls:

Refer to primary structural frame[3, 4]

[3.] No reduction for roof framing is permitted

[4.] Minimum fire-rating for exterior walls to be based on fire separation distance

Non-Bearing Walls and Partitions: 0 hours

Floor Construction and Associated Secondary Structural Members: 2 hours

Roof Construction and Associated Secondary Structural Members:

Buildings up to 180’-0” or 12 stories: 1 hour

Buildings taller than 180’-0” or 12 stories: 1.5 hours

3.2.1 Structural Connections

Fire-Resistance Rating to match, at a minimum, the lower of the connecting member(s) FRR.

Connections

Bearing type connections should utilize noncombustible protection, or require load tested (under a fire event) to achieve the FRR noted in section 2.1.1.

i. Connections utilizing intumescent paint for noncombustible protection should be load tested (under a fire event) to confirm compatibility between materials
ii. At the AHJ’s discretion, the use of engineering analysis could be provided to validate the fire-resistance rating of connections per section 2304.10.1 of IBC 2021 - All other mass timber connections should be load tested (under a fire event) for the specified fire rating. - Testing should meet the requirements of Section 2.1.3

3.2.2 Referencing analysis models developed for standards outside the jurisdiction: Should the team consider sourcing material that has been developed for design according to other building codes, the design team should provide documentation, calculations or testing reports, demonstrating that serviceability and strength parameters meet or exceed those required or documented in the NDS.

Many mass timber and connection hardware products are used successfully around the world, where engineered forest products have been developed for construction and code standards are generally on par with The International Building Code (IBC). Load factors and statistical or analytical models used in codes outside the United States, however, differ, so it is recommended the team translate design methodologies from other standards into NDS parameters or values. Conversion factors should be clearly stated for evaluation.

The design team shall justify to the AHJ and Peer Reviewer, the use of the design recommendations, factors, and equations that are sourced from other codes. If a building code in another jurisdiction, such as the Eurocode or Canadian Standards Association, provides a design methodology that is useful, the design team is responsible for demonstrating that the methodology meets or exceeds governing code standards, such as the NDS or IBC, and fulfills project-specific performance-based design objectives.

3.2.3 Validation by testing to local standards: If analysis models or prior test data is not readily translated to NDS parameters or values, products may be tested and evaluated for compliance with IBC- or NDS-referenced standards, such as the ANSI/APA PRG 320 Standard for Performance-Rated

Cross-Laminated Timber, ANSI/APA A190.1 Product Standard for Structural Glued Laminated Timber, or applicable qualification provisions for connections performance in wood materials.

3..2.3 Citing other references used for design: If references outside the scope of building codes and associated standards are used to justify the design, those references should be cited to acknowledge state-of-the-art research, analysis, and design checks used on the project.

3.3 Fire Safety

The fire safety features (passive and active) beyond those described in the structural section of this guide shall provide the same protection, or greater, to meet the goals of life safety for occupants, safe access for firefighters, and protection of property. This section provides an overview of additional fire protection features that shall be included to ensure fire safety in timber buildings.

3.3.1 Prevention of Ignition and Control of Fire Development/Spread: The risk of accidental fire must be reduced. Additionally, should a fire occur, the severity, duration, and spread must be controlled. The risk of ignition is accomplished by ensuring potential ignition sources are away from combustible materials and by selecting equipment with fire-safe features and design.

In the case of ignition, the rate of fire development and subsequent heat and smoke production must be controlled. For mass timber structures, this can be achieved by compartment geometry to reduce radiant feedback, proper selection of construction materials including interior finishes and exterior walls designs, ventilation control including pressurization and smoke extraction systems, compartmentalization with fire walls and smoke barriers, and adequately designed suppression systems.

3.3.2 Fire Detection and Notification: A fire detection system that provides early detection must be installed throughout any mass timber structure. The system shall notify occupants, emergency personnel, and activate any active fire protection systems such as a smoke extraction system, door releases, or a suppression system. The system operation must be well documented and agreed upon by the location fire department.

3.3.3 Fire Suppression: Automatic fire suppression systems are required for all mass timber structures and properly designed in accordance with NFPA 13 for each hazard identified within the structure. When approaching design considerations outside of the prescriptive requirements, additional redundancies within the fire suppression system (sprinkler system and standpipe system) shall be considered.

3.3.4 Concealed Spaces: It is the committee's opinion that mass timber should not be permitted in concealed spacings with the following exceptions: (1) non-combustible protection is provided within the interior (mass timber) space or (2) significant project specific testing/data is obtained and approved by the AOR/EOR, AHJ, and independent third-party peer reviewer.

There shall be no exposed mass timber in concealed spaces; concealed space permitted only with noncombustible protection as required for the interior mass timber.

1. Prohibition of concealed spaces 4HT has been removed. – (KA comment – concealed spaces language in the IBC and its commentary are not in agreement. For discussion.) gypsum detailing

a. Lean on prescriptive method. (KA comment – gypsum detailing requirements have been defined by Fire Design Specification for Wood Construction – Wood Products Council.)

3.2.5.1 Exterior Walls (Façade):

- " Exterior side of exterior walls protected by a non-combustible material—e.g., 5/8" Type X gypsum sheathing"

- " No combustible exterior wall coverings except for certain water-resistant barriers"

- " No exposed mass timber on the inside and outside surfaces of exit enclosures and elevator hoistways in high-rise buildings (occupied floor > 75 feet from lowest fire department access)"

- " Noncombustible construction only for exit enclosures and elevator hoistways greater than 12 stories or 180 feet"

3.2.5.1 Non-combustible Protection:

Shall follow IBC 2021 section 722.7. Korb previously noted some general concerns regarding discrepancies in the IBC 2021 code (section 722.7). It is recommended that the guideline specify specific detailing requirements in lieu of relying on a reference to IBC 2021.

"Proposal FS81-18 (new IBC 722.7) defined the level of noncombustible protection required and how to achieve this level, including a prescriptive method recognizing 1/2" Type X gypsum board providing 25 minutes of protection and 5/8" Type X gypsum board providing 40 minutes of protection. Proposal FS5-18 (new IBC 703.6) defined methods to determine the level of noncombustible protection provided by other applied materials through using the E119 test procedure. FS73-18 (IBC 718.2.1) added mass timber as a fire blocking material."

3.2.5.2 Joints and Intersections:

Sealing of adjacent mass timber elements per 703.7. Sealants shall meet the requirements of ASTM C920. Adhesives shall meet the requirements of ASTM D3498.

Fire blocking materials to meet the requirements of IBC Section 718.2.1

3.2.5.2.3 A new code section, IBC 703.7, was included in proposal FS6-18. It required that certain adhesives be applied at abutting edges and intersections of fire resistance-rated mass timber elements unless the assembly has been shown to provide the required FRR without utilizing sealants.

Definitions

"Fire Design Scenario" means a set of conditions that defines the development of fire and the spread of combustion products throughout a building or portion of a buildings, the reactions of people to fire, and the effects of combustion products. Ultimately, fire scenarios describe factors critical to the outcome of fires, such as fire protection features, ignition sources, the nature and configuration of the fuel, fire characteristics, ventilation, occupants, and conditions of the supporting structure.

"Department" means department of safety and professional services.

"AHJ" means authority having jurisdiction authority having jurisdiction shall be the department or its authorized representative.

Bibliography

In addition to the code requirements above, it is recommended that the design cite state of the art research and design documents. Examples of documents to cite, wherever applicable, include:

[1] CLT Diaphragm Design for Wind and Seismic Resistance (Woodworks)

[2] U.S. Mass Timber Floor Vibration Design Guide (Woodworks)

[3] CLT Composite engineering testing reports or research articles

[4] Design Guide XX, Hybrid Steel Frames with Wood Floors (AISC)

[5] 2022 Fire Design Specification (FDS) for Wood Construction

This bibliography is not a comprehensive list and may grow in scope and detail, as the mass timber construction industry advances.

References

References

The sources of substantiating information from tests, design standards, engineering reports and research articles should be clearly cited in the peer review calculations.

1. U.S. standards

a. Because the recent 2021 edition of the NDS specifically address cross-laminated timber (CLT), it is recommended the design team utilize the latest version of this design standard.

b. For main lateral-force resisting systems (MLFRS) including CLT diaphragms and shear walls, in particular, designers should reference 2021 Special Design Provisions for Wind and Seismic (SDPWS) as a general framework. It is likely that future editions of these documents will include more detailed and specific information on mass timber systems, to supplement the current general framework.

c. AWC technical report No. 10, Calculating the Fire Resistance of Wood Members and Assemblies provides guidance for calculating the fire endurance of timber structures with architecturally exposed surfaces.

d. ANSI/APA PRG 320: Standard for Performance-Rated Cross-Laminated Timber is referenced by building codes. Mass timber panels beyond the scope of this document should demonstrate performance with testing and calculations to demonstrate equivalent or enhanced performance.

e. ANSI A190.1-2022 Product Standard for Structural Glued Laminated Timber is referenced by building codes. Mass timber framing beyond the scope of this document should demonstrate performance with testing and calculations to demonstrate equivalent or enhanced performance.

3. Foreign Standards

Where current state of the art research and documents associated with mass timber fall outside of the United States, references des to foreign codes should check underlying assumptions of design equations and compare models with the design philosophies developed in the United States.