



VIRTUAL/TELECONFERENCE
MASS TIMBER TASK FORCE
Virtual, 4822 Madison Yards Way, Madison
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December 3, 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 October 31, 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 (4-13) *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

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.

3. Analysis, Design, and Detailing

For Type IV construction, beyond the prescriptive requirements of the adopted building code, ~~it is noted that~~ an alternate, performance-based, pathway is available for design and permitting.

The goal of this chapter is to provide guidance on design parameters, ~~as well as any necessary supervision and peer review~~ by third-party professionals ~~(where required)~~, to meet ~~the projects~~ performance ~~objectives~~goals. These performance ~~goals/objectives~~, ~~which~~ should be ~~approved~~ ~~agreed to be among~~ ~~between~~ all various project stakeholders, ~~which may include (design team, ownership, insurers, the design team, AHJ, tenants, and community first responders, to name a few...)~~, ~~early in the approval process~~; and ~~could include~~The level of performance (survivability, repairability, or continued operations despite extraordinary events) should be determined at the project onset so that appropriate ~~d (among other topics)~~ design load combinations, fire endurance ratings, serviceability criteria, and structural ~~stability or integrity~~load path checks, and other considerations may be applied accordingly to fulfill objectives~~(including redundancy/progressive collapse mitigation)~~.

3.1 Structural Design Considerations [KJ1]

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; ~~however, performance-based design objectives may be set higher than typically required by code to minimize damage to the structure, architectural and/or mechanical systems, and building contents.~~ Generally, code minimum requirements are established to prevent damage under routine service conditions and ensure that building occupants may evacuate buildings safely when an extraordinary event occurs. Higher performance-based design objectives, however, may be established at the discretion of project stakeholders (e.g. owners, insurers, tenants, and first responders) to minimize damage to the structure, architectural and/or mechanical systems, and building contents.

3.1.1 Load combinations should cite a model building code or other rational means of risk assessment to determine load combination factors and the effects of individual hazards (wind, seismic, flood, etc.) that result in applied loading conditions.

3.1.1.1 Standard Basic, code-code-required load combinations (e.g. ASCE/SEI 7) for ~~strength design or allowable stress design~~ should be addressed, at a minimum, ~~clarifying~~ ~~if~~ supplemental or enhanced requirements are being considered (similar to the performance-based design approaches ~~developed for seismic design~~ ~~taken for high seismic regions of the country~~), ~~those methods of load determination, applied load combination factors, and risk assessment should be indicated in the calculations.~~ ~~These additional considerations/enhancements could consider structural redundancy (progressive collapse) and structural integrity (rotational compatibility/ductility, structural and non-structural) depending on the site/project specific requirements.~~

3.1.1.2 Load combinations for extraordinary events are defined in the most recent edition of ASCE/SEI 7 to address low-probability events such as fires, explosions, and vehicular impacts that may cause disproportionate structural collapse by damaging columns. Among these extraordinary events, fire damage is generally applicable to performance-based design of mass timber structures that seek an alternative solution to the encapsulation requirements prescribed by building codes. Load combinations should consider the:

- Capacity of a structure or critical structural element to withstand the effects of a fire and simultaneous gravity loads,
- Residual capacity of damaged structures or critical structural elements affected by fire, and
- Stability requirements of the structure as a whole or critical elements, including the influence of second-order effects.

Whether to use ASCE 7, FDS, or other rationally derived load combination equations to determine the demands of mass timber structures subjected to fire is at the discretion of the design team and peer reviewers. The selected load combinations should be matched to either allowable stress design (ASD) or strength design (LRFD) methods. For further guidelines to assess the capacities of fire-damaged structures or structural elements, see Section 3.3 Fire Endurance Considerations.

3.1.2 Structural systems and components

The design (and documentation) should clearly define the structural load path and system, including defining primary, secondary, and main lateral force resisting members (including the role, or multiple roles, each individual member may serve). **In comparison to systems made from other**At this time, it is worth noting that **as of the original writing of this document**[K2], **current structural materials**, building codes and design standards contain **very relatively** few prequalified mass timber lateral systems. Additionally, innovative structural systems such as hybrid and composite mass timber are being developed; emphasizing the need for an alternate (performance-based) design approach (beyond the limited prequalified systems currently referenced in building codes).

3.1.3 Structural design references

~~Given continual/ongoing updates/revisions to~~Despite the rapid development of national design standards ~~for mass timber construction, such as the most recent editions of the NDS and Special Design Provisions for Wind and Seismic (SDPWS), dit is recommended the design teams will likely need to reference utilize and/or at least consider/review, the additional requirements of these updated editions of these design standards and state-of-the-art research (e.g. considering the lateral design requirements of 2021 Special Design Provisions for Wind and Seismic (SDPWS), even for building codes referencing earlier versions of IBC).~~ It is also noted that this to keep pace with industry developments and best practices ~~state of the art research may come from sources outside of the United States.~~ Refer to **Chapter X**[K3] for recommended references/design guides associated with many of the topics discussed above.

3.2 Non-Structural Design Considerations^[KJ4]

Serviceability considerations, including lateral drifts, floor deflections, and floor vibrations may often control, or at least provide significant guidance towards, the overall design of a structure (beyond standard strength designs/calculations). Additionally, due to the lightweight nature of mass timber construction, there are frequently additional non-structural design principals (e.g. acoustic design, sound mitigation, and thermal/energy performance) that need to be considered during design.

The reader is once again encouraged to review Chapter X for additional references associated with the topics above.

3.3 Fire Endurance Considerations

Performance-based fire designs may choose to modify the fire endurance durations/requirements from the code required minimum ratings, for a given occupancy/structure type. The design team should provide clear documentation noting what structural elements are considered exposed, concealed and/or partially concealed, and the associated fire rating of each element. Structural calculations provided to the AHJ should include calculations for both the standard design scenario and for any fire scenario(s), particularly where members rely on charring of the structure to achieve this rating.

For elements where the fire protection is provided by a combination of a non-combustible material and a wood charring layer, the contribution of each towards 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.

Any supplement testing to be completed (potentially as part of the project's variance process), should be certified by an independent, accredited 3rd party testing agency. The testing procedure and results should be reviewed for approval by Project AOR, EOR, Fire Engineer, and AHJ.

3.3.1 Minimum Fire-Resistance Rating (FRR's) Recommendations

Element	Minimum Fire-Resistance Rating
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}
Bearing Walls	Refer to primary structural frame ^{3, 4}
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
Structural Connections	FRR to match, at a minimum, the lower of the connection member(s) FRR

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.

³ No reduction for roof framing is permitted

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

3.3.2 Mass Timber Fire-Resistance Rating Validation

3.3.2.1 National Design Standards (Char Method)

Primary and Secondary Structure:

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, it is recommended the following (additional) items be considered:

- Load Resistance Factored Design Fire Factors: 2022 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 (Table 3.2.5).
- Extreme Event Loading: For loading in a fire scenario, the designer is referenced to the 2022 Fire Design Specification (FDS) for Wood Construction section 3.1.3.4.
- Char Calculations Beyond 2 Hours: For members requiring fire ratings beyond the current NDS provisions, it is recommended the design team provide specific testing, verifying the char rates utilized for design. It is recommended that the char rates not be reduced beyond those calculated based on extrapolation of the current NDS equations.

For projects utilizing Douglas Fir, American Spruce or European Spruce, the design team is advised to refer to the 3-hour testing provided by the USDA Forest Product Laboratory for the Ascent project.

Connections of Primary and Secondary Members:

- Bearing type connections should [KJ5] utilize noncombustible protection, or require load testing (under a fire event) to achieve the FRR noted in section 2.1.1 [KJ6].
 - Connections utilizing intumescent paint for noncombustible protection should be load tested (under a fire event) to confirm compatibility between materials
 - 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 [KJ7]

3.3.2.2 Non-Combustible Protection [KJ8]

Gypsum detailing requirements to follow IBC 2021 section 722.7.

Sealants: 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 meeting the requirements of 718.2.1 [KJ9]

3.3.2.3 Fire Testing/Certification Requirements: [KJ10]

Testing to be completed, and results certified, by an independent, accredited 3rd party testing agency. Testing procedure and results to be reviewed for approval by Project AOR, EOR, Fire Engineer, and AHJ.

3.3.3 Exposure

Primary and Secondary Structure:

The floor assembly should contain a non-combustible material no less than 1" in thickness above the mass timber floor. No additional limits are directly required of the primary and secondary structural exposure, contingent on meeting the fire-resistance ratings specified in Section 2.1.1. [KJ11]

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.[KJ12]

Exterior Walls (Façade):

The committee would note the following recommendations, consistent with the XXXXXXX[KJ13]

- “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”

3.3.4 Additional Recommendations:

Water Supply:

- Dual water supply for buildings 120 feet and above, in accordance with IBC 403.3.2 (2021), and including the following exception:
 - i. “Exception: Two connections to the same main shall be permitted provided the main is valved such that an interruption can be isolated so that the water supply will continue without interruption through no fewer than one of the connections”
- Water supply in accordance with 2021 IFC 3313 and 2021 IBC 3313

Sprinklers:

- i. Building fully sprinklered with an NFPA 13-compliant sprinkler system[KJ14]

Smoke Evacuation: Fire Department thoughts?

Type 1A Construction?

3.4 Fire Engineering Consultant:[KJ15][BW16]

TT Thoughts:

For buildings higher than 12 stories or 180’ (typically only required if designing alternative solutions to prescriptive fire protection requirements)

Qualifications and Selection

- Previous Mass Timber Experience
- Selected by Ownership/Design to be approved by AHJ

-Scope

1. Review mass timber framing and connections protection in concealed areas
2. Review mass timber connections in exposed connections
3. Review gypsum detailing per requirements of Section 3.2.2.2.
4. Smoke evacuation
5. Review testing provided by manufacturers for compliance with relevant standards

3.5 Peer Review [KJ17]

Qualifications and selection

For each project higher than 12 stories or 180', a Mass Timber Peer Review Panel (MTPRP) shall be convened. The MTPRP shall be a panel or a structural engineering firm with at least three (3) members with previous experience in relevant mass timber buildings.

The MTPRP shall be selected by the Building Official based on their qualifications applicable to the Mass Timber Peer Review of the project. The Building Official may request the opinion of the Project Sponsor and EOR on proposed SPRP members, with the Building Official making the final decision on the MTPROP membership.

The MTPRP shall bear no conflict of interest with respect to the project and shall not be part of the design team for the project.

The MTPRP provides their professional opinion to and acts under the instruction of the building official.

3.4.2 Review scope

To provide an independent, objective, technical review of those aspects of the building design that relate to the structural performance of the building according to the requirements and guidelines described on this building, and to advise Building Officials whether the design generally conforms to the intent of this documentation and other requirements set forth by the Building Official

Review structural calculations, under normal conditions and under a fire scenario; including the use of foreign codes, where applicable.

The MTPRP shall be convened as early in the structural design phase as practicable.

XXXXXXX [KJ18]

4. **Construction and Post-Occupancy**

Mass Timber construction to follow the general requirements of Type IV Construction, unless otherwise noted in this guide.

4.1 **During Construction**

Construction requirements per 2021 IFC 3303.5

Standpipes

Dual water supply

Non-combustible protection installed on levels 4 stories below the active mass timber construction

Required wall coverings shall be installed on levels 4 stories below the active mass timber construction.^[KJ19]

1. The Mass Timber Guidebook shall reference 2021 IFC 3303.5. To establish preliminary meeting to review planned measure and timeline for implementation throughout the course of the project. Outline regular meeting and inspection schedule. This may involve the inspection field staff and construction staff as it relates to Mass Timber construction.

- Should we include an inspection schedule, and would this be considered useful in the guidebook.

- Deviations and Field Modifications – Any substantial field modifications or deviations from the approved construction drawings should be reviewed with field inspector prior to implementation. (Example: structural modifications due to field variation – flange extension, component modification, etc.)

- If there are ~~substantial~~ field modifications from approved plan review the building construction, the initial plan review shall require a secondary plan review or AHJ plan reviewer (CBC chapter 361 JG) or delegated associate before implementation.

- We are not requiring anything beyond the current WI commercial building code.

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NFPA 33 – Mass Timber construction.^[KJ20]

4.2 **Special Inspections**

Mass timber special inspections

Follow the requirements of IBC 2021 (1705.5.3)...recommend including these requirements specifically in the guideline

Mass timber inspector qualification and selection

Previous experience in relevant mass timber buildings

Submit credentials to the city

Provide access to the plans prior the start of construction

Submit monthly reports to the city^[KJ21]

- Strongly recommend requiring special inspections for all mass timber projects, but specifically in accordance with the goals of the task force, for any project designed outside the parameters of the prescriptive code path shall require special inspections
 - o (Note: the only way we can require this in Wisconsin is as a condition of approval associated with a variance. Any project designed outside of the prescriptive path would require a variance as a path to approval.)

This Guidebook shall follow the requirements of IBC 2021 (1705.5.3) to recommend including these requirements specifically in the guideline.

In final document, DPD legal will have to reference table

Post Occupancy Inspection Guidance: Icc and American Wood Council.

Reference IBC and Fire Code. G7 ICC safety Guidelines for inspection. Wood construction in general

Currently adopt 2015. Recommendations for unique instances. Will have a variance for a new code, or agree to certain criteria.

Executive summary; 4 or more stories^[KJ22]

4.2 Post Occupancy

The owner shall ensure that required passive protection remains in place over the life of the building, section 701.6 of the IFC.^[KJ23]

DO WE WANT AN ADDITIONAL SECTION OF FIRE SAFETY?^[KJ24]

Standpipes – Do we need to define standpipes?

Dual water supply

Non-combustible protection installed on levels 4 stories below the active mass timber construction

Required wall coverings shall be installed on levels 4 stories below the active mass timber construction

I. **Closing Remarks**[KJ25]

