Ad Hoc Committee – Tall Wood Buildings
Structural Work Group
Draft Code Change Proposal
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The following is a draft code change proposal that has been developed by the Structural Work Group (WG) of the Ad Hoc Committee on Tall Wood Buildings (TWB). This draft proposal has been reviewed by the TWB Committee and is posted for information and comments. Please direct comments to the Chair of the WG: Matt Timmers at MTimmers@johnmartin.com>. **This is a draft only and is subject to change prior to submittal to cdpACCESS by the January 8, 2018 deadline.**

Section 1705.3 Wood Construction

Add new text as follows:

1705.5.3 Mass Timber Construction. *Special inspections* of *Mass Timber* construction in buildings, structures, or portions thereof greater than 85 feet above grade plane shall be in accordance with Table 1705.5.3.

TABLE 1705.5.3
REQUIRED SPECIAL INSPECTIONS OF MASS TIMBER CONSTRUCTION

Type	Continuous Special Inspection	Periodic Special Inspection
1. Inspection of anchorage and connections of mass timber construction to timber deep foundation systems.		X
2. Inspect erection and sequence of mass timber construction		X
3. Inspection of connections where installation methods are required to meet design loads		
a. Threaded fasteners		
1. Verify use of proper installation equipment.		X
2. Verify use of pre-drilled holes where required.		X
3. Inspect screws, including diameter, length, head type, spacing, installation angle, and depth.		X
b. Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads	X	
c. Bolted connections		X
d. Concealed connections		X

Section 1705.11.1 Structural Wood

Revise as follows:

1705.11.1 Structural wood. *Continuous special inspection* is required during field gluing operations of elements of the main windforce-resisting system. *Periodic special inspection* is required for nailing, bolting, anchoring and other fastening of elements of the main windforce-resisting system, including wood shear walls, wood diaphragms, drag struts, braces and hold-downs.

> **Exception:** *Special inspections* are not required for wood shear walls, shear panels and diaphragms, including nailing, bolting, anchoring and other fastening to other elements of the main windforce-resisting system, where the lateral resistance is provided by structural sheathing and the fastener spacing of the sheathing is more than 4 inches (102 mm) on center.

Section 1705.12.2 Structural Wood

Revise as follows:

1705.12.2 Structural wood. For the seismic force-resisting systems of structures assigned to *Seismic Design Category* C, D, E or F:

1. *Continuous special inspection* shall be required during field gluing operations of elements of the seismic force-resisting system.

2. *Periodic special inspection* shall be required for nailing, bolting, anchoring and other fastening of elements of the seismic force-resisting system, including wood shear walls, wood diaphragms, drag struts, braces, shear panels and hold-downs.

> **Exception:** *Special inspections* are not required for wood shear walls, shear panels and diaphragms, including nailing, bolting, anchoring and other fastening to other elements of the seismic force-resisting system, where the lateral resistance is provided by structural sheathing and the fastener spacing of the sheathing is more than 4 inches (102 mm) on center.

Reason: This proposal adds special inspection provisions to Section 1705 for mass timber. This new and unique type of construction requires a level of inspection consistent with other large buildings and unique applications where milestone inspections by the jurisdictional inspectors are not rigorous enough to ensure a level of quality control or quality assurance of the construction process. The proposed special inspections are similar to what is required for other prefabricated systems such as pre-cast concrete and structural steel.

Special Inspection is the monitoring of materials, installation, fabrication, erection and placement of components and connections that require special expertise that are critical to the integrity of the building structure. The special inspectors are required to ensure compliance with the approved

construction documents and referenced standards. The program allows jurisdictions to have access to highly specialized and trained inspectors. Some special inspection activities require construction activities to be continuously inspected; which would be logistically difficult for a typical building inspection program. Special inspection is a vital part of the compliance path for successful and compliant building projects constructed under the International Building Code.

The height trigger of 85 feet is intended to address buildings of Type IV-HT, where mass timber products may be used in the construction of Type IV-HT but would not require special inspection as the current codes apply for Type IV-HT construction. The height trigger would establish that taller mass timber buildings constructed of Type IV-A, IV-B, IV-C and only a very select set of buildings using mass timber products in Type IV-HT would require special inspections.

The specific elements requiring special inspection are:

1. Periodic inspection of the connection of mass timber elements to wood foundation elements. These connections are critical to transfer loads from the mass timber elements to the piles, particularly for lateral loading. The connections to concrete foundations are addressed in Table 1705.3, Item #3.
2. Periodic inspection of erection of mass timber elements. Similar to pre-cast concrete (Table 1705.3, Item #10), tall wood buildings utilizing pre- fabricated elements needs to have verification that the correct elements are placed in the right location in accordance with the design drawings.
3. Inspection of specialized connections.
    - Connections between mass timber products that utilized threaded, bolted, or concealed connections are considered periodic in a similar manner that concrete special inspections are required in Table 1705.3. The strength of many connection designs is predicated on specific screw lengths and installation angles. Bolted connections require specific diameters, and for lag bolts, specific lengths. Concealed connectors, many of which are proprietary, must be installed correctly for both structural and fire performance. Most of these cannot be verified by the jurisdictional inspector, so special inspections are required.
    - Adhesive anchorage installed in horizontal or upwardly inclined positions resisting tension loads shall be continuously inspected, again similar to Table 1705.3, Item 4a. This is required because of issues with creep of the adhesives under long-term tension loading discussed in previous code change cycles.

This code change also includes modifications to the exceptions in sections 1705.11.1 and 1705.12.2 to clarify that the exceptions to special inspections for wind and seismic resistance apply to shear walls, panels, and diaphragms sheathed as defined in NDS 2015 SDPWS. The exceptions should apply to traditional 2x framed elements or nail-laminated or dowel laminated diaphragms with sheathing; but not lateral force resisting systems relying solely on mass timber products for lateral resistance.

No changes are being proposed to address fabrication of mass timber structural elements. Mass timber structural assembled in a fabricator shop should be addressed by sections 1704.2.5 and 1704.2.5.1 of the current codes regarding fabrication

The Ad Hoc Committee for Tall Wood Buildings (AHC-TWB) was created by the ICC Board of Directors to explore the building science of tall wood buildings with the scope to investigate the feasibility of and take action on developing code changes for these buildings. Members of the AHC-TWB were appointed by the ICC Board of Directors. Since its creation in January, 2016, the AHC-TWB has held 6 open meetings and numerous Work Group conference calls. Four Work Groups were established to address over 80 issues and concerns and review over 60 code proposals for consideration by the AHC-TWB. Members of the Work Groups included AHC-TWB members and other interested parties. Related documentation and reports are posted on the AHC-TWB website at https://www.iccsafe.org/codes-tech-support/cs/icc-ad-hoc-committee-on-tall-wood-buildings/

Cost Impact:

Since all of the code proposals related to Mass Timber products are to address new types of building construction, in theory this will not increase the cost of construction, but rather provides design options not currently provided for in the code. The committee took great care to not change the requirements of the pre-existing construction types, and our changes do not increase the cost of construction using those pre-existing construction types. However, based on a typically residential or office building of typical floor plates an estimate of Special Inspection costs would range from $1,000 to $2,000 per floor. Another approach to the cost of special inspection is a percentage of total construction costs; for typical pre-fabricated construction elements the cost of special inspection can range between 0.15% to 0.30%, depending on labor cost and complexities of the construction in the building. These estimates are based on responses to surveys of special inspection agencies in the Seattle and Las Vegas areas.

