



Statewide Alternate Method No. 18-01 Tall Wood Buildings – Background

Statewide Alternate Method (SAM) Number 18-01 provides prescriptive path elements for Tall Wood Buildings of mass timber construction. This alternate path includes scientific conclusions established by the International Code Council’s Ad Hoc Committee on Tall Wood Buildings that were incorporated into fourteen national proposals and utilizes concrete, steel or masonry for the vertical elements of the seismic force-resisting system.

The provisions detailed in the SAM are crafted to coincide with the *2014 Oregon Structural Specialty Code* (OSSC) when selected for use.

Three new types of construction are introduced under this method, all three of which are organized under Type IV construction, typically referred to as heavy timber.

The new types of construction are:

- Type IV A
- Type IV B
- Type IV C

Prior to this document, heavy timber (wood) structures of this type were limited to six stories.

Major distinctions between these types of construction are found in the required fire-resistance rating of the structure and the protection specified, in terms of timber surface encapsulation.

Type IV A buildings with an automatic sprinkler system require 3-hour fire-resistance-rated primary structural frame elements and bearing walls, with 2-hour fire-resistance-rated floors. Exposed timber surfaces must be entirely encapsulated. For certain occupancies or uses, Type IV A buildings are permitted to achieve eighteen stories and 270 feet in building height.

Type IV B buildings with an automatic sprinkler system require 2-hour fire-resistance-rated primary structural frame elements and bearing walls, with 2-hour fire-resistance-rated floors. A calculated percentage of the exposed timber surfaces may remain exposed under this type, as established in Section 602.4.2.2.2 of the alternate. For certain occupancies or uses, Type IV B buildings are permitted to achieve twelve stories and 180 feet in building height.

Type IV C buildings with an automatic sprinkler system require 2-hour fire-resistance-rated primary structural frame elements and bearing walls, with 2-hour fire-resistance-rated floors. Exposed timber surfaces are permitted to remain entirely exposed under this type. For certain occupancies or uses, Type IV C buildings are permitted to achieve nine stories and 85 feet in building height.

Various additional increased safeguards, manufacturing specifications, material conditions and design configuration prescriptions are detailed in the alternate method.

This statewide alternate method intentionally reinforces the notion that the state building code is not a barrier to innovation or any method, technique or material of construction that is supported by scientific findings, while further preserving Oregon’s ability to serve as a single place to obtain statewide approval, providing a predictable regulatory system of business.



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Statewide Alternate Methods are approved by the Division administrator in consultation with the appropriate advisory board. The advisory board's review includes technical and scientific facts of the proposed alternate method. In addition:

- Building officials shall approve the use of any material, design or method of construction addressed in a statewide alternate method;
- The decision to use a statewide alternate method is at the discretion of the applicant; and
- Statewide alternate methods do not limit the authority of the building official to consider other proposed alternate methods encompassing the same subject matter.

Code edition: 2014 Oregon Structural Specialty Code (OSSC)

Date: Aug. 8, 2018

Subject: Tall wood buildings

Background:

In 2015 the International Code Council's (ICC) Board of Directors created an ad hoc committee to explore and investigate the scientific and technical merits of tall wood buildings. The purpose of this ad hoc committee, in part, was to determine if prescriptive codes for tall wood buildings were feasible to develop through scientific research procedures, modelling and rigorous testing. Establishing prescriptive code proposals, based on scientific findings, for consideration during the public 2021 International Building Code (IBC) promulgation process was the group's primary goal.

The ad hoc committee was named the ICC Ad Hoc Committee on Tall Wood Buildings (TWB) and was comprised of subject expert stakeholders from all facets of industry and regulatory organizations. Their complex efforts were conducted over several years, working towards the goal of prescriptive code proposal preparation. Ultimately, fourteen proposals were formed for the international code consideration body through a public event known as the Committee Action Hearing.

The Committee Action Hearing took place in April of 2018. All fourteen of the TWB proposals were either approved as submitted or approved as modified during the hearing, reinforcing the overwhelming scientific evidence for the codification of prescriptive allowances for this construction material and method. The provisions outlined herein align with the intent of those proposals approved at the Group A Committee Action Hearings.

In Oregon, numerous projects utilizing this method of construction had already been approved as the TWB Committee first began its endeavor. These projects were channeled to compliance approval through alternative methods and performance-based designs, since a prescriptive "deemed to comply" path did not exist. Oregon's statutory charge regarding application and enforcement of the state building code includes supporting the allowance for use of emerging innovative technologies and modern materials, methods or techniques that are substantiated by technical and scientific facts.

This statewide alternate method intentionally reinforces the notion that the state building code is not a barrier to innovation or any method, technique or material of construction that is supported by scientific findings, while further preserving Oregon's ability to lead the construction industry.

Discussion:

Alternate Methods:

In addressing alternate means and methods of construction, Oregon Revised Statute (ORS) 455.060 authorizes the Director of the Department of Consumer and Business Services to issue a ruling with respect to the acceptability of any material, design, or method of construction about which there is a question under any provision of the state building code. This alternate method ensures that local and state building officials have a clear path to allow, permit and adequately govern related designs.

Pursuant to ORS 455.020, the OSSC fosters encouragement of code officials to exercise local flexibility and innovation while still ensuring reasonable safeguards for occupants and users of buildings. The problem addressed by this alternate method is that the current OSSC leads the customer to an often long, arduous and costly path of requesting the consideration or acceptance of local alternate method proposals.

The state realizes that local building officials are often hesitant to rule on determination of minimum code equivalent compliance achieved through a proposed complex alternative design. This statewide alternate intends to provide prescriptive path elements for this method of construction to serve as a recognized linear compliance path for customers, industry and local government partners.

Conclusion:

Accordingly, the ICC Ad Hoc Committee on Tall Wood Buildings compilation of proposals, approved during the 2018 Group A Committee Action Hearing and as further modified by this document, serve as an effective prescriptive alternative subject to the following parameters:

1. Where this statewide alternate method does not specify a requirement or allowance, the existing provisions of the *2014 OSSC* shall apply.
2. The referenced American National Standard/American Plywood Association's Standard for Performance-Rated Cross-Laminated Timber (PRG-320) shall be the 2018 edition.
3. The vertical elements of the seismic force-resisting system selected for structures of Types IV A, IV B and IV C construction, as outlined in this statewide alternate, shall be of a type indicated in ASCE 7-10; limited to concrete, steel, masonry, or a combination thereof.
For example, a fully sprinkled Group R-2 structure design is permitted to be 18 stories and a maximum of 270 feet tall under Type IV A. See Table 503(a) for more details.
4. The design coefficients and factors for seismic force-resisting system mass timber elements provided in Statewide Alternate Method No. 15-01 (see Conclusion Section VIII) may be used for Type IV HT. Other values may be acceptable where justified by the *design professional* and *approved by the building official*.
For example, a fully sprinkled Group R-2 structure design is permitted to be 5 stories and a maximum of 85 feet tall under Type IV HT.
5. Use of the statewide alternate method is limited to those provisions outlined below in conjunction with the state building code. The provisions below effectively serve as amendments to the *2014 OSSC* under this method.

The technical and scientific facts for this Statewide Alternate Method are approved.

Signature on file

Mark Long, Administrator
Building Codes Division

Aug. 8, 2018

Date

CHAPTER 2 DEFINITIONS

CROSS-LAMINATED TIMBER. A prefabricated engineered wood product consisting of not less than three layers of solid-sawn lumber or structural composite lumber where the adjacent layers are cross oriented and bonded with structural adhesive to form a solid wood element.

MASS TIMBER. Structural elements of Type IV construction primarily of solid, built-up, panelized or engineered wood products that meet minimum cross section dimensions of Type IV construction.

NONCOMBUSTIBLE PROTECTION (FOR MASS TIMBER). Noncombustible material, in accordance with Section 703.5, designed to increase the fire-resistance rating and delay the combustion of mass timber.

WALL, LOAD-BEARING. Any wall meeting either of the following classifications:

1. Any metal or wood stud wall that supports more than 100 pounds per linear foot (1459 N/m) of vertical load in addition to its own weight.
2. Any masonry, ~~or~~ concrete, or mass timber wall that supports more than 200 pounds per linear foot (2919 N/m) of vertical load in addition to its own weight.

CHAPTER 4 SPECIAL DETAILED REQUIREMENTS BASED ON OCCUPANCY AND USE

403.3.2 Water supply to required fire pumps. In all buildings that are more than 420 feet (128 m) in building height, and buildings of Type IV A and IV B construction that are more than 120 feet in building height, required fire pumps shall be supplied by connections to not fewer than two water mains located in different streets. Separate supply piping shall be provided between each connection to the water main and the pumps. Each connection and the supply piping between the connection and the pumps shall be sized to supply the flow and pressure required for the pumps to operate.

Exception: Two connections to the same main shall be permitted provided that the main is valved such that an interruption can be isolated so that the water supply will continue without interruption through not fewer than one of the connections.

CHAPTER 5 GENERAL BUILDING HEIGHTS AND AREAS

Use modified Table 503(a) for Type IV A, B and C construction

**TABLE 503(a)
TYPE IV A, B & C CONSTRUCTION ALLOWABLE HEIGHTS, STORIES AND AREAS^{a,b,c}**

OCCUPANCY CLASSIFICATION	TYPE IV					
	A		B		C	
A-1	65'	NS	65'	NS	65'	NS
	270'	S	180'	S	85'	S
	3 stories	NS	3 stories	NS	3 stories	NS
	9 stories	S	6 stories	S	4 stories	S
	45,000 sq. ft.	NS	30,000 sq. ft.	NS	18,750 sq. ft.	NS
	180,000 sq. ft.	S	120,000 sq. ft.	S	75,000 sq. ft.	S
	135,000 sq. ft.	SM	90,000 sq. ft.	SM	56,250 sq. ft.	SM
A-2	65'	NS	65'	NS	65'	NS
	270'	S	180'	S	85'	S
	3 stories	NS	3 stories	NS	3 stories	NS
	18 stories	S	12 stories	S	6 stories	S
	45,000 sq. ft.	NS	30,000 sq. ft.	NS	18,750 sq. ft.	NS
	180,000 sq. ft.	S	120,000 sq. ft.	S	75,000 sq. ft.	S
	135,000 sq. ft.	SM	90,000 sq. ft.	SM	56,250 sq. ft.	SM

OCCUPANCY CLASSIFICATION	TYPE IV					
	A		B		C	
A-3	65'	NS	65'	NS	65'	NS
	270'	S	180'	S	85'	S
	3 stories	NS	3 stories	NS	3 stories	NS
	18 stories	S	12 stories	S	6 stories	S
	45,000 sq. ft.	NS	30,000 sq. ft.	NS	18,750 sq. ft.	NS
	180,000 sq. ft.	S	120,000 sq. ft.	S	75,000 sq. ft.	S
	135,000 sq. ft.	SM	90,000 sq. ft.	SM	56,250 sq. ft.	SM
A-4	65'	NS	65'	NS	65'	NS
	270'	S	180'	S	85'	S
	3 stories	NS	3 stories	NS	3 stories	NS
	18 stories	S	12 stories	S	6 stories	S
	45,000 sq. ft.	NS	30,000 sq. ft.	NS	18,750 sq. ft.	NS
	180,000 sq. ft.	S	120,000 sq. ft.	S	75,000 sq. ft.	S
	135,000 sq. ft.	SM	90,000 sq. ft.	SM	56,250 sq. ft.	SM
A-5	65'	NS	65'	NS	65'	NS
	270'	S	180'	S	85'	S
	1 story	NS	1 story	NS	1 story	NS
	UL stories	S	UL stories	S	UL stories	S
	UL Area sq. ft.		UL Area sq. ft.		UL Area sq. ft.	
B	65'	NS	65'	NS	65'	NS
	270'	S	180'	S	85'	S
	5 stories	NS	5 stories	NS	5 stories	NS
	18 stories	S	12 stories	S	9 stories	S
	108,000 sq. ft.	NS	72,000 sq. ft.	NS	45,000 sq. ft.	NS
	432,000 sq. ft.	S	288,000 sq. ft.	S	180,000 sq. ft.	S
	324,000 sq. ft.	SM	216,000 sq. ft.	SM	135,000 sq. ft.	SM
E	65'	NS	65'	NS	65'	NS
	270'	S	120'	S	85'	S
	3 stories	NS	3 stories	NS	3 stories	NS
	9 stories	S	6 stories	S	4 stories	S
	76,500 sq. ft.	NS	51,000 sq. ft.	NS	31,875 sq. ft.	NS
	306,000 sq. ft.	S	204,000 sq. ft.	S	127,500 sq. ft.	S
	229,500 sq. ft.	SM	153,000 sq. ft.	SM	95,625 sq. ft.	SM
F-1	65'	NS	65'	NS	65'	NS
	270'	S	120'	S	85'	S
	3 stories	NS	3 stories	NS	3 stories	NS
	10 stories	S	7 stories	S	5 stories	S
	100,500 sq. ft.	NS	67,000 sq. ft.	NS	41,875 sq. ft.	NS
	402,000 sq. ft.	S	268,000 sq. ft.	S	167,500 sq. ft.	S
	301,500 sq. ft.	SM	201,000 sq. ft.	SM	125,625 sq. ft.	SM
F-2	65'	NS	65'	NS	65'	NS
	270'	S	180'	S	85'	S
	5 stories	NS	5 stories	NS	5 stories	NS
	12 stories	S	8 stories	S	6 stories	S
	151,000 sq. ft.	NS	101,000 sq. ft.	NS	63,125 sq. ft.	NS
	606,000 sq. ft.	S	404,000 sq. ft.	S	252,500 sq. ft.	S
	454,500 sq. ft.	SM	303,000 sq. ft.	SM	189,375 sq. ft.	SM
H-1	120'	S	90'	S	65'	S
	1 story	S	1 story	S	1 story	S
	10,500 sq. ft.	S	10,500 sq. ft.	S	10,500 sq. ft.	S
H-2	120'	S	90'	S	65'	S
	2 stories	S	2 stories	S	2 stories	S
	10,500 sq. ft.	S	10,500 sq. ft.	S	10,500 sq. ft.	S
H-3	120'	S	90'	S	65'	S
	4 stories	S	4 stories	S	4 stories	S
	25,500 sq. ft.	S	25,500 sq. ft.	S	25,500 sq. ft.	S
H-4	140'	S	100'	S	85'	S
	8 stories	S	7 stories	S	6 stories	S
	288,000 sq. ft.	S	216,000 sq. ft.	S	162,000 sq. ft.	S
	216,000 sq. ft.	SM	162,000 sq. ft.	SM	121,500 sq. ft.	SM
H-5	120'	S	90'	S	65'	S
	3 stories	S	3 stories	S	3 stories	S
	288,000 sq. ft.	S	216,000 sq. ft.	S	162,000 sq. ft.	S
	216,000 sq. ft.	SM	162,000 sq. ft.	SM	121,500 sq. ft.	SM

OCCUPANCY CLASSIFICATION	TYPE IV					
	A		B		C	
I-1 Condition 1	65'	(13R)	65'	(13R)	65'	(13R)
	180'	S	120'	S	85'	S
	4 stories	(13R)	4 stories	(13R)	4 stories	(13R)
	10 stories	S	7 stories	S	5 stories	S
	54,000 sq. ft.	(13R)	36,000 sq. ft.	(13R)	18,000 sq. ft.	(13R)
	216,000 sq. ft.	S	144,000 sq. ft.	S	72,000 sq. ft.	S
	162,000 sq. ft.	SM	108,000 sq. ft.	SM	54,000 sq. ft.	SM
I-1 Condition 2	65'	S	65'	S	65'	S
	10 stories	S	6 stories	S	4 stories	S
	216,000 sq. ft.	S	144,000 sq. ft.	S	72,000 sq. ft.	S
	162,000 sq. ft.	SM	108,000 sq. ft.	SM	54,000 sq. ft.	SM
I-2	65'	S	65'	S	65'	S
	7 stories	S	5 stories	S	1 story	S
	144,000 sq. ft.	S	96,000 sq. ft.	S	48,000 sq. ft.	S
	108,000 sq. ft.	SM	72,000 sq. ft.	SM	36,000 sq. ft.	SM
I-3	180'	S	120'	S	85'	S
	7 stories	S	5 stories	S	3 stories	S
	144,000 sq. ft.	S	96,000 sq. ft.	S	48,000 sq. ft.	S
	108,000 sq. ft.	SM	72,000 sq. ft.	SM	36,000 sq. ft.	SM
I-4	65'	NS	65'	NS	65'	NS
	180'	S	120'	S	85'	S
	3 stories	NS	3 stories	NS	3 stories	NS
	9 stories	S	6 stories	S	4 stories	S
	76,500 sq. ft.	NS	51,000 sq. ft.	NS	25,500 sq. ft.	NS
	306,000 sq. ft.	S	204,000 sq. ft.	S	102,000 sq. ft.	S
	229,500 sq. ft.	SM	153,000 sq. ft.	SM	76,500 sq. ft.	SM
M	65'	NS	65'	NS	65'	NS
	270'	S	180'	S	85'	S
	4 stories	NS	4 stories	NS	4 stories	NS
	12 stories	S	8 stories	S	6 stories	S
	61,500 sq. ft.	NS	41,000 sq. ft.	NS	25,625 sq. ft.	NS
	246,000 sq. ft.	S	164,000 sq. ft.	S	102,500 sq. ft.	S
	184,500 sq. ft.	SM	123,000 sq. ft.	SM	76,875 sq. ft.	SM
R-1, R-2, R-4	65'	(13R)	65'	(13R)	65'	(13R)
	270'	S	180'	S	85'	S
	4 stories	(13R)	4 stories	(13R)	4 stories	(13R)
	18 stories	S	12 stories	S	8 stories	S
	61,500 sq. ft.	(13R)	41,000 sq. ft.	(13R)	(R-4 = 5 stories)	S
	246,000 sq. ft.	S	164,000 sq. ft.	S	25,625 sq. ft.	(13R)
	184,500 sq. ft.	SM	123,000 sq. ft.	SM	102,500 sq. ft.	S
					76,875 sq. ft.	SM
R-3	65'	(13D)	65'	(13D)	65'	(13D)
	270'	S	180'	S	85'	S
	4 stories	(13D)	4 stories	(13D)	4 stories	(13D)
	18 stories	S	12 stories	S	5 stories	S
	UL Area sq. ft.	(13D)	UL Area sq. ft.	(13D)	UL Area sq. ft.	(13D)
S-1	65'	NS	65'	NS	65'	NS
	270'	S	180'	S	85'	S
	4 stories	NS	4 stories	NS	4 stories	NS
	10 stories	S	7 stories	S	5 stories	S
	76,500 sq. ft.	NS	51,000 sq. ft.	NS	31,875 sq. ft.	NS
	306,000 sq. ft.	S	204,000 sq. ft.	S	127,500 sq. ft.	S
	229,500 sq. ft.	SM	153,000 sq. ft.	SM	95,625 sq. ft.	SM
S-2, S-3	65'	NS	65'	NS	65'	NS
	270'	S	180'	S	85'	S
	4 stories	NS	4 stories	NS	4 stories	NS
	12 stories	S	8 stories	S	5 stories	S
	115,500 sq. ft.	NS	77,000 sq. ft.	NS	48,125 sq. ft.	NS
	462,000 sq. ft.	S	308,000 sq. ft.	S	192,500 sq. ft.	S
	346,500 sq. ft.	SM	231,000 sq. ft.	SM	144,375 sq. ft.	SM
U	65'	NS	65'	NS	65'	NS
	270'	S	180'	S	85'	S
	4 stories	NS	4 stories	NS	4 stories	NS
	9 stories	S	6 stories	S	5 stories	S
	54,000 sq. ft.	NS	36,000 sq. ft.	NS	22,500 sq. ft.	NS
	216,000 sq. ft.	S	144,000 sq. ft.	S	90,000 sq. ft.	S
	162,000 sq. ft.	SM	108,000 sq. ft.	SM	67,500 sq. ft.	SM

- UL = Unlimited;
- S = Buildings equipped throughout with an NFPA 13 *automatic sprinkler system*;
- NS = Buildings not equipped throughout with an NFPA 13 *automatic sprinkler system*;
- S1 = Buildings a maximum of one story above grade plane equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1;
- SM = Buildings two or more stories above grade plane equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1;
- 13R = Buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.2;
- 13D = Buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.3.
- a. See Chapters 4 and 5 for specific exceptions to the allowable height in this chapter.
 - b. See Section 903.2 for the minimum thresholds for protection by an *automatic sprinkler system* for specific occupancies.
 - c. 2018 IBC Section 506 shall be used for any possible allowable area increases to the tabular values.

508.4.4 Separation...

508.4.4.1 Construction. Required separations shall be *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both, so as to completely separate adjacent occupancies. *Mass timber* elements serving as *fire barriers* or *horizontal assemblies* to separate occupancies in Type IV B or IV C construction shall be separated from the interior of the building with an approved thermal barrier consisting of a minimum of ½ inch (12.7 mm) gypsum board or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.

509.4.1 Separation...

509.4.1.1 Type IV B and IV C construction. Where Table 509 specifies a fire-resistance-rated separation, *mass timber* elements serving as *fire barriers* or a *horizontal assembly* in Type IV B or IV C construction shall be separated from the interior of the incidental use with an approved thermal barrier consisting of a minimum of ½ inch (12.7 mm) gypsum board or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.

CHAPTER 6 TYPES OF CONSTRUCTION

Strike 2014 OSSC Section 602.4 (including subsections) and replace with the following:

602.4 Type IV. Type IV construction is that type of construction in which the building elements are *mass timber* or noncombustible materials and have *fire-resistance ratings* in accordance with Table 601. *Mass timber* elements shall meet the *fire-resistance rating* requirements of this section based on either the *fire-resistance rating* of the *noncombustible protection*, the *mass timber*, or a combination of both and shall be determined in accordance with Section 703.2 or 703.3. The minimum dimensions and permitted materials for building elements shall comply with the provisions of this section and Section 2304.10. *Mass timber* elements of Types IV A, IV B and IV C construction shall be protected with *noncombustible protection* applied directly to the *mass timber* in accordance with Sections 602.4.1 through 602.4.3. The time assigned to the *noncombustible protection* shall be determined in accordance with Section 703.8 and comply with Section 722.7.

Cross-laminated timber shall be labeled as conforming to PRG 320-18 as referenced in Section 2303.1.12.

Exterior *load-bearing walls* and *nonload-bearing walls* shall be *mass timber* construction, or shall be of noncombustible construction.

Exception: Exterior *load-bearing walls* and *nonload-bearing walls* of Type IV HT construction in accordance with Section 602.4.4.

The interior building elements, including *nonload-bearing walls* and partitions, shall be of *mass timber* construction or of noncombustible construction.

Exception: Interior building elements and *nonload-bearing walls* and partitions of Type IV HT construction in accordance with Section 602.4.4.

Combustible concealed spaces are not permitted except as otherwise indicated in Sections 602.4.1 through 602.4.4. Combustible stud spaces within light frame walls of Type IV HT construction shall not be

considered concealed spaces, but shall comply with Section 718. In buildings of Type IV A, B, and C, construction with an occupied floor located more than 75 feet above the lowest level of fire department access, up to and including 12 stories or 180 feet above grade plane, mass timber interior exit and elevator hoistway enclosures shall be protected in accordance with Section 602.4.1.2. In buildings greater than 12 stories or 180 feet above grade plane, interior exit and elevator hoistway enclosures shall be constructed of non-combustible materials.

602.4.1 Type IV A. Building elements in Type IV A construction shall be protected in accordance with Sections 602.4.1.1 through 602.4.1.6. The required fire-resistance rating of noncombustible elements and protected mass timber elements shall be determined in accordance with Section 703.2 or Section 703.3.

602.4.1.1 Exterior protection. The outside face of exterior walls of mass timber construction shall be protected with noncombustible protection with a minimum assigned time of 40 minutes as determined in Section 722.7.1(1). All components of the exterior wall covering, shall be of noncombustible material except water resistive barriers having a peak heat release rate of less than 150kW/m², a total heat release of less than 20 MJ/m² and an effective heat of combustion of less than 18MJ/kg as determined in accordance with ASTM E1354 and having a flame spread index of 25 or less and a smoke-developed index of 450 or less as determined in accordance with ASTM E84 or UL 723. The ASTM E1354 test shall be conducted on specimens at the thickness intended for use, in the horizontal orientation and at an incident radiant heat flux of 50 kW/m².

602.4.1.2 Interior protection. Interior faces of all mass timber elements, including the inside faces of exterior mass timber walls and mass timber roofs, shall be protected with materials complying with Section 703.5.

602.4.1.2.1 Protection time. Noncombustible protection shall contribute a time equal to or greater than times assigned in Table 722.7.1(1), but not less than 80 minutes. The use of materials and their respective protection contributions listed in Table 722.7.1(2) shall be permitted to be used for compliance with Section 722.7.1.

602.4.1.3 Floors. The floor assembly shall contain a noncombustible material not less than one inch in thickness above the mass timber. Floor finishes in accordance with Section 804 shall be permitted on top of the noncombustible material. The underside of floor assemblies shall be protected in accordance with 602.4.1.2.

602.4.1.4 Roofs. The interior surfaces of roof assemblies shall be protected in accordance with Section 602.4.1.2. Roof coverings in accordance with Chapter 15 shall be permitted on the outside surface of the roof assembly.

602.4.1.5 Concealed spaces. Concealed spaces shall not contain combustibles other than electrical, mechanical, fire protection, or plumbing materials and equipment permitted in plenums in accordance with Section 602 of the Mechanical Code, and shall comply with all applicable provisions of Section 718. Combustible construction forming concealed spaces shall be protected in accordance with Sections 602.4.1.2.

602.4.1.6 Shafts. Shafts shall be permitted in accordance with Sections 713 and Section 718. Both the shaft side and room side of mass timber elements shall be protected in accordance with Section 602.4.1.2.

602.4.2 Type IV B. Building elements in Type IV B construction shall be protected in accordance with Sections 602.4.2.1 through 602.4.2.6. The required fire-resistance rating of noncombustible elements or mass timber elements shall be determined in accordance with Section 703.2 or Section 703.3.

602.4.2.1 Exterior protection. The outside face of exterior walls of mass timber construction shall be protected with noncombustible protection with a minimum assigned time of 40 minutes as determined in Section 722.7.1(1). All components of the exterior wall covering shall be of noncombustible material except water-resistive barriers having a peak heat release rate of less than 150kW/m², a total heat release of less than 20 MJ/m² and an effective heat of combustion of less than 18 MJ/kg as

determined in accordance with ASTM E1354, and having a flame spread index of 25 or less and a smoke-developed index of 450 or less as determined in accordance with ASTM E84 or UL 723. The ASTM E1354 test shall be conducted on specimens at the thickness intended for use, in the horizontal orientation and at an incident radiant heat flux of 50 kW/m².

602.4.2.2 Interior protection. Interior faces of all *mass timber* elements, including the inside face of exterior *mass timber* walls and *mass timber* roofs, shall be protected, as required by this section, with materials complying with Section 703.5.

602.4.2.2.1 Protection time. *Noncombustible protection* shall contribute a time equal to or greater than times assigned in Table 722.7.1(1), but not less than 80 minutes. The use of materials and their respective protection contributions listed in Table 722.7.1(2) shall be permitted to be used for compliance with Section 722.7.1.

602.4.2.2.2 Protected area. All interior faces of all *mass timber* elements shall be protected in accordance with Section 602.4.2.2.1, including the inside face of exterior *mass timber* walls and *mass timber* roofs.

Exceptions: Unprotected portions of *mass timber* ceilings and walls complying with Section 602.4.2.2.4 and the following:

1. Unprotected portions of *mass timber* ceilings, including attached beams, shall be permitted and shall be limited to an area equal to 20 percent of the floor area in any dwelling unit or fire area; or
2. Unprotected portions of *mass timber* walls, including attached columns, shall be permitted and shall be limited to an area equal to 40 percent of the floor area in any dwelling unit or fire area; or
3. Unprotected portions of both walls and ceilings of *mass timber*, including attached columns and beams, in any dwelling unit or fire area shall be permitted in accordance with Section 602.4.2.2.3.
4. *Mass timber* columns and beams which are not an integral portion of walls or ceilings, respectively, shall be permitted to be unprotected without restriction of either aggregate area or separation from one another.

602.4.2.2.3 Mixed unprotected areas. In each *dwelling unit* or fire area, where both portions of ceilings and portions of walls are unprotected, the total allowable unprotected area shall be determined in accordance with Equation 6-1.

$$(U_{tc}/U_{ac}) + (U_{tw}/U_{aw}) \leq 1$$

(Equation 6-1)

where:

U_{tc} = Total unprotected mass timber ceiling areas

U_{ac} = Allowable unprotected mass timber ceiling area conforming to Section 602.4.2.2.2, Exception 1

U_{tw} = Total unprotected mass timber wall areas

U_{aw} = Allowable unprotected mass timber wall area conforming to Section 602.4.2.2.2, Exception 2

602.4.2.2.4 Separation distance between unprotected mass timber elements. In each *dwelling unit* or fire area, unprotected portions of *mass timber* walls and ceilings shall be not less than 15 feet from unprotected portions of other walls and ceilings, measured horizontally along the ceiling and from other unprotected portions of walls measured horizontally along the floor.

602.4.2.3 Floors. The floor assembly shall contain a noncombustible material not less than one inch in thickness above the *mass timber*. Floor finishes in accordance with Section 804 shall be permitted on top of the noncombustible material. The underside of floor assemblies shall be protected in accordance with Section 602.4.1.2.

602.4.2.4 Roofs. The interior surfaces of roof assemblies shall be protected in accordance with 602.4.2.2 except, in nonoccupiable spaces, they shall be treated as a concealed space with no portion left unprotected. Roof coverings in accordance with Chapter 15 shall be permitted on the outside surface of the roof assembly.

602.4.2.5 Concealed spaces. Concealed spaces shall not contain combustibles other than electrical, mechanical, fire protection, or plumbing materials and equipment permitted in plenums in accordance with Section 602 of the *Mechanical Code*, and shall comply with all applicable provisions of Section 718. Combustible construction forming concealed spaces shall be protected in accordance with Section 602.4.1.2.

602.4.2.6 Shafts. Shafts shall be permitted in accordance with Section 713 and Section 718. Both the shaft side and room side of *mass timber* elements shall be protected in accordance with Section 602.4.1.2.

602.4.3 Type IV C. Building elements in Type IV C construction shall be protected in accordance with Sections 602.4.3.1 through 602.4.3.6. The required *fire-resistance rating* of building elements shall be determined in accordance with Section 703.2 or Section 703.3.

602.4.3.1 Exterior protection. The exterior side of walls of combustible construction shall be protected with *noncombustible protection* with a minimum assigned time of 40 minutes as determined in Section 722.7.1(1). All components of the exterior wall covering, shall be of noncombustible material except water resistive barriers having a peak heat release rate of less than 150 kW/m², a total heat release of less than 20 MJ/m² and an effective heat of combustion of less than 18 MJ/kg as determined in accordance with ASTM E1354 and having a flame spread index of 25 or less and a smoke-developed index of 450 or less as determined in accordance with ASTM E84 or UL 723. The ASTM E1354 test shall be conducted on specimens at the thickness intended for use, in the horizontal orientation and at an incident radiant heat flux of 50 kW/m².

602.4.3.2 Interior protection. *Mass timber* elements are permitted to be unprotected.

602.4.3.3 Floors. Floor finishes in accordance with Section 804 shall be permitted on top of the floor construction.

602.4.3.4 Roofs. Roof coverings in accordance with Chapter 15 shall be permitted on the outside surface of the roof assembly.

602.4.3.5 Concealed spaces. Concealed spaces shall not contain combustibles other than electrical, mechanical, fire protection, or plumbing materials and equipment permitted in plenums in accordance with Section 602 of the *Mechanical Code*, and shall comply with all applicable provisions of Section 718. Combustible construction forming concealed spaces shall be protected with *noncombustible protection* with a minimum assigned time of 40 minutes as determined in Section 722.7.1(1).

602.4.3.6 Shafts. Shafts shall be permitted in accordance with Section 713 and Section 718. Shafts, elevator hoistways and *interior exit stairway* enclosures shall be protected with *noncombustible protection* with a minimum assigned time of 40 minutes as determined in Section 722.7.1(1), on both the inside of the shaft and the outside of the shaft.

602.4.4 Type IV HT. Type IV construction (Heavy Timber, HT) is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of solid wood, laminated heavy timber or structural composite lumber (SCL), without concealed spaces. The minimum dimensions for permitted materials including solid timber, glued-laminated timber, structural composite lumber (SCL) and cross laminated timber (CLT) and details of Type IV construction shall comply with the provisions of this section and Section 2304.10. Exterior walls complying with Section 602.4.4.1 or 602.4.4.2 shall be permitted. Interior walls and partitions not less than one-hour *fire-resistance rating* or heavy timber conforming with Section 2304.10.2.2 shall be permitted.

602.4.4.1 Fire-retardant-treated wood in exterior walls. Fire-retardant-treated wood framing and sheathing complying with Section 2303.2 shall be permitted within exterior wall assemblies not less than 6 inches (152 mm) in thickness with a 2-hour rating or less.

602.4.4.2 Cross-laminated timber in exterior walls. *Cross-laminated timber* complying with Section 2303.1.12 shall be permitted within exterior wall assemblies not less than 6 inches (152 mm) in thickness with a 2-hour rating or less, provided the exterior surface of the *cross-laminated timber* is protected by one the following:

1. Fire-retardant-treated wood sheathing complying with Section 2303.2 and not less than $\frac{15}{32}$ inch (12 mm) thick;
2. Gypsum board not less than $\frac{1}{2}$ inch (12.7 mm) thick; or
3. A noncombustible material.

602.4.4.3 Exterior structural members. Where a horizontal separation of 20 feet (6096 mm) or more is provided, wood columns and arches conforming to heavy timber sizes complying with Section 2304.10 shall be permitted to be used externally.

**TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)**

BUILDING ELEMENT	TYPE IV			
	<u>A</u>	<u>B</u>	<u>C</u>	<u>HT</u>
Primary structural frame ^e	<u>3^a</u>	<u>2^a</u>	<u>2^a</u>	HT
Bearing walls				
Exterior ^{f,g}	<u>3</u>	<u>2</u>	<u>2</u>	2
Interior	<u>3</u>	<u>2</u>	<u>2</u>	1/HT
Nonbearing walls and partitions Exterior	See Table 602			
Nonbearing walls and partitions Interior ^a	<u>0</u>	<u>0</u>	<u>0</u>	See Section 2304.10.2
Floor construction and associated secondary members (see Section 202)	<u>2</u>	<u>2</u>	<u>2</u>	HT
Roof construction and associated secondary members (see Section 202)	<u>1.5</u>	<u>1</u>	<u>1</u>	HT

For SI: 1 foot = 304.8 mm.

- a. Roof supports: *Fire-resistance ratings* of primary structural frame and bearing walls are permitted to be reduced by 1 hour where supporting a roof only. This reduction is not applicable to roofs supporting rooftop structures governed by Section 1509, roof gardens and landscaped roofs.
- b. Except in Group F-1, H, M and S-1 occupancies, fire protection of structural members shall not be required, including protection of roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below. Fire-retardant-treated wood members shall be allowed to be used for such unprotected members.
- c. In all occupancies, heavy timber shall be allowed where a 1-hour or less *fire-resistance rating* is required.
- d. An approved *automatic sprinkler system* in accordance with Section 903.3.1.1 shall be allowed to be substituted for 1-hour fire-resistance-rated construction, provided such system is not otherwise required by other provisions of the code or used for an allowable area increase in accordance with Section 506.3 or an allowable height increase in accordance with Section 504.2. The 1-hour substitution for the fire resistance of exterior walls shall not be permitted.
- e. Not less than the *fire-resistance rating* required by other sections of this code.
- f. Not less than the *fire-resistance rating* based on fire separation distance (see Table 602).
- g. Not less than the *fire-resistance rating* as referenced in Section 704.10.

**TABLE 602
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE
SEPARATION DISTANCE^{a, e, h}**

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H ^f	OCCUPANCY GROUP F-1, M, S-1 ^g	OCCUPANCY GROUP A, B, E, F-2, I, R, S-2 ^g , S-3 ^g , U ^b
X < 5 ^c	All	3	2	1
5 ≤ X < 10	I A, IV A	3	2	1
	Others	2	1	1
10 ≤ X < 30	I A, I B, IV A, IV B	2	1	1 ^d
	II B, V B	1	0	0
	Others	1	1	1 ^d
X ≥ 30	All	0	0	0

For SI: 1 foot = 304.8 mm.

- a. Load-bearing exterior walls shall also comply with the *fire-resistance rating* requirements of Table 601.
- b. For special requirements for Group U occupancies, see Section 406.3.
- c. See Section 706.1.1 for party walls.
- d. Open parking garages complying with Section 406 shall not be required to have a *fire-resistance rating*.
- e. The *fire-resistance rating* of an exterior wall is determined based upon the fire separation distance of the exterior wall and the story in which the wall is located.
- f. For special requirements for Group H occupancies, see Section 415.5.
- g. For special requirements for Group S aircraft hangars, see Section 412.4.1.
- h. Where Table 705.8 permits nonbearing exterior walls with unlimited area of unprotected openings, the required *fire-resistance rating* for the exterior walls is 0 hours.

CHAPTER 7 FIRE AND SMOKE PROTECTION FEATURES

703.8 Determination of noncombustible protection time contribution. The time, in minutes, contributed to the fire-resistance rating by the noncombustible protection of mass timber building elements, components, or assemblies, shall be established through a comparison of assemblies tested using procedures set forth in ASTM E119 or UL 263. The test assemblies shall be identical in construction, loading, and materials, other than the noncombustible protection. The two test assemblies shall be tested to the same criteria of structural failure.

1. Test Assembly 1 shall be without protection.
2. Test Assembly 2 shall include the representative noncombustible protection. The protection shall be fully defined in terms of configuration details, attachment details, joint sealing details, accessories and all other relevant details.

The noncombustible protection time contribution shall be determined by subtracting the fire resistance time, in minutes, of Test Assembly 1 from the fire resistance time, in minutes, of Test Assembly 2.

703.9 Sealing of adjacent mass timber elements. In buildings of Type IV A, IV B, and IV C construction, sealant or adhesive shall be provided to resist the passage of air in the following locations:

1. At abutting edges and intersections of mass timber building elements required to be fire-resistance-rated.
2. At abutting intersections of mass timber building elements and building elements of other materials where both are required to be fire resistance-rated.

Sealants shall meet the requirements of ASTM C920. Adhesives shall meet the requirements of ASTM D3498.

Exception: Where sealant or adhesive is not a required component of a fire resistance-rated assembly.

718.2 Fireblocking...

718.2.1 Fireblocking materials. Fireblocking shall consist of the following materials:

1. Two-inch (51 mm) nominal lumber.
2. Two thicknesses of 1-inch (25 mm) nominal lumber with broken lap joints.
3. One thickness of 0.719-inch (18.3 mm) wood structural panels with joints backed by 0.719-inch (18.3 mm) wood structural panels.
4. One thickness of 0.75-inch (19.1 mm) particleboard with joints backed by 0.75-inch (19 mm) particleboard.
5. One-half-inch (12.7 mm) gypsum board.
6. One-fourth-inch (6.4 mm) cement-based millboard.
7. Batts or blankets of mineral wool, mineral fiber or other approved materials installed in such a manner as to be securely retained in place.
8. Cellulose insulation installed as tested for the specific application.
9. Mass timber complying with Section 2304.10.

722.7 Fire-resistance rating of mass timber. The required fire resistance of mass timber elements in Section 602.4 shall be determined in accordance with Section 703.2 or Section 703.3. The fire-resistance rating of building elements shall be as required in Tables 601 and 602 and as specified elsewhere in this code. The fire-resistance rating of the mass timber elements shall consist of the fire resistance of the unprotected element added to the protection time of the noncombustible protection.

722.7.1 Minimum required protection. Where required by Sections 602.4.1 through 602.4.3, noncombustible protection shall be provided for mass timber building elements in accordance with Table 722.7.1(1). The rating, in minutes, contributed by the noncombustible protection of mass timber building elements, components, or assemblies, shall be established in accordance with Section 703.8. The protection contributions indicated in Table 722.7.1(2) shall be deemed to comply with this requirement when installed and fastened in accordance with Section 722.7.2.

TABLE 722.7.1(1)
PROTECTION REQUIRED FROM NONCOMBUSTIBLE COVERING MATERIAL

<u>REQUIRED FIRE-RESISTANCE RATING OF BUILDING ELEMENT PER TABLES 601 AND 602 (hours)</u>	<u>MINIMUM PROTECTION REQUIRED FROM NONCOMBUSTIBLE PROTECTION (minutes)</u>
<u>1</u>	<u>40</u>
<u>2</u>	<u>80</u>
<u>3 or more</u>	<u>120</u>

TABLE 722.7.1(2)
PROTECTION REQUIRED FROM NONCOMBUSTIBLE COVERING MATERIAL

<u>NONCOMBUSTIBLE PROTECTION</u>	<u>PROTECTION CONTRIBUTION (minutes)</u>
<u>1/2-inch Type X Gypsum Board</u>	<u>25</u>
<u>5/8-inch Type X Gypsum Board</u>	<u>40</u>

722.7.2 Installation of gypsum board noncombustible protection. Gypsum board complying with Table 722.7.1(2) shall be installed in accordance with this section.

722.7.2.1 Interior surfaces. Layers of Type X gypsum board serving as *noncombustible protection* for interior surfaces of wall and ceiling assemblies determined in accordance with Table 722.7.1(1) shall be installed in accordance with the following:

1. Each layer shall be attached with Type S drywall screws of sufficient length to penetrate the mass timber at least 1 inch when driven flush with the paper surface of the gypsum board.
Exception: The third layer, where determined necessary by Section 722.7, shall be permitted to be attached with 1-inch #6 Type S drywall screws to furring channels in accordance with ASTM C645.
2. Screws for attaching the base layer shall be 12 inches on center in both directions.
3. Screws for each layer after the base layer shall be 12 inches on center in both directions and offset from the screws of the previous layers by 4 inches in both directions.
4. All panel edges of any layer shall be offset 18 inches from those of the previous layer.
5. All panel edges shall be attached with screws sized and offset as in items 1 through 4 above and placed at least 1-inch but not more than 2 inches from the panel edge.
6. All panels installed at wall-to-ceiling intersections shall be installed such that ceiling panels are installed first and the wall panels are installed after the ceiling panel has been installed and is fitted tight to the ceiling panel. Where multiple layers are required, each layer shall repeat this process.
7. All panels installed at a wall-to-wall intersection shall be installed such that the panels covering an exterior wall or a wall with a greater fire resistance rating shall be installed first and the panels covering the other wall shall be fitted tight to the panel covering the first wall. Where multiple layers are required, each layer shall repeat this process.
8. Panel edges of the face layer shall be taped and finished with joint compound. Fastener heads shall be covered with joint compound.
9. Panel edges protecting *mass timber* elements adjacent to unprotected *mass timber* elements in accordance with Section 602.4.2.2 shall be covered with 1¼ inch metal corner bead and finished with joint compound.

722.7.2.2 Exterior surfaces. Layers of Type X gypsum board serving as *noncombustible protection* for the outside of the exterior heavy timber walls determined in accordance with Table 722.7.1(1) shall be fastened 12 inches on center each way and 6 inches on center at all joints or ends. All panel edges shall be attached with fasteners located at least 1-inch but not more than 2 inches from the panel edge. Fasteners shall comply with one of the following:

1. Galvanized nails of minimum 12 Gage with a 7/16-inch head of sufficient length to penetrate the *mass timber* a minimum of 1 inch.
2. Screws which comply with ASTM C1002 (Type S, Type W, or Type G) of sufficient length to penetrate the *mass timber* a minimum of 1 inch.

CHAPTER 8 INTERIOR FINISHES

803.3 Heavy timber exemption. Exposed portions of building elements complying with the requirements for buildings of heavy timber construction in Section 602.4 or Section 2304.10 shall not be subject to interior finish requirements except in interior exit stairways, interior *exit* ramps, and *exit* passageways.

803.11 Application of interior finish materials to fire-resistance-rated or noncombustible building elements...

803.11.3 Heavy timber construction. Wall and ceiling finishes of all classes as permitted in this chapter that are installed directly against the wood decking or planking of heavy timber construction in Section 602.4 or 2304.10 or to wood furring strips applied directly to the wood decking or planking shall be fireblocked as specified in Section 803.11.1.1.

CHAPTER 15 ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

1509.2.5 Type of construction. Penthouses shall be constructed with walls, floors and roofs as required for the type of construction of the building on which such penthouses are built.

Exceptions: (*1 & 2 remain unchanged*)

3. On buildings of Type III, IV or V construction, the exterior walls of penthouses with a fire separation distance greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour *fire-resistance rating* or a lesser *fire-resistance rating* as required by Table 602. On buildings of Type III, IV or V A construction, the exterior walls of penthouses with a fire separation distance of 20 feet (6096 mm) or greater shall be permitted to be of heavy timber construction complying with Sections 602.4 and 2304.10 or noncombustible construction or fire-retardant-treated wood and shall not be required to have a *fire-resistance rating*.

CHAPTER 16 STRUCTURAL DESIGN

1604.11 Seismic systems of Types IV A, B, C and HT. The vertical elements of the seismic force-resisting system for structures of Types IV A, IV B, and IV C shall conform to one of the types indicated in ASCE 7-10 Table 12.2-1 or a combination of systems as permitted in ASCE 7-10 Sections 12.2.2, 12.2.3, and 12.2.4. Use of seismic force-resisting systems not contained in ASCE 7-10 Table 12.2-1 shall be permitted contingent on submittal to and approval by the *building official* and independent structural design review of an accompanying set of design criteria and substantiating analytical and test data as outlined in ASCE 7-10 Section 12.2.1. Structures of Type IV HT may be designed in accordance with Oregon Statewide Alternate Method 15-01.

CHAPTER 17 SPECIAL INSPECTIONS AND TESTS

1705.19 Sealing of mass timber. Periodic special inspections of sealants or adhesives shall be conducted where sealant or adhesive required by Section 703.9 is applied to *mass timber* building elements as designated in the *approved* construction documents.

CHAPTER 23 WOOD

2303.1.12 Structural glued cross-laminated timber. *Cross-laminated timber* shall be manufactured and identified in accordance with ANSI/APA PRG 320.

Strike 2014 OSSC Section 2304.10 (including subsections) and replace with the following:

2304.10 Heavy timber construction. Where a structure, portion thereof or individual structural elements are required by provisions of this code to be of heavy timber, the building elements therein shall comply

with the applicable provisions of Sections 2304.10.1 through 2304.10.4. Minimum dimensions of heavy timber shall comply with the applicable requirements in Table 2304.10 based on roofs or floors supported and the configuration of each structural element, or in Sections 2304.10.2 through 2304.10.4. Lumber decking shall be in accordance with Section 2304.8.

2304.10.1 Details of heavy timber structural members. Heavy timber structural members shall be detailed and constructed in accordance with Sections 2304.10.1.1 through 2304.10.1.3.

2304.10.1.1 Columns. Minimum dimensions of columns shall be in accordance with Table 2304.10. Columns shall be continuous or superimposed throughout all stories and connected in an approved manner. Girders and beams at column connections shall be closely fitted around columns and adjoining ends shall be cross tied to each other, or intertied by caps or ties, to transfer horizontal loads across joints. Wood bolsters shall not be placed on tops of columns unless the columns support roof loads only. Where traditional heavy timber detailing is used, connections shall be by means of reinforced concrete or metal caps with brackets, by properly designed steel or iron caps, with pintles and base plates, by timber splice plates affixed to the columns by metal connectors housed within the contact faces, or by other approved methods.

2304.10.1.2 Floor framing. Minimum dimensions of floor framing shall be in accordance with Table 2304.10. Approved wall plate boxes or hangers shall be provided where wood beams, girders or trusses rest on masonry or concrete walls. Where intermediate beams are used to support a floor, they shall rest on top of girders, or shall be supported by an approved metal hanger into which the ends of the beams shall be closely fitted. Where traditional heavy timber detailing is used, these connections shall be permitted to be supported by ledgers or blocks securely fastened to the sides of the girders.

2304.10.1.3 Roof framing. Minimum dimensions of roof framing shall be in accordance with Table 2304.10. Every roof girder and not less than every alternate roof beam shall be anchored to its supporting member to resist forces as required in Chapter 16.

2304.10.2 Partitions and walls. Partitions and walls shall comply with Section 2304.10.2.1 or 2304.10.2.2.

2304.10.2.1 Exterior walls. Exterior walls shall be permitted to be *cross-laminated timber* meeting the requirements of Section 2303.1.12.

2304.10.2.2 Interior walls and partitions. Interior walls and partitions shall be of solid wood construction formed by not less than two layers of 1-inch (25 mm) matched boards or laminated construction 4 inches (102 mm) thick, or of 1-hour fire-resistance-rated construction.

2304.10.3 Floors. Floors shall be without concealed spaces. Wood floors shall be constructed in accordance with Section 2304.10.3.1 or 2304.10.3.2.

2304.10.3.1 Cross-laminated timber floors. *Cross-laminated timber* shall be not less than 4 inches (102 mm) in actual thickness. *Cross-laminated timber* shall be continuous from support to support and mechanically fastened to one another. *Cross-laminated timber* shall be permitted to be connected to walls without a shrinkage gap providing swelling or shrinking is considered in the design. Corbelling of masonry walls under the floor shall be permitted to be used.

2304.10.3.2 Sawn or glued-laminated plank floors. Sawn or glued-laminated plank floors shall be one of the following:

1. Sawn or glued-laminated planks, splined or tongue-and-groove, of not less than 3 inches (76 mm) nominal in thickness covered with 1-inch (25 mm) nominal dimension tongue-and-groove flooring, laid crosswise or diagonally, $1\frac{15}{32}$ -inch (12 mm) wood structural panel or ½-inch (12.7 mm) particleboard.
2. Planks not less than 4 inches (102 mm) nominal in width set on edge close together and well spiked and covered with 1-inch (25 mm) nominal dimension flooring or $1\frac{15}{32}$ -inch (12 mm) wood structural panel or ½-inch (12.7 mm) particle-board. The lumber shall be laid so that continuous lines of joints will occur only at points of support. Floors shall not extend closer than ½-inch

(12.7 mm) to walls. Such ½-inch (12.7 mm) space shall be covered by a molding fastened to the wall and so arranged that it will not obstruct the swelling or shrinkage movements of the floor. Corbelling of masonry walls under the floor shall be permitted to be used in place of molding.

2304.10.4 Roof decks. Roofs shall be without concealed spaces and roof decks shall be constructed in accordance with Section 2304.10.4.1 or 2304.10.4.2. Other types of decking shall be an alternative that provides equivalent fire resistance and structural properties. Where supported by a wall, roof decks shall be anchored to walls to resist forces determined in accordance with Chapter 16. Such anchors shall consist of steel bolts, lags, screws or approved hardware of sufficient strength to resist prescribed forces.

2304.10.4.1 Cross-laminated timber roofs. *Cross-laminated timber* roofs shall be not less than 3 inches (76 mm) nominal in thickness and shall be continuous from support to support and mechanically fastened to one another.

2304.10.4.2 Sawn, wood structural panel, or glued-laminated plank roofs. Sawn, wood structural panel, or glued-laminated plank roofs shall be one of the following:

1. Sawn or glued laminated, splined or tongue-and-groove plank, not less than 2 inches (51 mm) nominal in thickness.
2. 1/8-inch-thick (32 mm) wood structural panel (exterior glue).
3. Planks not less than 3 inches (76 mm) nominal in width, set on edge close together and laid as required for floors.

**TABLE 2304.10
MINIMUM DIMENSIONS OF HEAVY TIMBER STRUCTURAL MEMBERS**

SUPPORTING	HEAVY TIMBER STRUCTURAL ELEMENTS	MINIMUM NOMINAL SOLID SAWN SIZE		MINIMUM GLUED- LAMINATED NET SIZE		MINIMUM STRUCTURAL COMPOSITE LUMBER NET SIZE	
		Width, inch	Depth, inch	Width, inch	Depth, inch	Width, inch	Depth, inch
Floor loads only or combined floor and roof loads	Columns; Framed sawn or glued- laminated timber arches that spring from the floor line;	8	8	6 ³ / ₄	8 ¹ / ₄	7	7 ¹ / ₂
	Framed timber trusses						
	Wood beams and girders	6	10	5	10 ¹ / ₂	5 ¹ / ₄	9 ¹ / ₂
Roof loads only	Columns (roof and ceiling loads); Lower half of: wood-frame or glued-laminated arches that spring from the floor line or from grade	6	8	5	8 ¹ / ₄	5 ¹ / ₄	7 ¹ / ₂
	Upper half of: wood-frame or glued-laminated arches that spring from the floor line or from grade	6	6	5	6	5 ¹ / ₄	5 ¹ / ₂
	Framed timber trusses and other roof framing; ^a Framed or glued-laminated arches that spring from the top of walls or wall abutments	4 ^b	6	3 ^b	6 ⁷ / ₈	3 ¹ / ₂ ^b	5 ¹ / ₂

For SI: 1 inch = 25.4 mm.

- a. Spaced members shall be permitted to be composed of two or more pieces not less than 3 inches nominal in thickness where blocked solidly throughout their intervening spaces or where spaces are tightly closed by a continuous wood cover plate of not less than 2 inches nominal in thickness secured to the underside of the members. Splice plates shall be not less than 3 inches nominal in thickness.
- b. Where protected by approved automatic sprinklers under the roof deck, framing members shall be not less than 3 inches nominal in width.

PLASTIC

2603.4 Thermal barrier. Except as provided for in Sections 2603.4.1 and 2603.10, foam plastic shall be separated from the interior of a building by an approved thermal barrier of ½-inch (12.7 mm) gypsum wallboard, heavy timber in accordance with Section 602.4 or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275. Combustible concealed spaces shall comply with Section 718.

**CHAPTER 35
REFERENCED STANDARDS**

APA	APA – Engineered Wood Association 7011 South 19 th Street Tacoma, WA 98466
<u>ANSI/APA PRG 320—18</u>	<u>Standard for Performance-rated Cross-laminated Timber</u> <u>2303.1.12</u>

ASTM	ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken, PA 19428-2959
<u>D3498-03(2011)</u>	<u>Standard Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems</u> <u>703.9</u>
