Mass Timber AMM Guide

Supplementary Requirements for
Mass Timber Buildings of Type IV Construction

USE WITH THE 2018 INTERNATIONAL BUILDING CODE

AMERICAN
WOOD COUNCIL

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Mass Timber AMM Guide

Supplementary Requirements for Mass Timber Buildings of Type IV Construction for Use with the 2018 International Building Code

Introduction

This Guide provides information for code officials to establish requirements for approval of mass timber buildings as Alternative Materials and Methods (AMM) projects under the 2018 *International Building Code*© (IBC). Requirements of this Guide are supplementary to requirements of the adopted code and are predicated on acceptability of the 2024 *International Building Code*© (IBC) which provides requirements for larger and taller mass timber buildings than permitted by the 2018 IBC. This Guide is intended to assist the code official in review and permitting of mass timber buildings; however, it is not intended to limit or restrict buildings from being larger or taller, provided the authority having jurisdiction is satisfied that performance objectives are met.

Primary Considerations for the Code Official - Alternative Materials and Methods Review and Approval Under Section 104.11 of the 2018 IBC

The development of mass timber building requirements in the I-Codes was through efforts of the International Code Council's (ICC) Tall Wood Building Ad Hoc Committee (TWB). Resource documents, including code change proposals for development of the 2021 I-Codes and 2024 I-Codes[1], are available at the ICC website. Primary considerations for AMM review and approval of mass timber buildings under Section 104.11 of the 2018 IBC include the following:

- Following the reasoning adopted by the TWB, existing Type IV, coupled with increased fire safety and fire protection requirements for new Type IV mass timber buildings (i.e., Type IV-A, IV-B, and IV-C in the 2024 I-Codes), as prescribed in this Guide, is a basis for review and approval of larger and taller mass timber buildings than permissible under the 2018 IBC.

- Coordination between requirements of this Guide and the 2018 Edition of the *International Fire Code* (IFC). The 2024 IFC Chapter 33 contains requirements for Type IV-A, IV-B, IV-C construction. Additionally, the 2024 IFC Section 3301.1 references *NFPA 241-22* which contains specific requirements for safeguarding construction for Tall Mass Timber Wood Structures.

- Requirements for owners' responsibility based on Section 701.6 of the 2024 *International Fire Code*:

> *The owner shall maintain an inventory of all required fire-resistance-rated construction, construction installed to resist the passage of smoke and the construction included in Sections 703 through 707 and Sections 602.4.1 and 602.4.2 of the International Building Code. Such construction shall be visually inspected by the owner annually and properly repaired, restored or replaced where damaged, altered, breached or penetrated. Where concealed, such elements shall not be required to be visually inspected by the owner unless the concealed space is accessible by the removal or movement of a panel, access door, ceiling tile or similar movable entry to the space.*

[1] https://www.iccsafe.org/products-and-services/i-codes/code-development/cs/icc-ad-hoc-committee-on-tall-wood buildings/

Resources for the Code Official

Helpful resources that describe development of and/or requirements for the new Type IV-A, IV-B and IV-C construction types include:

1. International Code Council's (ICC) Tall Wood Building Ad Hoc Committee (TWB)
   https://www.iccsafe.org/products-and-services/i-codes/code-development/cs/icc-ad-hoc-committee-on-tall-wood-buildings/

2. Tall Mass Timber Type of Construction Comparison
   https://awc.org/publications/tall-mass-timber-construction-comparison/

3. Building Officials Guide to Tall Mass Timber Code Changes
   https://awc.org/publications/understanding-the-mass-timber-proposals-a-guide-for-building-officials/

4. Understanding the Tall Mass Timber Code Changes - A Toolkit for Fire Officials
   https://awc.org/wp-content/uploads/2022/01/tmt_toolkit.pdf

5. DES607: Tall Mass Timber Provisions in the 2021 I-Codes which is a recorded webinar on the new mass timber construction types in the 2021 I-Codes.
   https://www.youtube.com/watch?v=9FwcJNBAgIM

Supplementary Requirements for Mass Timber Buildings of Type IV Construction for Use with the 2018 International Building Code

This Guide provides supplementary requirements to be used with the 2018 I*nternational Building Code* to support Alternative Materials and Methods approval of mass timber Type IV-A, IV-B, IV-C, and IV-HT construction consistent with the 2024 I-Codes. This Guide also provides supplementary requirements to be used with the 2018 International Fire Code (IFC). IFC provisions are indicated with [F].

The underlined and ~~struckthrough~~ text are specific to those provisions for mass timber.

Underlined text indicates additions to the 2018 International Building Code (or International Fire Code where indicated by an [F]).

~~Struckthrough~~ text indicates deletions to the 2018 International Building Code (or International Fire Code where indicated by an [F]).

Changes in the code between the 2018 and 2024 codes that are not related to mass timber are not included. Changes due to local or state amendments are also not included.

CHAPTER 1
SCOPE AND ADMINISTRATION

SECTION 110
INSPECTIONS

110.3.12 Types IV-A, IV-B, and IV-C connection protection inspection. In buildings of Types IV-A, IV-B, and IV-C construction, where connection fire-resistance ratings are provided by wood cover calculated to meet the requirements of Section 2304.10.8, inspection of the wood cover shall be made after the cover is installed, but before any other coverings or finishes are installed.

CHAPTER 2
DEFINITIONS

[BS] 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.

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 703.8, designed to increase the *fire-resistance rating* and delay the combustion of *mass timber*.

CHAPTER 3
OCCUPANCY CLASSIFICATION AND USE

(No mass timber related changes.)

CHAPTER 4
SPECIAL DETAILED REQUIREMENTS BASED ON OCCUPANCY AND USE

SECTION 403
HIGH-RISE BUILDINGS

403.3.2 Water supply to required fire pumps. In all *buildings* that are more than 420 feet (128 000 mm) in *building height* and *buildings* of Type IV-A and IV-B construction that are more than 120 feet (36 576 mm) in *building height*, required fire pumps shall be supplied by connections to no 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 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.

CHAPTER 5
GENERAL BUILDING HEIGHTS AND AREAS

SECTION 504
BUILDING HEIGHT AND NUMBER OF STORIES

TABLE 504.3
ALLOWABLE BUILDING HEIGHT IN FEET ABOVE GRADE PLANE

OCCUPANCY CLASSIFICATION	See Footnotes	TYPE OF CONSTRUCTION											
		Type I		Type II		Type III		Type IV				Type V	
		A	B	A	B	A	B	A	B	C	HT	A	B
A, B, E, F, M, S, U	NS[b]	UL	160	65	55	65	55	65	65	65	65	50	40
	S	UL	180	85	75	85	75	270	180	85	85	70	60
H-1, H-2, H-3, H-5	NS[c,d]	UL	160	65	55	65	55	120	90	65	65	50	40
	S												
H-4	NS[c,d]	UL	160	65	55	65	55	65	65	65	65	50	40
	S	UL	180	85	75	85	75	140	100	85	85	70	60
I-1Condition 1, I-3	NS[d,e]	UL	160	65	55	65	55	65	65	65	65	50	40
	S	UL	180	85	75	85	75	180	120	85	85	70	60
I-1Condition 2, I-2	NS[d,e,f]	UL	160	65	55	65	55	65	65	65	65	50	40
	S	UL	180	85									
I-4	NS[d,g]	UL	160	65	55	65	55	65	65	65	65	50	40
	S	UL	180	85	75	85	75	180	120	85	85	70	60
R_h	NS[d]	UL	160	65	55	65	55	65	65	65	65	50	40
	S13D	60	60	60	60	60	60	60	60	60	60	50	40
	S13R	60	60	60	60	60	60	60	60	60	60	60	60
	S	UL	180	85	75	85	75	270	180	85	85	70	60

For SI: 1 foot = 304.8 mm.

UL = Unlimited; NS = Buildings not equipped throughout with an automatic sprinkler system; S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2; S13D = 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. New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.

d. The NS value is only for use in evaluation of existing building height in accordance with the *International Existing Building Code*.

e. New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies Condition 1, see Exception 1 of Section 903.2.6.

f. New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and Section 1103.5 of the *International Fire Code*.

g. For new Group I-4 occupancies, see Exceptions 2 and 3 of Section 903.2.6.

h. New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8.

TABLE 504.4
ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE[a, b]

OCCUPANCY CLASSIFICATION	TYPE OF CONSTRUCTION												
	See Footnotes	Type I		Type II		Type III		Type IV				Type V	
		A	B	A	B	A	B	A	B	C	HT	A	B
A-1	NS	UL	5	3	2	3	2	3	3	3	3	2	1
	S	UL	6	4	3	4	3	9	6	4	4	3	2
A-2	NS	UL	11	3	2	3	2	3	3	3	3	2	1
	S	UL	12	4	3	4	3	18	12	6	4	3	2
A-3	NS	UL	11	3	2	3	2	3	3	3	3	2	1
	S	UL	12	4	3	4	3	18	12	6	4	3	2
A-4	NS	UL	11	3	2	3	2	3	3	3	3	2	1
	S	UL	12	4	3	4	3	18	12	6	4	3	2
A-5	NS	UL	UL	UL	UL	UL	UL	1	1	1	UL	UL	UL
	S	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL
B	NS	UL	11	5	3	5	3	5	5	5	5	3	2
	S	UL	12	6	4	6	4	18	12	9	6	4	3
E	NS	UL	5	3	2	3	2	3	3	3	3	1	1
	S	UL	6	4	3	4	3	9	6	4	4	2	2
F-1	NS	UL	11	4	2	3	2	3	3	3	4	2	1
	S	UL	12	5	3	4	3	10	7	5	5	3	2
F-2	NS	UL	11	5	3	4	3	5	5	5	5	3	2
	S	UL	12	6	4	5	4	12	8	6	6	4	3
H-1	NS[c, d]	1	1	1	1	1	1	NP	NP	NP	1	1	NP
	S							1	1	1			
H-2	NS[c, d]	UL	3	2	1	2	1	1	1	1	2	1	1
	S							2	2	2			
H-3	NS[c, d]	UL	6	4	2	4	2	3	3	3	4	2	1
	S							4	4	4			
H-4	NS[c, d]	UL	7	5	3	5	3	5	5	5	5	3	2
	S	UL	8	6	4	6	4	8	7	6	6	4	3
H-5	NS[c, d]	4	4	3	3	3	3	2	2	2	3	3	2
	S							3	3	3			
I-1 Condition 1	NS[d, e]	UL	9	4	3	4	3	4	4	4	4	3	2
	S	UL	10	5	4	5	4	10	7	5	5	4	3
I-1 Condition 2	NS[d, e]	UL	9	4	3	4	3	3	3	3	4	3	2
	S	UL	10	5				10	6	4			
I-2	NS[d, f]	UL	4	2	1	1	NP	NP	NP	NP	1	1	NP
	S	UL	5	3				7	5	1			
I-3	NS[d, e]	UL	4	2	1	2	1	2	2	2	2	2	1
	S	UL	5	3	2	3	2	7	5	3	3	3	2
I-4	NS[d, g]	UL	5	3	2	3	2	3	3	3	3	1	1
	S	UL	6	4	3	4	3	9	6	4	4	2	2
M	NS	UL	11	4	2	4	2	4	4	4	4	3	1
	S	UL	12	5	3	5	3	12	8	6	5	4	2

(continued)

TABLE 504.4—continued
ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE[a, b]

OCCUPANCY CLASSIFICATION	TYPE OF CONSTRUCTION												
	See Footnotes	Type I		Type II		Type III		Type IV				Type V	
		A	B	A	B	A	B	A	B	C	HT	A	B
R-1[h]	NS[d]	UL	11	4	4	4	4	4	4	4	4	3	2
	S13R	4	4									4	3
	S	UL	12	5	5	5	5	18	12	8	5	4	3
R-2[h]	NS[d]	UL	11	4	4	4	4	4	4	4	4	3	2
	S13R	4	4	4								4	3
	S	UL	12	5	5	5	5	18	12	8	5	4	3
R-3[h]	NS[d]	UL	11	4	4	4	4	4	4	4	4	3	3
	S13D	4	4									3	3
	S13R	4	4									4	4
	S	UL	12	5	5	5	5	18	12	5	5	4	4
R-4[h]	NS[d]	UL	11	4	4	4	4	4	4	4	4	3	2
	S13D	4	4									3	2
	S13R	4	4									4	3
	S	UL	12	5	5	5	5	18	12	5	5	4	3
S-1	NS	UL	11	4	2	3	2	4	4	4	4	3	1
	S	UL	12	5	4	4	4	10	7	5	5	4	2
S-2	NS	UL	11	5	3	4	3	4	4	4	5	4	2
	S	UL	12	6	4	5	4	12	8	5	6	5	3
U	NS	UL	5	4	2	3	2	4	4	4	4	2	1
	S	UL	6	5	3	4	3	9	6	5	5	3	2

UL = Unlimited; NP = Not Permitted; NS = Buildings not equipped throughout with an automatic sprinkler system; S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2; S13D = 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. New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.
d. The NS value is only for use in evaluation of existing *building height* in accordance with the *International Existing Building Code*.
e. New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies, Condition 1, see Exception 1 of Section 903.2.6.
f. New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and 1103.5 of the *International Fire Code*.
g. For new Group I-4 occupancies, see Exceptions 2 and 3 of Section 903.2.6.
h. New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8

SECTION 506
BUILDING AREA

TABLE 506.2
ALLOWABLE AREA FACTOR (A_t = NS, S1, S13R, S13D or SM, as applicable) IN SQUARE FEET[a, b]

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION											
		Type I		Type II		Type III		Type IV				Type V	
		A	B	A	B	A	B	A	B	C	HT	A	B
A-1	NS	UL	UL	15,500	8,500	14,000	8,500	45,000	30,000	18,750	15,000	11,500	5,500
	S1	UL	UL	62,000	34,000	56,000	34,000	180,000	120,000	75,000	60,000	46,000	22,000
	SM	UL	UL	46,500	25,500	42,000	25,500	135,000	90,000	56,250	45,000	34,500	16,500
A-2	NS	UL	UL	15,500	9,500	14,000	9,500	45,000	30,000	18,750	15,000	11,500	6,000
	S1	UL	UL	62,000	38,000	56,000	38,000	180,000	120,000	75,000	60,000	46,000	24,000
	SM	UL	UL	46,500	28,500	42,000	28,500	135,000	90,000	56,250	45,000	34,500	18,000
A-3	NS	UL	UL	15,500	9,500	14,000	9,500	45,000	30,000	18,750	15,000	11,500	6,000
	S1	UL	UL	62,000	38,000	56,000	38,000	180,000	120,000	75,000	60,000	46,000	24,000
	SM	UL	UL	46,500	28,500	42,000	28,500	135,000	90,000	56,250	45,000	34,500	18,000
A-4	NS	UL	UL	15,500	9,500	14,000	9,500	45,000	30,000	18,750	15,000	11,500	6,000
	S1	UL	UL	62,000	38,000	56,000	38,000	180,000	120,000	75,000	60,000	46,000	24,000
	SM	UL	UL	46,500	28,500	42,000	28,500	135,000	90,000	56,250	45,000	34,500	18,000
A-5	NS	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL
	S1												
	SM												
B	NS	UL	UL	37,500	23,000	28,500	19,000	108,000	72,000	45,000	36,000	18,000	9,000
	S1	UL	UL	150,000	92,000	114,000	76,000	432,000	288,000	180,000	144,000	72,000	36,000
	SM	UL	UL	112,500	69,000	85,500	57,000	324,000	216,000	135,000	108,000	54,000	27,000
E	NS	UL	UL	26,500	14,500	23,500	14,500	76,500	51,000	31,875	25,500	18,500	9,500
	S1	UL	UL	106,000	58,000	94,000	58,000	306,000	204,000	127,500	102,000	74,000	38,000
	SM	UL	UL	79,500	43,500	70,500	43,500	229,500	153,000	95,625	76,500	55,500	28,500
F-1	NS	UL	UL	25,000	15,500	19,000	12,000	100,500	67,000	41,875	33,500	14,000	8,500
	S1	UL	UL	100,000	62,000	76,000	48,000	402,000	268,000	167,500	134,000	56,000	34,000
	SM	UL	UL	75,000	46,500	57,000	36,000	301,500	201,000	125,625	100,500	42,000	25,500
F-2	NS	UL	UL	37,500	23,000	28,500	18,000	151,500	101,000	63,125	50,500	21,000	13,000
	S1	UL	UL	150,000	92,000	114,000	72,000	606,000	404,000	252,500	202,000	84,000	52,000
	SM	UL	UL	112,500	69,000	85,500	54,000	454,500	303,000	189,375	151,500	63,000	39,000
H-1	NS[c]	21,000	16,500	11,000	7,000	9,500	7,000	10,500	10,500	10,500	10,500	7,500	NP
	S1												
H-2	NS[c]	21,000	16,500	11,000	7,000	9,500	7,000	10,500	10,500	10,500	10,500	7,500	3,000
	S1												
	SM												
H-3	NS[c]	UL	60,000	26,500	14,000	17,500	13,000	25,500	25,500	25,500	25,500	10,000	5,000
	S1												
	SM												
H-4	NS[c, d]	UL	UL	37,500	17,500	28,500	17,500	72,000	54,000	40,500	36,000	18,000	6,500
	S1	UL	UL	150,000	70,000	114,000	70,000	288,000	216,000	162,000	144,000	72,000	26,000
	SM	UL	UL	112,500	52,500	85,500	52,500	216,000	162,000	121,500	108,000	54,000	19,500
H-5	NS[c, d]	UL	UL	37,500	23,000	28,500	19,000	72,000	54,000	40,500	36,000	18,000	9,000
	S1	UL	UL	150,000	92,000	114,000	76,000	288,000	216,000	162,000	144,000	72,000	36,000
	SM	UL	UL	112,500	69,000	85,500	57,000	216,000	162,000	121,500	108000	54,000	27,000

(continued)

TABLE 506.2—continued
ALLOWABLE AREA FACTOR (A_t = NS, S1, S13R, S13D or SM, as applicable) IN SQUARE FEET[a, b]

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION											
		Type I		Type II		Type III		Type IV				Type V	
		A	B	A	B	A	B	A	B	C	HT	A	B
I-1	NS[d, e]	UL	55,000	19,000	10,000	16,500	10,000	54,000	36,000	18,000	18,000	10,500	4,500
	S1	UL	220,000	76,000	40,000	66,000	40,000	216,000	144,000	72,000	72,000	42,000	18,000
	SM	UL	165,000	57,000	30,000	49,500	30,000	162,000	108,000	54,000	54,000	31,500	13,500
I-2	NS[d, f]	UL	UL	15,000	11,000	12,000	NP	36,000	24,000	12,000	12,000	9,500	NP
	S1	UL	UL	60,000	44,000	48,000	NP	144,000	96,000	48,000	48,000	38,000	NP
	SM	UL	UL	45,000	33,000	36,000	NP	108,000	72,000	36,000	36,000	28,500	NP
I-3	NS[d, e]	UL	UL	15,000	10,000	10,500	7,500	36,000	24,000	12,000	12,000	7,500	5,000
	S1	UL	UL	60,000	40,000	42,000	30,000	144,000	96,000	48,000	48,000	30,000	20,000
	SM	UL	UL	45,000	30,000	31,500	22,500	108,000	72,000	36,000	36,000	22,500	15,000
I-4	NS[d, g]	UL	60,500	26,500	13,000	23,500	13,000	76,500	51,000	25,500	25,500	18,500	9,000
	S1	UL	121,000	106,000	52,000	94,000	52,000	306,000	204,000	102,000	102,000	74,000	36,000
	SM	UL	181,500	79,500	39,000	70,500	39,000	229,500	153,000	76,500	76,500	55,500	27,000
M	NS	UL	UL	21,500	12,500	18,500	12,500	61,500	41,000	26,625	20,500	14,000	9,000
	S1	UL	UL	86,000	50,000	74,000	50,000	246,000	164,000	102,500	82,000	56,000	36,000
	SM	UL	UL	64,500	37,500	55,500	37,500	184,500	123,000	76,875	61,500	42,000	27,000
R-1[h]	NS[d]	UL	UL	24,000	16,000	24,000	16,000	61,500	41,000	25,625	20,500	12,000	7,000
	S13R												
	S1	UL	UL	96,000	64,000	96,000	64,000	246,000	164,000	102,500	82,000	48,000	28,000
	SM	UL	UL	72,000	48,000	72,000	48,000	184,500	123,000	76,875	61,500	36,000	21,000
R-2[h]	NS[d]	UL	UL	24,000	16,000	24,000	16,000	61,500	41,000	25,625	20,500	12,000	7,000
	S13R												
	S1	UL	UL	96,000	64,000	96,000	64,000	246,000	164,000	102,500	82,000	48,000	28,000
	SM	UL	UL	72,000	48,000	72,000	48,000	184,500	123,000	76,875	61,500	36,000	21,000
R-3[h]	NS[d]	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL
	S13D												
	S13R												
	S1												
	SM												
R-4[h]	NS[d]	UL	UL	24,000	16,000	24,000	16,000	61,500	41,000	25,625	20,500	12,000	7,000
	S13D												
	S13R												
	S1	UL	UL	96,000	64,000	96,000	64,000	246,000	164,000	102,500	82,000	48,000	28,000
	SM	UL	UL	72,000	48,000	72,000	48,000	184,500	123,000	76,875	61,500	36,000	21,000
S-1	NS	UL	48,000	26,000	17,500	26,000	17,500	76,500	51,000	31,875	25,500	14,000	9,000
	S1	UL	192,000	104,000	70,000	104,000	70,000	306,000	204,000	127,500	102,000	56,000	36,000
	SM	UL	144,000	78,000	52,500	78,000	52,500	229,500	153,000	95,625	76,500	42,000	27,000
S-2	NS	UL	79,000	39,000	26,000	39,000	26,000	115,500	77,000	48,125	38,500	21,000	13,500
	S1	UL	316,000	156,000	104,000	156,000	104,000	462,000	308,000	192,500	154,000	84,000	54,000
	SM	UL	237,000	117,000	78,000	117,000	78,000	346,500	231,000	144,375	115,500	63,000	40,500
U	NS[i]	UL	35,500	19,000	8,500	14,000	8,500	54,000	36,000	22,500	18,000	9,000	5,500
	S1	UL	142,000	76,000	34,000	56,000	34,000	216,000	144,000	90,000	72,000	36,000	22,000
	SM	UL	106,500	57,000	25,500	42,000	25,500	162,000	108,000	67,500	54,000	27,000	16,500

(continued)

TABLE 506.2—continued
ALLOWABLE AREA FACTOR (A_t = NS, S1, S13R, S13D or SM, as applicable) IN SQUARE FEET[a, b]

For SI: 1 square foot = 0.0929 m^2.

UL = Unlimited; NP = Not Permitted; NS = Buildings not equipped throughout with an 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; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2; S13D = 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 area in this chapter.
b. See Section 903.2 for the minimum thresholds for protection by an automatic sprinkler system for specific occupancies.
c. New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.
d. The NS value is only for use in evaluation of existing building area in accordance with the *International Existing Building Code*.
e. New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies, Condition 1, see Exception 1 of Section 903.2.6.
f. New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and Section 1103.5 of the *International Fire Code*.
g. New Group I-4 occupancies see Exceptions 2 and 3 of Section 903.2.6.
h. New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8.
i. The maximum allowable area for a single-story nonsprinklered Group U greenhouse is permitted to be 9,000 square feet, or the allowable area shall be permitted to comply with Table C102.1 of Appendix C.

SECTION 508
MIXED USE AND OCCUPANCY

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 *gypsum board* that is not less than 1/2 inch (12.7 mm) in thickness 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.

Exception: The thermal barrier shall not be required on the top of horizontal assemblies serving as occupancy separations.

SECTION 509
INCIDENTAL USES

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 *horizontal assemblies* 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 *gypsum board* that is not less than 1/2 inch (12.7mm) in thickness 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.

Exception: The thermal barrier shall not be required on the top of horizontal assemblies serving as incidental use separations.

CHAPTER 6
TYPES OF CONSTRUCTION

SECTION 601
GENERAL

TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV				TYPE V	
	A	B	A	B	A	B	A	B	C	HT	A	B
Primary structural frame[f] (see Section 202)	3[a, b]	2[a,b,c]	1[b, c]	0[c]	1[b, c]	0	3[a]	2[a]	2[a]	HT	1[b, c]	0
Bearing walls												
Exterior[e, f]	3	2	1	0	2	2	3	2	2	2	1	0
Interior	3[a]	2[a]	1	0	1	0	3	2	2	1/HT[g]	1	0
Nonbearing walls and partitions Exterior	See Table 705.5											
Nonbearing walls and partitions Interior[d]	0	0	0	0	0	0	0	0	0	See Section 2304.11.2	0	0
Floor construction and associated secondary structural members (see Section 202)	2	2	1	0	1	0	2	2	2	HT	1	0
Roof construction and associated secondary structural members (see Section 202)	$1^1/_2$[b]	1[b,c]	1[b,c]	0[c]	1[b,c]	0	$1^1/_2$	1	1	HT	1[b,c]	0

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.

b. Except in Group F-1, H, M and S-1 occupancies, fire protection of structural members in roof construction shall not be required, including protection of primary structural frame members, 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 complying with Section 2304.11 shall be allowed for roof construction, including primary structural frame members, where a 1-hour or less fire-resistance rating is required.

d. Not less than the fire-resistance rating required by other sections of this code.

e. Not less than the fire-resistance rating based on fire separation distance (see Table 602).

f. Not less than the fire-resistance rating as referenced in Section 704.10.

g. Heavy timber bearing walls supporting more than two floors or more than a floor and a roof shall have a *fire-resistance rating* of not less than 1 hour.

SECTION 602
CONSTRUCTION CLASSIFICATION

602.4 Type IV. ~~Type IV construction is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of solid wood, laminated wood, heavy timber (HT) 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 and details of Type IV construction shall comply with the provisions of this section and Section 2304.11. Exterior walls complying with Section 602.4.4.1 or 602.4.4.2 shall be permitted. Interior walls and partitions not less than 1-hour fire-resistance rating or heavy timber complying with Section 2304.11.2.2 shall be permitted.~~ 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 n*oncombustible protection*, the *mass timber*, or a combination of both and shall be determined in accordance with Section 703.2. The minimum dimensions and permitted materials for *building elements* shall comply with the provisions of this section and Section 2304.11. *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 ANSI/APA PRG 320 as referenced in Section 2303.1.4.

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, IV-B, and IV-C construction with an occupied floor located more than 75 feet (22,860 mm) above the lowest level of fire department vehicle access, up to and including 12 *stories* or 180 feet (54,864 mm) 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 (54,864 mm) above *grade plane*, interior exit and elevator hoistway enclosures shall be constructed of noncombustible 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.

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 specified in Table 722.7.1(1). 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/m^2, a total heat release of less than 20 MJ/m^2 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/m^2.

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 703.3.

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 specified 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 1 inch (25 mm) 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.

602.4.1.4 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 *International 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.

602.4.1.6 Shafts. *Shafts* shall be permitted in accordance with Sections 713 and 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 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.

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 specified in Table 722.7.1(1). 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/m^2, a total heat release of less than 20 MJ/m^2 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/m^2.

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 703.3.

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 specified 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. Interior faces of *mass timber* elements, including the inside face of exterior *mass timber* walls and *mass timber* roofs, shall be protected in accordance with Section 602.4.2.2.1.

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 and walls complying with one of the following:

   1.1 Unprotected portions of *mass timber* ceilings, including attached beams, shall be permitted and shall be limited to an area less than or equal to 100 percent of the floor area in any *dwelling unit* within a story or *fire area* within a story.

   1.2 Unprotected portions of *mass timber* walls, including attached columns, shall be permitted and shall be limited to an area less than or equal to 40 percent of the floor area in any *dwelling unit* within a story or *fire area* within a story.

   1.3 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.

2. *Mass timber* columns and beams that 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.

$$(U_{tc}/\ U_{ac})+(U_{tw}/U_{aw})< 1 \quad \textbf{(Equation 6-1)}$$

where:

U_{tc} = Total unprotected *mass timber* ceiling areas.
U_{ac} = Allowable unprotected *mass timber* ceiling area conforming to Exception 1.1 of Section 602.4.2.2.2.
U_{tw} = Total unprotected *mass timber* wall areas.
U_{aw} = Allowable unprotected *mass timber* wall area conforming to Exception 1.2 of Section 602.4.2.2.2.

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 shall be not less than 15 feet (4572 mm) from unprotected portions of other walls measured horizontally along the floor.

602.4.2.3 Floors. The floor assembly shall contain a noncombustible material not less than 1 inch (25 mm) in thickness above the *mass timber*. Floor finishes in accordance with Section 804 shall be permitted on top of the noncombustible material. Except where unprotected *mass timber* ceilings are permitted in Section 602.4.2.2.2, 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 Section 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 *International 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 Sections 713 and 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.

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 Table 722.7.1(1). 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/m^2, a total heat release of less than 20 MJ/m^2 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/m^2.

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 Roof coverings. *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 *International 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 specified in Table 722.7.1(1).

602.4.3.6 Shafts. *Shafts* shall be permitted in accordance with Sections 713 and 718. *Shafts* and elevator hoistway and *interior exit stairway enclosures* shall be protected with *noncombustible protection* with a minimum assigned time of 40 minutes, as specified in Table 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-HT (Heavy Timber) construction 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 or with concealed spaces complying with Section 602.4.4.3. The minimum dimensions for permitted materials including solid timber, glued-laminated timber, SCL and *cross-laminated timber* (CLT) and the details of Type IV construction shall comply with the provisions of this section and Section 2304.11. *Exterior walls* complying with Section 602.4.4.1 or 602.4.4.2 shall be permitted. Interior walls and partitions not less than 1-hour fire-resistance rated or heavy timber conforming with Section 2304.11.2.2 shall be permitted.

~~**602.4.1**~~ **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.

~~**602.4.2**~~ **602.4.4.2 Cross-laminated timber in *exterior walls*.** *Cross-laminated timber* not less than 4 inches (102 mm) in thickness complying with Section 2303.1.4 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~~ Heavy timber structural members appurtenant to the *CLT exterior wall* shall meet the requirements of Table 2304.11 and be

fire-resistance rated as required for the *exterior wall*. The exterior surface of the *cross-laminated timber* and heavy timber elements ~~is~~ shall be protected by one the following:

1. *Fire-retardant-treated wood* sheathing complying with Section 2303.2 and not less than 15/32 inch (12 mm) thick.
2. *Gypsum board* not less than 1/2 inch (12.7 mm) thick.
3. A noncombustible material.

602.4.4.3 Concealed spaces. Concealed spaces shall not contain combustible materials other than *building elements* and electrical, mechanical, fire protection, or plumbing materials and equipment permitted in plenums in accordance with Section 602 of the *International Mechanical Code*. Concealed spaces shall comply with applicable provisions of Section 718. Concealed spaces shall be protected in accordance with one or more of the following:

1. The building shall be sprinklered throughout in accordance with Section 903.3.1.1 and automatic sprinklers shall also be provided in the concealed space.
2. The concealed space shall be completely filled with noncombustible insulation.
3. Combustible surfaces within the concealed space shall be fully sheathed with not less than 5/8-inch *Type X gypsum board*.

Exception: Concealed spaces within interior walls and partitions with a 1-hour or greater *fire-resistance rating* complying with Section 2304.11.2.2 shall not require additional protection.

~~**602.4.3**~~ **602.4.4.4 Exterior structural members.** Where a fire separation distance of 20 feet (6096 mm) or more is provided, wood columns and arches conforming to heavy timber sizes complying with Section 2304.11 shall be permitted to be used externally.

TABLE 602
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE[a, d, g]

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H[e]	OCCUPANCY GROUP F-1, M, S-1[f]	OCCUPANCY GROUP A, B, E, F-2, I, R[i], S-2, U[h]
X < 5[b]	All	3	2	1
5 ≤ X < 10	IA, IVA	3	2	1
	Others	2	1	1
10 ≤ X < 30	IA, IB, IVA, IVB	2	1	1[c]
	IIB, VB	1	0	0
	Others	1	1	1[c]
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. See Section 706.1.1 for party walls.
c. Open parking garages complying with Section 406 shall not be required to have a fire-resistance rating.
d. 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.
e. For special requirements for Group H occupancies, see Section 415.6.
f. For special requirements for Group S aircraft hangars, see Section 412.3.1.
g. 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. For a building containing only a Group U occupancy private garage or carport, the exterior wall shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet (1523 mm) or greater.
h. For a Group R-3 building of Type II-B or Type V-B construction, the exterior wall shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet (1523 mm) or greater.

CHAPTER 7
FIRE AND SMOKE PROTECTION FEATURES

SECTION 703
FIRE-RESISTANCE RATINGS AND FIRE TESTS

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 with the following conditions:

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 Types 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: Sealants or adhesives need not be provided where they are not a required component of a tested fire-resistance-rated assembly.

SECTION 705
PROJECTIONS

705.2.3.1 Balconies and similar projections. Balconies and similar projections of combustible construction other than *fire-retardant-treated wood* shall be *fire-resistance* rated where required by Table 601 for floor construction or shall be of heavy timber construction in accordance with Section 2304.11. The aggregate length of the projections shall not exceed 50 percent of the *building*'s perimeter on each floor.

Exceptions:

1. On *buildings* of Type I and II construction, three *stories* or less above *grade plane*, *fire-retardant-treated wood* shall be permitted for balconies, porches, decks and exterior *stairways* not used as required exits.
2. Untreated *wood, and plastic composites* that comply with ASTM D7032 and Section 2612, are permitted for pickets, rails and similar guard components that are limited to 42 inches (1067 mm) in height.
3. Balconies and similar projections on *buildings* of Type III, IV-HT and V construction shall be permitted to be of Type V construction, and shall not be required to have a *fire-resistance rating* where sprinkler protection is extended to these areas.
4. Where sprinkler protection is extended to the balcony areas, the aggregate length of the balcony on each floor shall not be limited.

SECTION 718
CONCEALED SPACES

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 2304.11.

SECTION 722
CALCULATED FIRE-RESISTANCE

722.7 Fire-resistance rating for mass timber. The required *fire resistance* of *mass timber* elements in Section 602.4 shall be determined in accordance with Section 703.2. 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 703.6. The protection contributions indicated in Table 722.7.1(2) shall be deemed to comply with this requirement where installed and fastened in accordance with Section 722.7.2.

TABLE 722.7.1(1)
PROTECTION REQUIRED FROM NONCOMBUSTIBLE COVERING MATERIAL

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

TABLE 722.7.1(2)
PROTECTION PROVIDED BY NONCOMBUSTIBLE COVERING MATERIAL

NONCOMBUSTIBLE PROTECTION	PROTECTION CONTRIBUTION (minutes)
1/2-inch Type X gypsum board	25
5/8-inch Type X gypsum board	40

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 (25 mm) 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 (25 mm) No. 6 Type S drywall screws to furring channels in accordance with AISI S220.

2. Screws for attaching the base layer shall be 12 inches (305 mm) on center in both directions.
3. Screws for each layer after the base layer shall be 12 inches (305 mm) on center in both directions and offset from the screws of the previous layers by 4 inches (102 mm) in both directions.
4. All panel edges of any layer shall be offset 18 inches (457 mm) from those of the previous layer.
5. All panel edges shall be attached with screws sized and offset as in Items 1 through 4 and placed at least 1 inch (25 mm) but not more than 2 inches (51 mm) 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 11/4-inch (32 mm) 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 *mass timber* walls determined in accordance with Table 722.7.1(1) shall be fastened 12 inches (305 mm) on center each way and 6 inches (152 mm) on center at all joints or ends. All panel edges shall be attached with fasteners located at least 1 inch (25 mm) but not more than 2 inches (51 mm) from the panel edge. Fasteners shall comply with one of the following:

1. Galvanized nails of minimum 12 gage with a 7/16-inch (11 mm) head of sufficient length to penetrate the *mass timber* a minimum of 1 inch (25 mm).

2. Screws that comply with ASTM C1002 (Type S, W or G) of sufficient length to penetrate the *mass timber* a minimum of 1 inch (25 mm).

CHAPTER 14
EXTERIOR WALLS

SECTION 1405
COMBUSTIBLE MATERIALS ON THE EXTERIOR SIDE OF EXTERIOR WALLS

1405.1.1 Type I, II, III and IV-HT construction. On buildings of Type I, II, III and IV-HT construction, *exterior wall coverings* shall be permitted to be constructed of combustible materials, complying with the following limitations:

1. Combustible *exterior wall coverings* shall not exceed 10 percent of an *exterior wall* surface area where the *fire separation distance* is 5 feet (1524 mm) or less.
2. Combustible *exterior wall coverings* shall be limited to 40 feet (12 192 mm) in height above *grade plane*.
3. Combustible *exterior wall coverings* constructed of *fire-retardant-treated wood* complying with Section 2303.2 for exterior installation shall not be limited in wall surface area where the *fire separation distance* is 5 feet (1524 mm) or less and shall be permitted up to 60 feet (18 288 mm) in height above grade plane regardless of the *fire separation distance*.
4. Wood *veneers* shall comply with Section 1404.5.

CHAPTER 17
SPECIAL INSPECTION AND TESTS

SECTION 1705.5.3
MASS TIMBER CONSTRUCTION

1705.5.3 Inspections of mass timber elements in Types IV-A, IV-B and IV-C construction shall be in accordance with Table 1705.5.3.

TABLE 1705.5.3
REQUIRED 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 of mass timber construction.		—	X
3.	Inspection of connections where installation methods are required to meet design loads.			
	Threaded fasteners.	Verify use of proper installation equipment.	—	X
		Verify use of pre-drilled holes where required.	—	X
		Inspect screws, including diameter, length, head type, spacing, installation angle and depth.	—	X
	Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads.		X	—
	Adhesive anchors not defined in preceding cell.		—	X
	Bolted connections.		—	X
	Concealed connections.		—	X

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

SECTION 2301
GENERAL

2301.2 ~~Nominal sizes~~ Dimensions. For the purposes of this chapter, where dimensions of lumber are specified, they shall be deemed to be nominal dimensions unless specifically designated as actual dimensions (see Section 2304.2). Where dimensions of *cross-laminated timber* thickness are specified, they shall be deemed to be actual dimensions.

SECTION 2304
GENERAL CONSTRUCTION REQUIREMENTS

2304.10 Connectors and fasteners. Connectors and fasteners shall comply with the applicable provisions of Sections 2304.10.1 through ~~2304.10.7~~ 2304.10.8.

2304.10.8 Fire protection of connections. Connections used with *fire-resistance*-members and in fire-resistance-rated assemblies of Type IV-A, IV-B or IV-C construction shall be protected for the time associated with the fire-resistance rating. Protection time shall be determined by one of the following:

1. Testing in accordance with Section 703.2 where the connection is part of the *fire resistance* test.
2. Engineering analysis that demonstrates that the temperature rise at any portion of the connection is limited to an average temperature rise of 250°F (139°C), and a maximum temperature rise of 325°F (181°C), for a time corresponding to the required *fire-resistance* rating of the structural element being connected. For the purposes of this analysis, the connection includes connectors, fasteners, and portions of wood members included in the structural design of the connection.

2304.11.1.1 Columns. Minimum dimensions of columns shall be in accordance with Table 2304.11. Columns shall be connected in an *approved* manner. Columns shall be continuous or aligned vertically from floor to floor in ~~superimposed throughout~~ all stories of Type IV-HT construction ~~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 permitted to 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.

2304.11.3.1 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.

2304.11.4 Roof decks. Roofs shall be without concealed spaces ~~and roof~~ or with concealed spaces complying with Section 602.4.4.3. Roof decks shall be constructed in accordance with Section 2304.11.4.1 or 2304.11.4.2. Other types of decking shall be an alternative that provides equivalent *fire resistance* and structural properties are being provided. 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.

CHAPTER 31
SPECIAL CONSTRUCTION

SECTION 3102
MEMBRANE STRUCTURES

3102.3 Type of construction. *Noncombustible membrane structures* shall be classified as Type IIB construction. Noncombustible frame or cable-supported *structures* covered by an *approved* membrane in accordance with Section 3102.3.1 shall be classified as Type IIB construction. Heavy timber frame-supported *structures* covered by an *approved* membrane in accordance with Section 3102.3.1 shall be classified as Type IV-HT construction. Other membrane *structures* shall be classified as Type V construction.

> **Exception**: Plastic less than 30 feet (9144 mm) above any floor used in *greenhouses*, where occupancy by the general public is not authorized, and for aquaculture pond covers is not required to meet the fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701.

3102.6.1.1 Membrane. A membrane meeting the fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701 shall be permitted to be used as the roof or as a skylight on buildings of Type IIB, III, IV-HT and V construction, provided the membrane is not less than 20 feet (6096 mm) above any floor, balcony or gallery.

CHAPTER 35
REFERENCED STANDARDS

This guide includes mass timber sections of the 2024 IBC. Therefore, references provided here are limited to these mass timber specific sections provided in this guide.

AISI S220—20	**North American Standard for Cold-formed Steel Framing-Nonstructural Members**, 2020 Edition 722.7.2.1
ANSI/APA PRG 320-2019	**Standard for Performance-Rated Cross-Laminated Timber** 602.4
ASTM C920—2018	**Standard for Specification for Elastomeric Joint Sealants** 703.9
ASTM C1002—20	**Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs** 722.7.2.2
ASTM D3498—19a	**Standard Specifications for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) toWood Based Floor Systems** 703.9
ASTM D7032—2021	**Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite and Plastic Lumber Deck Boards, Stair Treads, Guards and Handrails** 703.9, 705.2.3.1
ASTM E84—21a	**Standard Test Methods for Surface Burning Characteristics of Building Materials** 202, 602.4.1.1, 602.4.2.1, 602.4.3.1,
ASTM E119—20	**Standard Test Methods for Fire Tests of Building Construction and Materials** 703.8
ASTM E1354—2017	**Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products using an Oxygen Consumption Calorimeter** 602.4.1.1, 602.4.2.1, 602.4.3.1
NFPA 275—22	**Standard Method of Fire Tests for the Evaluation of Thermal Barriers** 508.4.4.1, 509.4.1
NFPA 701—23	**Standard Methods of Fire Tests for Flame Propagation of Textiles and Films** 3102.3, 3102.6.1.1
UL 263—2011	**Fire Tests of Building Construction and Materials – with Revisions through August 2021** 703.8
UL 723—2018	**Standard for Test for Surface Burning Characteristics of Building Materials** 602.4.1.1, 602.4.2.1, 602.4.3.1

APPENDIX D
FIRE DISTRICTS

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

SECTION D102
BUILDING RESTRICTIONS

D102.2.5 Structural fire rating. Walls, floors, roofs and their supporting structural members shall be a minimum of 1-hour fire-resistance-rated construction.

Exceptions:

1. Buildings of Type IV-HT construction.
2. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
3. Automobile parking structures.
4. Buildings surrounded on all sides by a permanently open space of not less than 30 feet (9144 mm).
5. Partitions complying with Section 603.1, Item 11.

The following sections are from the 2024 International Fire Code (IFC)

CHAPTER 33
SAFEGUARDS DURING CONSTRUCTION

[F] SECTION 3315
Fire safety requirements for buildings of Types IV-A, IV-B, and IV-C construction

[F] 3315.1 Fire safety requirements for buildings of Types IV-A, IV-B, and IV-C construction. Buildings of Types IV-A, IV-B, and IV-C construction designed to be greater than six stories above grade plane shall comply with the following requirements during construction unless otherwise *approved* by the *fire code official*.

1. Standpipes shall be provided in accordance with Section 3313.

2. A water supply for fire department operations, as approved by the *fire code official* and the *fire chief*.

3. Where building construction exceeds six stories above *grade plane*, and noncombustible protection is required by Section 602.4, at least one layer of noncombustible protection shall be installed on all building elements on floor levels, including mezzanines, more than four levels below active mass timber construction before additional floor levels can be erected.

   Exceptions:
   1. *Shafts* and vertical exit enclosures shall not be considered a part of the active mass timber construction.
   2. Noncombustible material on the top of mass timber floor assemblies shall not be required before erecting additional floor levels.

4. Where building construction exceeds six stories above *grade plane* required *exterior wall coverings* shall be installed on all floor levels, including mezzanines, more than 4 floor levels below active mass timber construction before additional floor levels can be erected.

   Exception: *Shafts* and vertical exit enclosures shall not be considered a part of active mass timber construction.

CHAPTER 80
REFERENCED STANDARDS

This guide includes mass timber sections of the 2024 IFC. Therefore, references provided here are limited to these mass timber specific sections provided in this guide.

NFPA 241—22 **Standard for Safeguarding Construction, Alteration and Demolition Operations** 3301.1, 3303.2

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