Mass Timber Construction
Innovation in Code Development

May 2024

Ministry of Housing

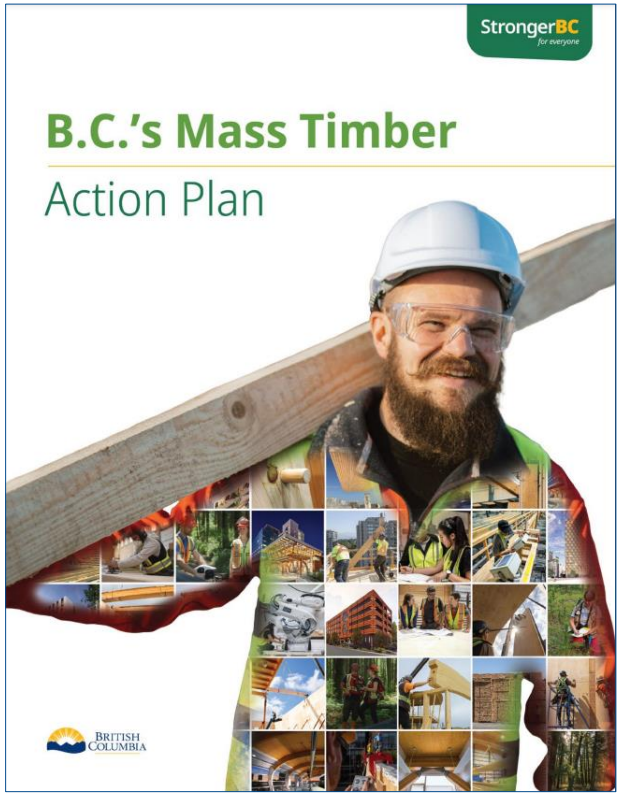
Aman Gill, Director, Policy & Legislation
Ministry of Housing

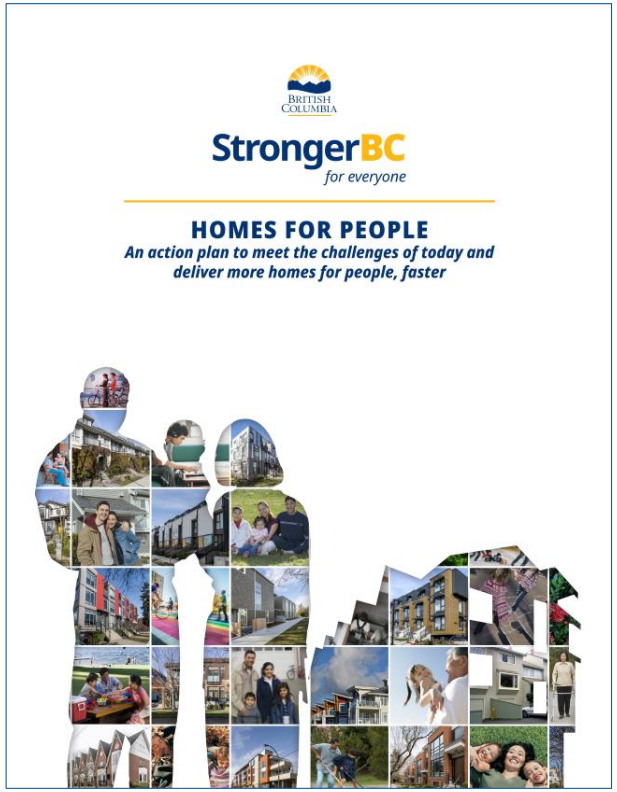
Cameron McDonald, Senior Technical Lead
Office of Mass Timber Implementation

Outline

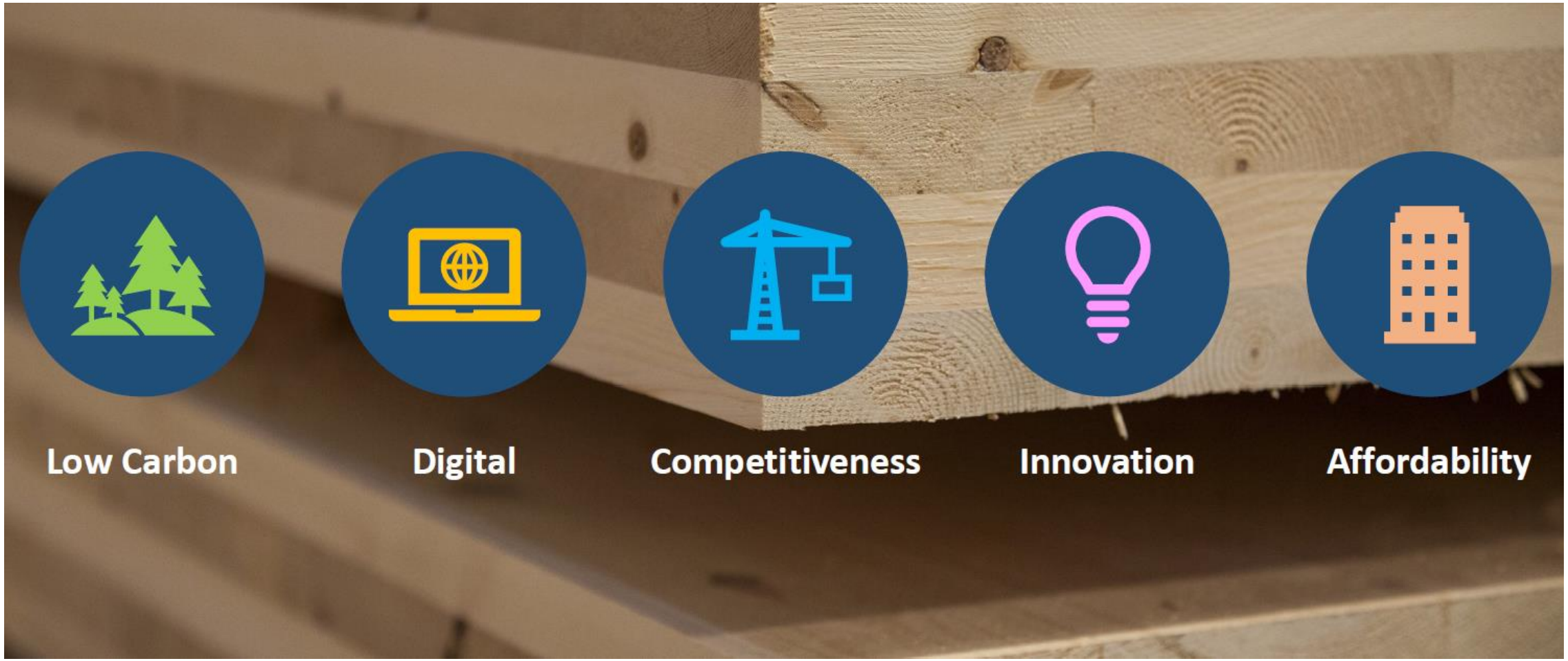
- Why it’s important to expand the role of mass timber in construction
- An overview of the process to develop the recent code changes
- A description of the new code changes

Policy Drivers





Provincial and National Interests



Innovative Approach – PT-led “Harmonized Variations”

Harmonized Variations

- Parallel to National Model Codes process
- Not taking resources out of National system
- Accelerate process … 12 to 18 months, versus several years
- Code content is available to all PTs for early adoption ahead of anticipated inclusion in 2030 National Code

Pan-Canadian Approach – BC and Quebec co-chair Joint Task Group (JTG)

- Develop code content for new mass timber permissions into the National Model Codes

Expert Technical Advisory Group – a subcommittee of JTG with mandate to:

- Examine transferability of IBC into National Model Codes
- Identify areas for more research
- Targeted engagement
- Generate code content and make recommendations to JTG


Benefits

- Opportunity for PTs with a policy mandate, a pathway to adopt a code change prior to full implementation in the National Codes

- Maximizes timely development of priority code changes without requiring national technical committees to drop current priority work

- Supports harmonization by creating a consistent pan-Canadian approach, providing some assurance that National Codes will follow similar direction


Scope of Code Changes

Taller than current 12-storey limit

- Up to 18-storeys

More occupancies – beyond just residential and office (Group C & D)

- A2 (assembly)
- B3, (care)
- E (mercantile)
- F2, F3 (medium- and low-hazard industrial)

More exposed mass timber or fewer layers of encapsulation

- based on height and use of a building


Consultation

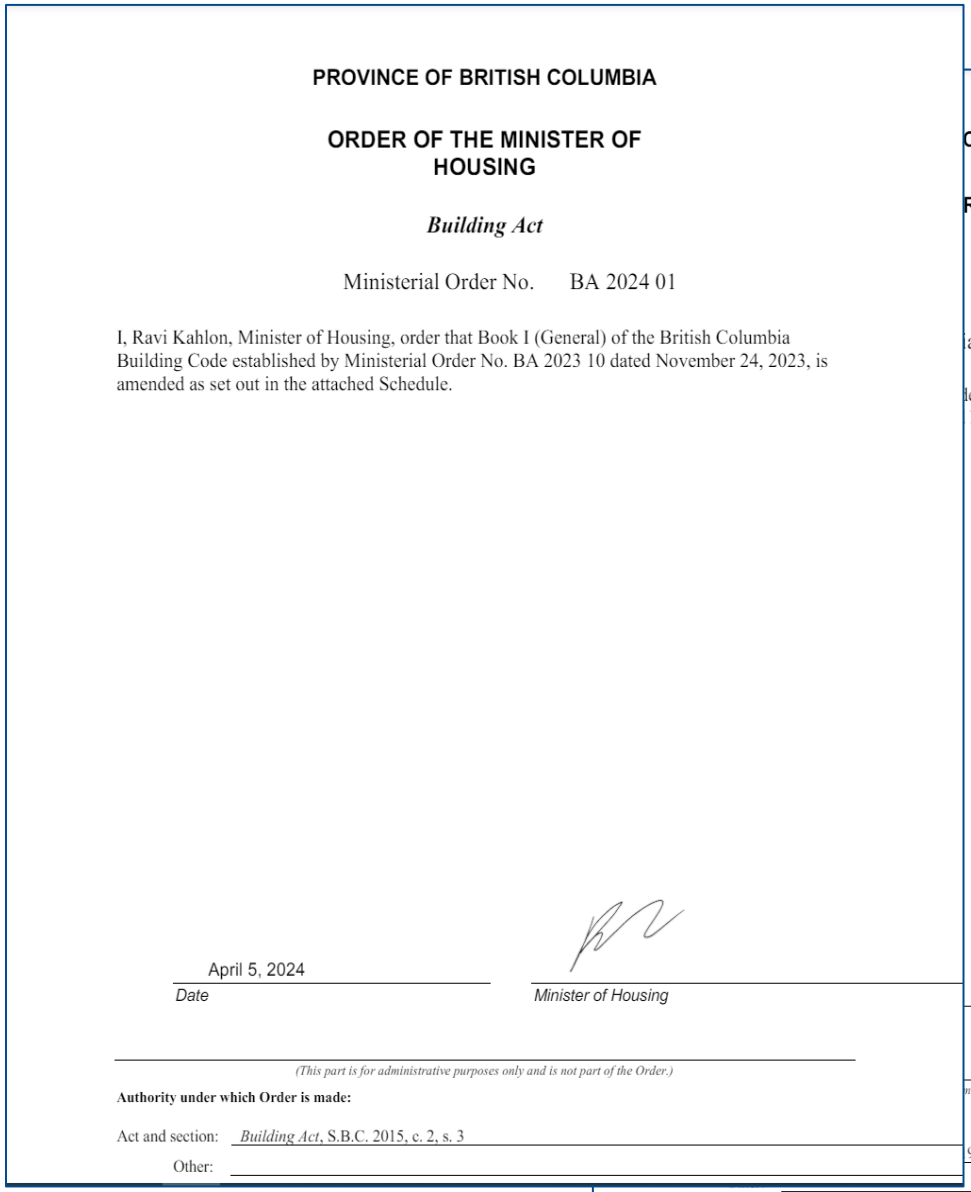
- 10-week national public review coordinated through CBHCC, webinar, news release and emails to ~5,000 code users in BC; promotion of review by Ontario and Quebec

- 124 written submissions, 66% from BC and 30% from ON
  - 48% from designers/architects/engineers
  - 21% from building/fire/plumbing officials
  - 18% from fire chiefs and fire fighters

- 85% supported the code changes as is or with modifications

BC Building and Fire Code Revision 1

- ✓ **Taller Buildings**
- ✓ **New Building Types**
- ✓ **More Exposed Mass Timber**



PROVINCE OF BRITISH COLUMBIA

ORDER OF THE MINISTER OF HOUSING

Building Act

Ministerial Order No. BA 2024 01

I, Ravi Kahlon, Minister of Housing, order that Book I (General) of the British Columbia Building Code established by Ministerial Order No. BA 2023 10 dated November 24, 2023, is amended as set out in the attached Schedule.

April 5, 2024
Date

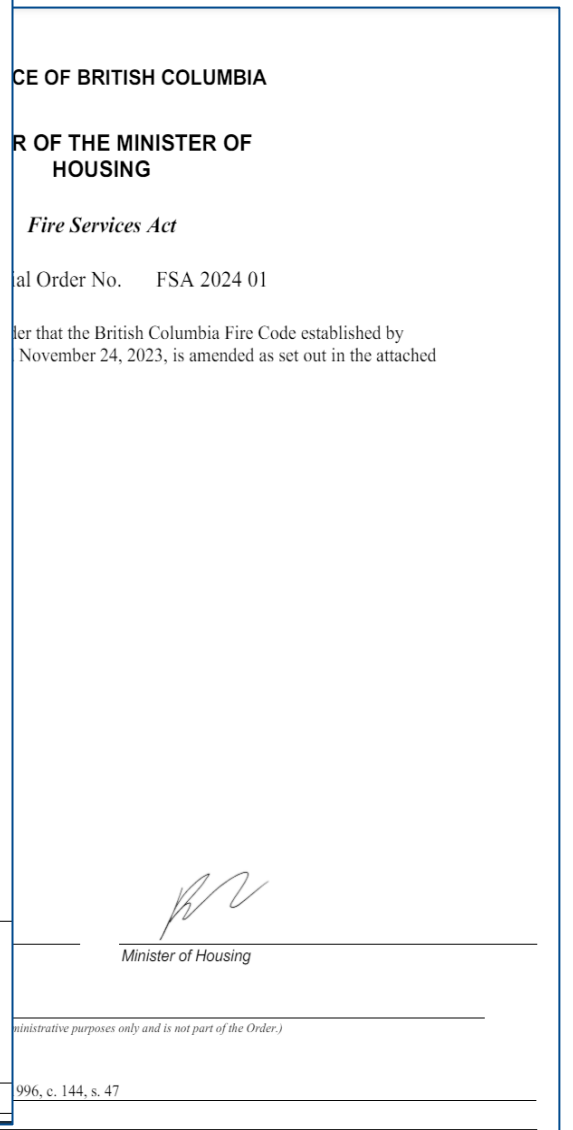
Minister of Housing

(This part is for administrative purposes only and is not part of the Order.)

Authority under which Order is made:

Act and section: *Building Act*, S.B.C. 2015, c. 2, s. 3

Other:



CE OF BRITISH COLUMBIA

R OF THE MINISTER OF HOUSING

Fire Services Act

ial Order No. FSA 2024 01

ler that the British Columbia Fire Code established by November 24, 2023, is amended as set out in the attached

Minister of Housing

inistrative purposes only and is not part of the Order.)

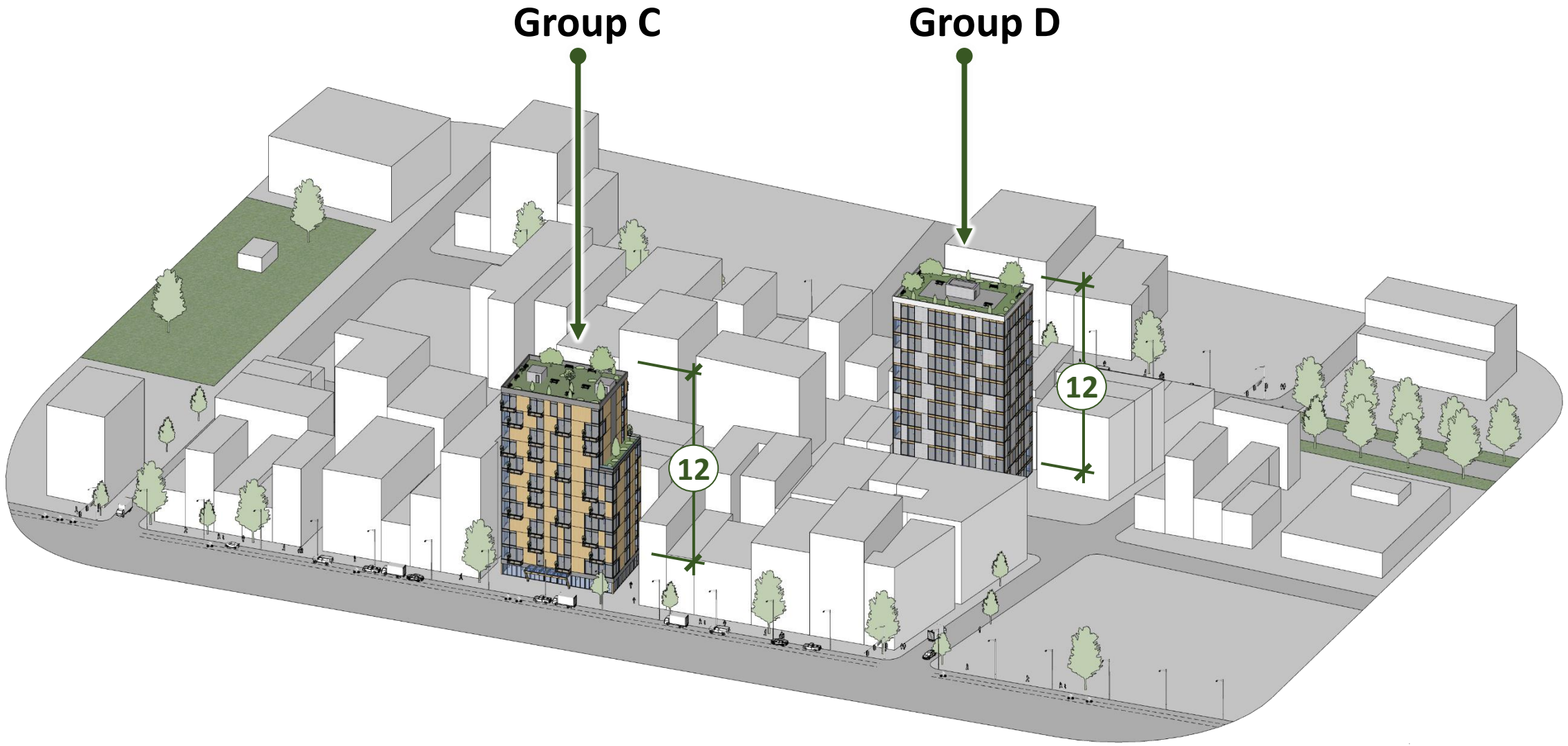
996, c. 144, s. 47

Code Revisions for EMTC

BCBC 2024 Revision 1 - EMTC

Ministry of Housing

Previously Permitted EMTC Buildings



Permitted EMTC Buildings Now

Under 2024 BCBC, Revision 1

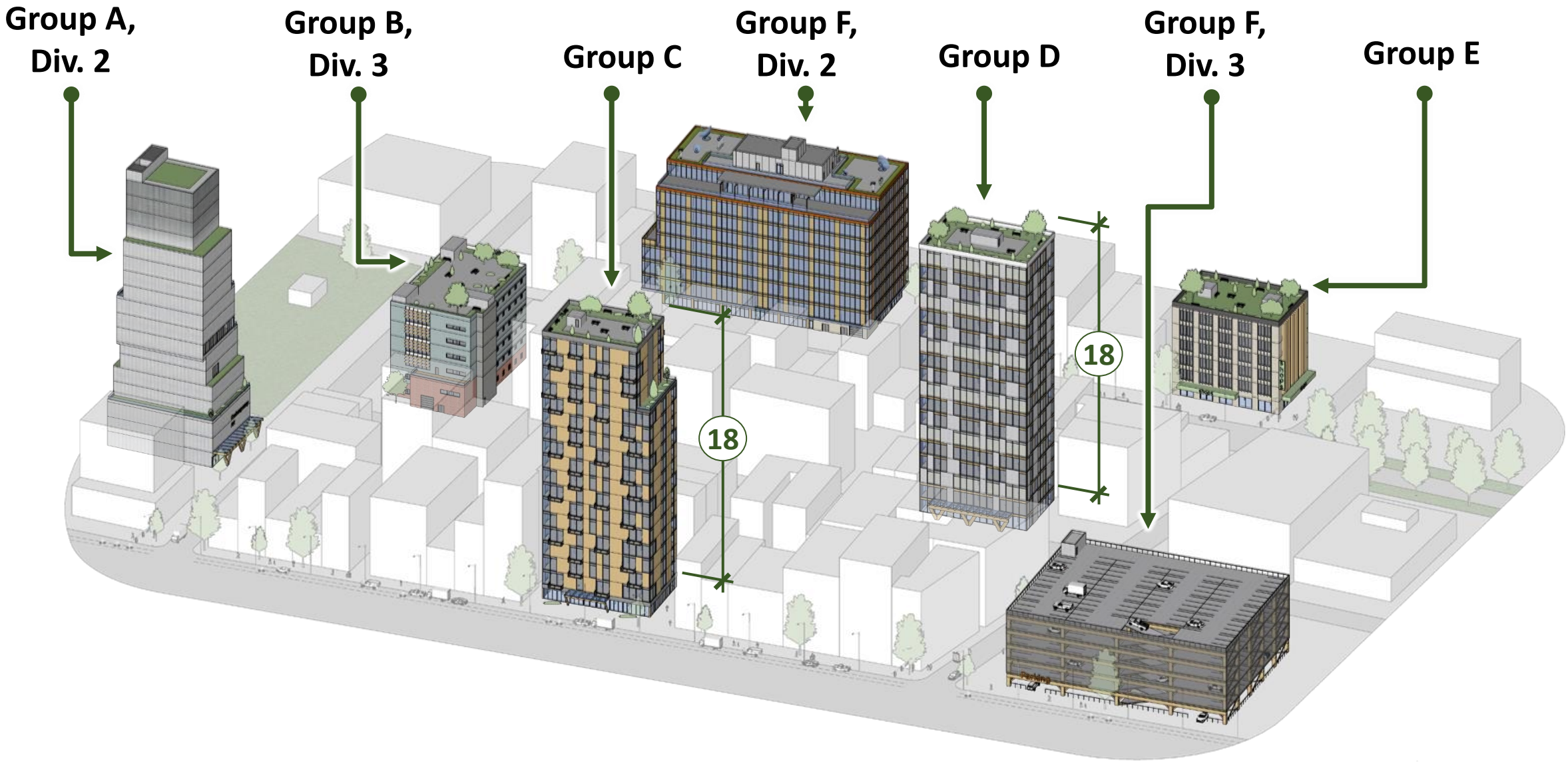



Table 3.2.2.93.
– Forming part of Sentence 3.2.2.93.(1).

Major Occupancy	Max. Height, Storeys	Max. Height, m	Max. Area, m^2	Minimum Encapsulation Rating, min
A-2	18	76	7200	70
	12	51		50
	6	26		0
B-3	10	42	8000	70
	6	26		50
	4	17		0
C	18	76	6000	70
	8	34		0
D	18	76	7200	70
	9	38		0
E	12	51	6000	70
	8	34		50
	6	26		0
F-2	10	42	4500	70
	7	30		50
	5	21		0
F-3	12	51	7200	70
	8	34		50
	5	21		0


Article 3.2.2.93. provisions

- 2 hr floor assembly fire separations
- Relaxations for various occupancy combinations are similar to existing Articles
  - Commercial space (E) or storage garage permitted on lower floors of A2, C or D
  - A2 permitted on lower floors of C or D
  - F2 or F3 permitted on lower floors of D

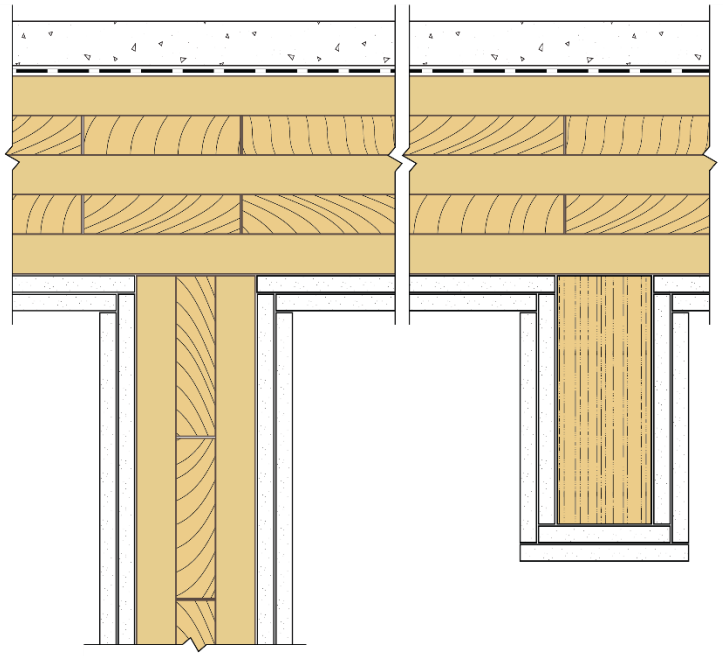
TABLE 1 (SECTION 4.5)

MAXIMUM PERMISSIBLE HEIGHTS OF BUILDINGS FOR A GIVEN OCCUPANCY CLASSIFICATION

Note: The more restrictive requirement, either *height* in feet or in *storeys*, shall govern.

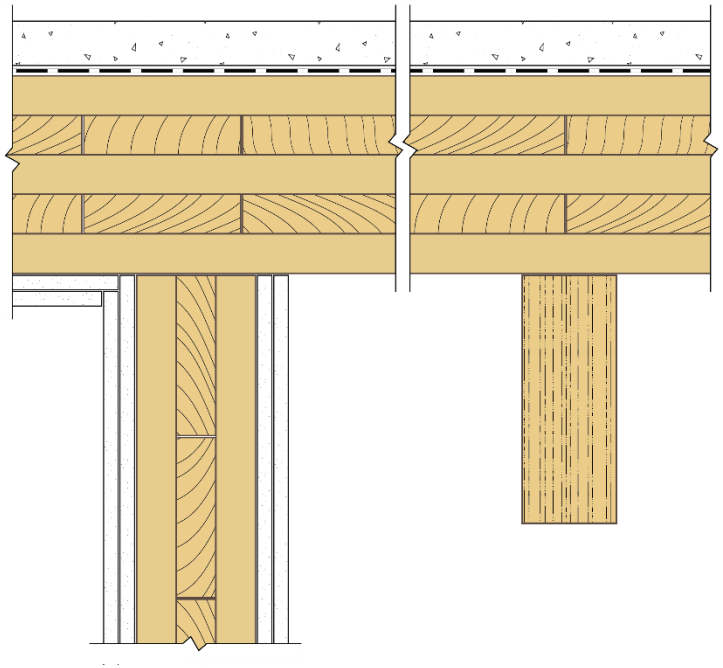
Occupancy Group	Division of Occupancy Group (See Art. 4.2.1 for full details)		Types of Construction						
			1A Fire Resistive	1B Fire Resistive	1C Fire Resistive	2 Heavy Timber	3 Masonry and Frame	4 Wood Frame	5 Unprotected Metal or Fire-retardant treated Wood
A	1	*Theatres* and *motion picture theatres*[d]	Unlimited	75 ft.[a]	45 ft.[a] 3 *storeys*	45 ft. 3 *storeys*	35 ft. 2 *storeys*	35 ft. 1 *storey*	35 ft. 1 *storey*
	2	Auditoriums, community halls, etc., including non-residential colleges and schools[c]	Unlimited	75 ft.[a]	55 ft.[a] 4 *storeys*	55 ft. 4 *storeys* [b]	45 ft. 3 *storeys*	35 ft. 1 *storey*	1 *storey*
B	1	Asylums, jails, etc.	Unlimited	75 ft.	Not permitted				
	2	Children's shelters, hospitals, etc.	Unlimited	75 ft.	45 ft. 3 *storeys*	45 ft. 3 *storeys*	35 ft. 2 *storeys*	35 ft. 1 *storey*	1 *storey*
C	1	Dry-cleaning plants employing flammable or explosive solvents	1 *storey*	1 *storey*	Not permitted				
	2	High hazard industrial occupancies	75 ft.[g]	75 ft.	45 ft. 3 *storeys*	45 ft. 3 *storeys*	35 ft. 2 *storeys*	25 ft. 1 *storey*	1 *storey*
	3	Medium hazard industrial and commercial occupancies excluding office buildings	Unlimited	75 ft.	75 ft.[e]	55 ft. 4 *storeys*	45 ft. 3 *storeys*	35 ft. 2 *storeys*	1 *storey*
		Office buildings	Unlimited	Unlimited	75 ft.	75 ft.	55 ft. 4 *storeys*	35 ft. 2 *storeys*	1 *storey*
	4	Low hazard industrial occupancies	Unlimited	Unlimited	75 ft.	75 ft.	55 ft. 4 *storeys*	35 ft. 2 *storeys*	1 *storey*
D	1	Convents, dormitories, etc.	Unlimited	Unlimited	55 ft. 4 *storeys*	55 ft.[b] 4 *storeys*	45 ft.[b] 3 *storeys*	35 ft. 1 *storey*	1 *storey*
	2	Apartment houses, *hotels*, etc.	Unlimited	Unlimited	75 ft.[e] 6 *storeys*	55 ft. 4 *storeys*	45 ft. 3 *storeys*	35 ft.[h] 2 *storeys*	1 *storey*
	3	*One-* and *two-family dwellings*	Unlimited	Unlimited	55 ft. 4 *storeys*	55 ft. 4 *storeys*	45 ft. 3 *storeys*	40 ft. 3 *storeys*	1 *storey*
E	1	Open sheds, *private* barns, *garages*, etc.	Unlimited	Unlimited	55 ft.	55 ft.	45 ft.	20 ft.	45 ft.
	2	Towers, water tanks	Unlimited	Unlimited	Unlimited				
	3	Stands and stadiums, etc.	Unlimited	Unlimited	55 ft.	55 ft.	45 ft.	35 ft.[f]	45 ft.

Encapsulation Ratings



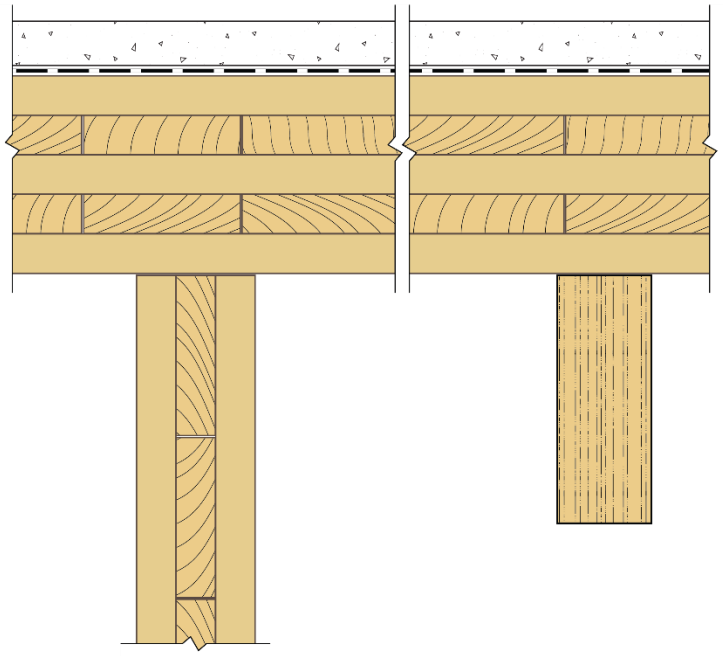
70 min

Fully Encapsulated



50 min

Current Provisions



0 min

No Encapsulation


3.1.6.4.(1) Encapsulation of Mass Timber Elements

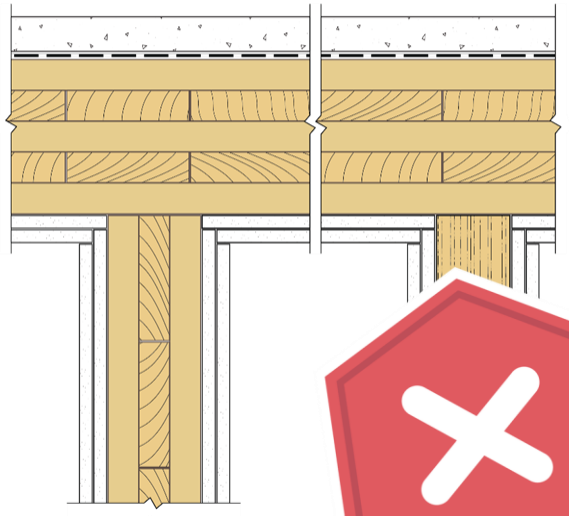
3.1.6.4. Encapsulation of Mass Timber Elements

(See also Note A-3.1.6.3.)

1) Except as provided in Sentences (3) to (9), 3.1.6.3.(4), 3.1.6.16.(2) and 3.1.6.17.(2), and Articles 3.1.6.7. and 3.1.6.12., the exposed surfaces of structural mass timber elements conforming to Article 3.1.6.3. shall be protected from adjacent spaces in the *building*, including adjacent concealed spaces within wall, floor and roof assemblies, by a material or assembly of materials conforming to Sentence (2) that provides an *encapsulation rating* that

a) is not less than 50 minutes in a *building* or part of a *building* constructed in conformance with Article 3.2.2.48. or 3.2.2.57., or

b) conforms to the minimum values stated in Table 3.2.2.93. for the applicable *major occupancy* and *building height*.



70 min

Fully Encapsulated


3.1.6.4.(3) to (7) Encapsulation Relaxations

Sentence (3) – Beams, columns and arches

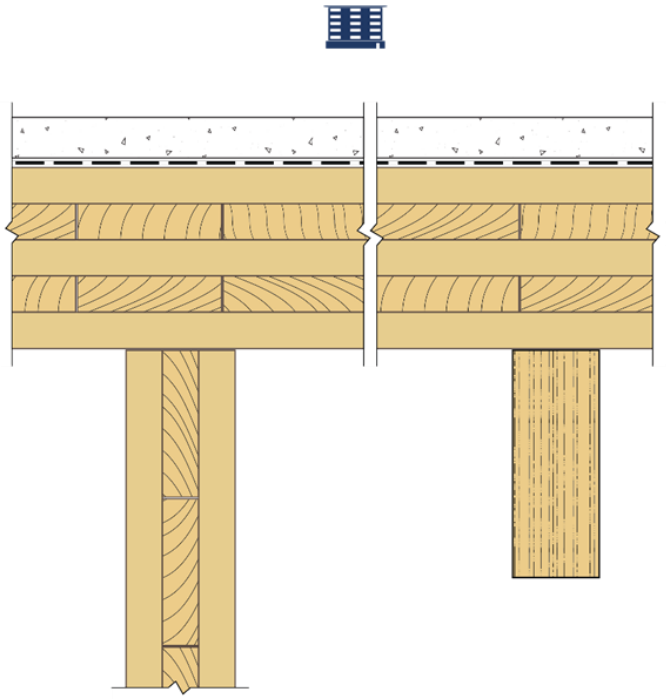
Sentence (4) - Walls

Sentence (6) & (7) - Ceilings

- "Give and take" – More exposure in one place could mean less in another (caps on maximum aggregate exposure)
- Only applies to buildings assigned a 50-minute encapsulation rating
- Appendix note clarified regarding calculation of "total wall area of the perimeter of a suite or fire compartment"

Images: KK Law, Derek Lepper Photography, Courtesy NaturallyWood.com

3.1.6.4.(8) & (9) More Encapsulation Relaxations



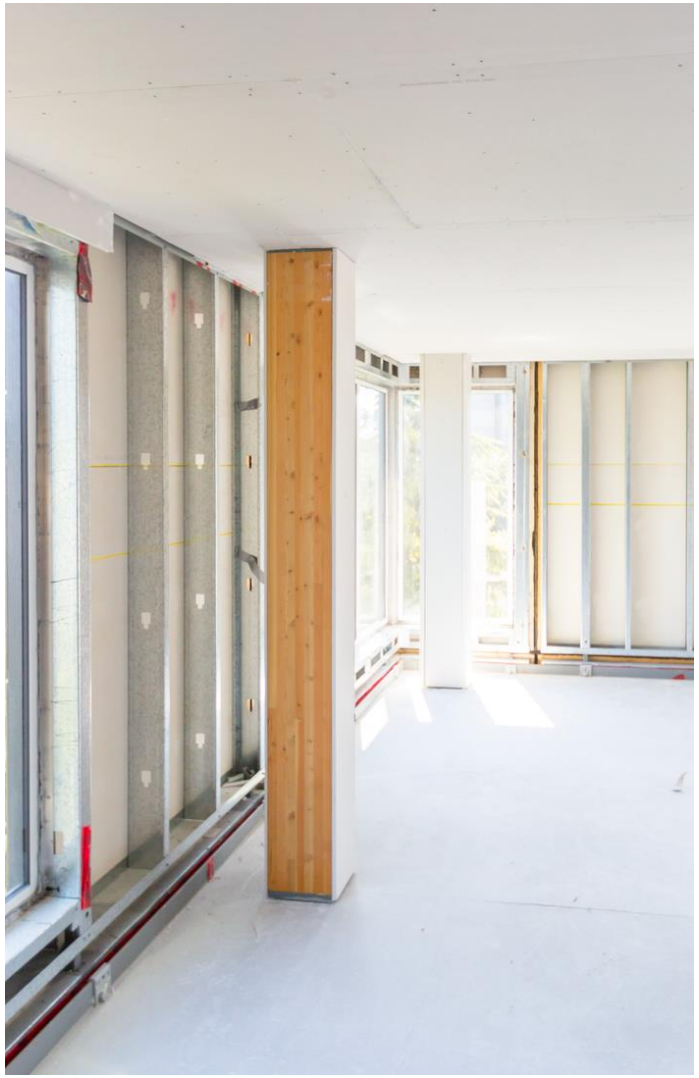
0 min

No Encapsulation…. mostly

- **Sentence (8)** - 0-minute buildings waived from encapsulation requirements, except that vertical service spaces, exits and public corridors must still be encapsulated to 25 min on the *interior*
- **Sentence (9)** – 70-minute buildings only require a 50-minute rating on upper surface of floors

3.1.6.6. Encapsulation Materials

- Prescriptive provisions to achieve encapsulation rating:
  - **25 min**: 1 layer ½” Type X GWB
  - **50 min**: 2 layers ½” Type X GWB, 1½” Concrete or Gypsum-concrete floor topping
  - **70 min**: 2 layers ⅝” Type X GWB
  - **80 min**: 3 layers ½” Type X GWB



Does Encapsulation Work?

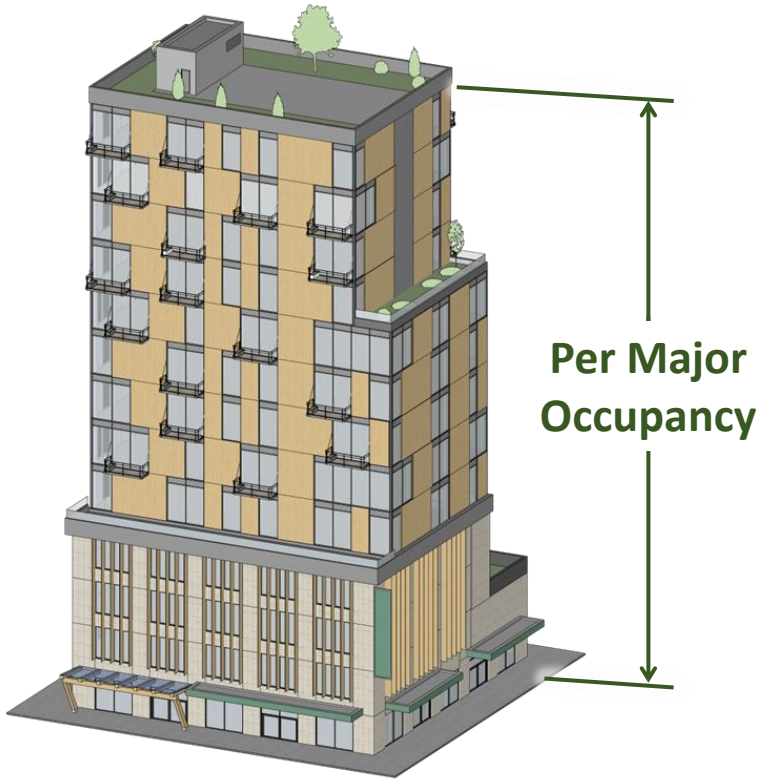
Before (3 layers ½” GWB applied)

After 2-hour fire test

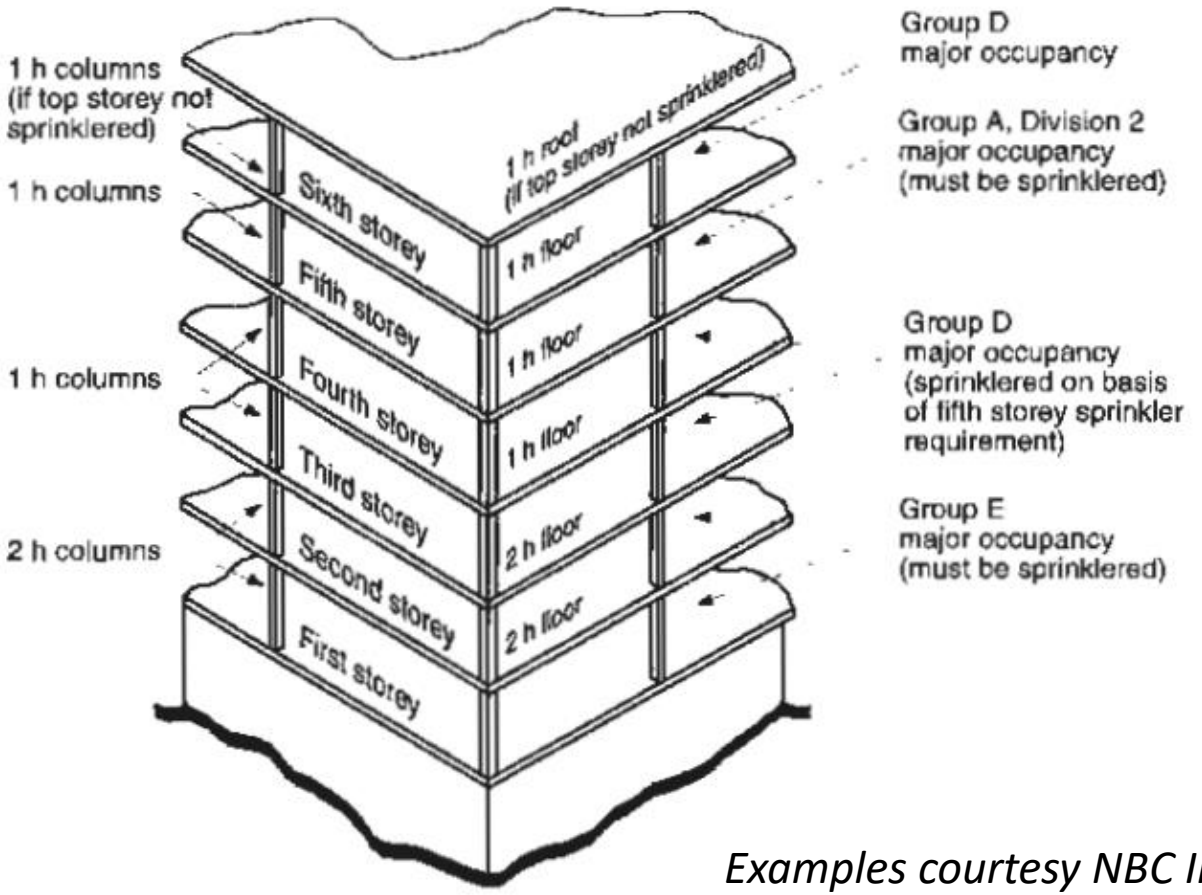
Combustible Cladding Permissions

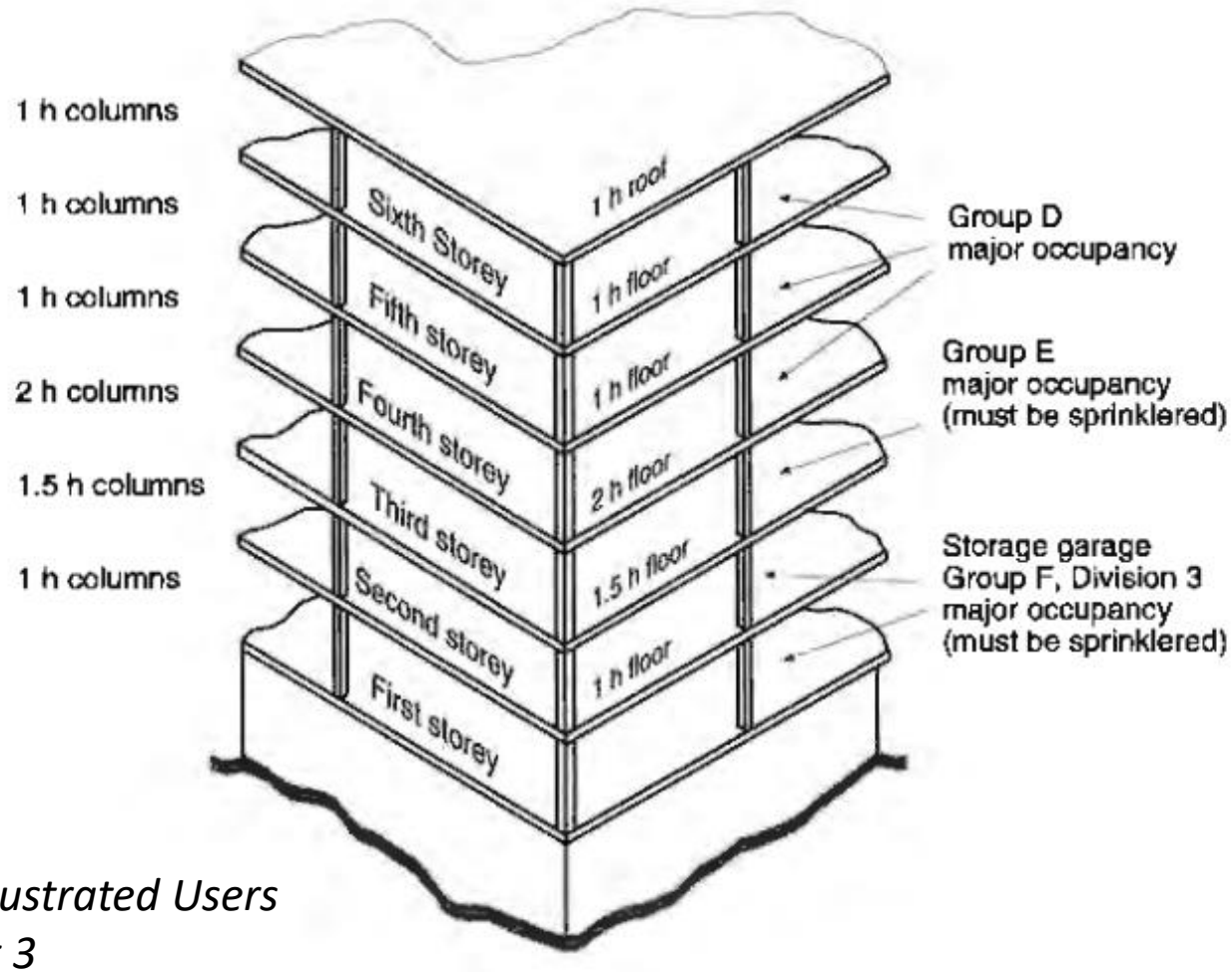
Building Height, Storeys	Non-Combustible	Current EMTC Cladding	Current 3.1.4.8. Cladding	Combustible Cladding
1–4	✓	✓	✓	✓
5–6	✓	✓	✓	⊘
7–12	✓	✓	⊘	⊘
13+	✓	⊘	⊘	⊘

Mixed Occupancy Type



Mixed Major Occupancies





Examples courtesy NBC Illustrated Users Guide to Part 3


Mixed Encapsulation Rating

3.2.2.6. Multiple Major Occupancies

2) In a *building* or part of a *building* constructed in conformance with Article 3.2.2.48., 3.2.2.57. or 3.2.2.93. containing more than one *major occupancy*, the most restrictive encapsulation requirements of Article 3.1.6.4. and Table 3.2.2.93. for any *major occupancy* contained within a *storey* shall apply to the encapsulation required on the interior of a *public corridor* or *exit* within that *storey*.

3.2.2.7. Superimposed Major Occupancies

3) In a *building* or part of a *building* constructed in conformance with Article 3.2.2.48., 3.2.2.57. or 3.2.2.93., if one *major occupancy* is located above another *major occupancy*,

a) the most restrictive encapsulation requirements of Article 3.1.6.4. and Table 3.2.2.93. for any *major occupancy* contained within the *building* shall apply to the encapsulation required on the interior of *vertical service spaces* and *exit* stairs, and

b) the encapsulation requirements of Article 3.1.6.4. and Table 3.2.2.93. for a mass timber floor assembly between the *major occupancies* shall be determined on the basis of the requirements for

i) the upper *major occupancy* for the encapsulation of the upper surface of the mass timber floor assembly, and

ii) the lower *major occupancy* for the encapsulation of the underside of the mass timber floor assembly.


Mixed Encapsulation Ratings – Example 1

MAJOR OCCUPANCY	MAX. *BUILDING HEIGHT, STOREYS*	MAX. HEIGHT, m	MAX. *BUILDING AREA*, m^2	MINIMUM *ENCAPSULATION RATING*, min
A-2	18	76	7200	70
	12	51		50
	6	26		0
B-3	10	42	8000	70
	6	26		50
	4	17		0
C	18	76	6000	70
	8	34		0
D	18	76	7200	70
	9	38		0
E	12	51	6000	70
	8	34		50
	6	26		0
F-2	10	42	4500	70
	7	30		50
	5	21		0
F-3	12	51	7200	70
	8	34		50
	5	21		0

5 Upper Storeys B-3 – 50 min

Main Floor E – 0 min

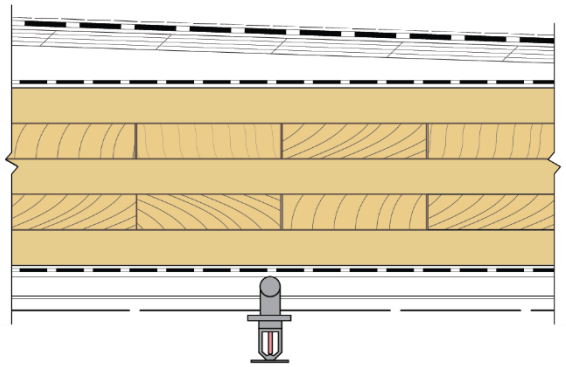

Mixed Encapsulation Ratings – Example 2

MAJOR OCCUPANCY	MAX. *BUILDING HEIGHT, STOREYS*	MAX. HEIGHT, m	MAX. *BUILDING AREA*, m^2	MINIMUM *ENCAPSULATION RATING*, min
A-2	18	76	7200	70
	12	51		50
	6	26		0
B-3	10	42	8000	70
	6	26		50
	4	17		0
C	18	76	6000	70
	8	34		0
D	18	76	7200	70
	9	38		0
E	12	51	6000	70
	8	34		50
	6	26		0
F-2	10	42	4500	70
	7	30		50
	5	21		0
F-3	12	51	7200	70
	8	34		50
	5	21		0

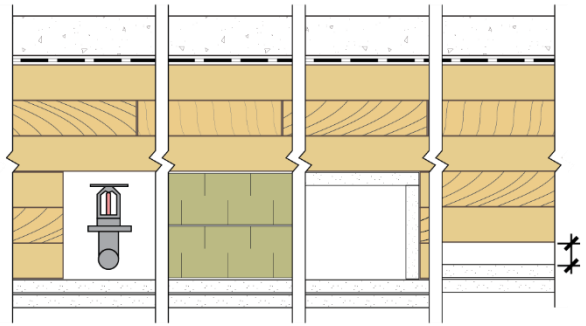
3 Upper Storeys D – 0 min

6 Lower Storeys F-2 – 70 min

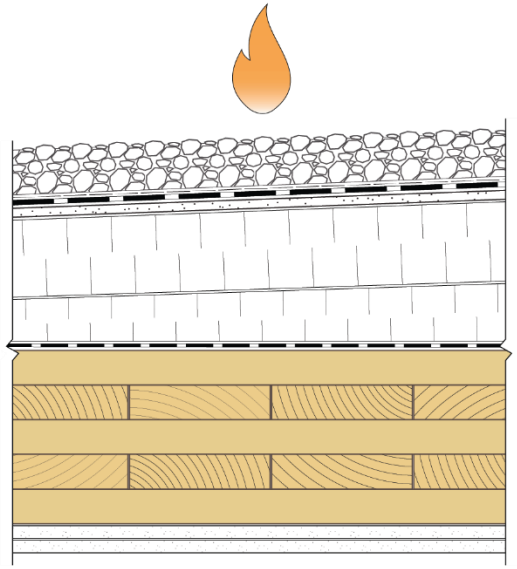
Existing Protective Provisions



Fully Sprinklered, Including Balconies



Protection of Concealed Spaces



Class A Roof Coverings

High Buildings

BC Fire Code, Revision 1

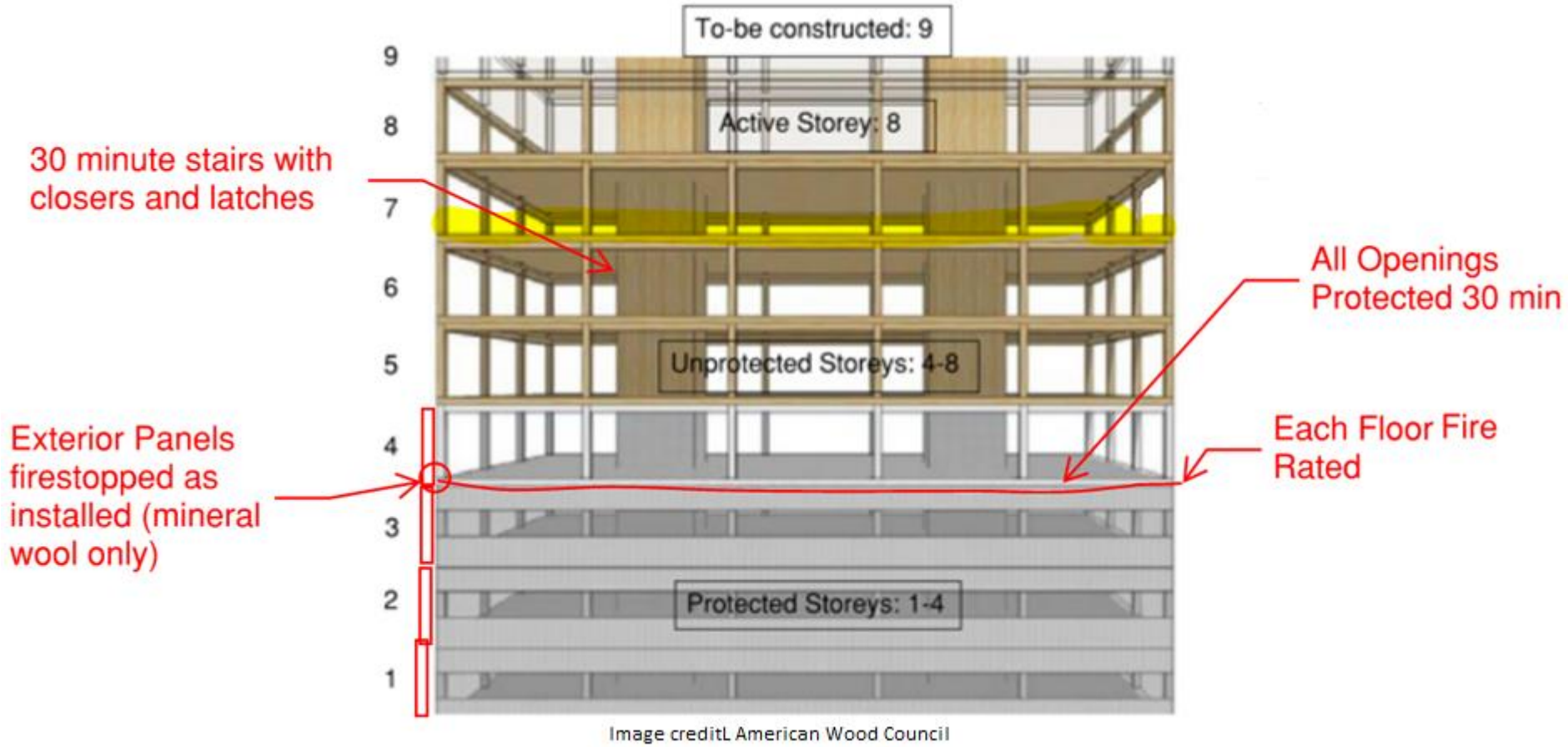


Image creditL American Wood Council

Fire Protection Other Than "Encapsulate as You Go"

Technical Content Summary

- Expanded occupancy types: **A-2, B-3, E, F-2 and F-3**, in addition to C and D
- Greater heights: Up to **18-storey** provisions for certain occupancies
- Three “tiers” of assigned **encapsulation rating** and varying levels of permitted **combustible cladding**, to ensure safety provisions are commensurate with individual building risk, including:
  - fully encapsulated, 70-minute encapsulation rating tall wood buildings with NC cladding
  - Nearly fully exposed, 0-minute rated buildings with combustible cladding in low rise buildings

For More Information Please Visit:

www.gov.bc.ca/buildingcodes

BRITISH COLUMBIA

Ministry of Housing