Canadian Wood Council

Conseil canadien du bois

Richmond, BC
November 2013
BOABC Education Conference

5- and 6-storey Wood Buildings: National Code Change Proposals and Research

Ineke Van Zeeland
Manager, Codes & Standards

Canadian Wood Council

National Federation of Associations

Wood Preservation Canada
Préservation du bois Canada

The Canadian Wood Truss Association
Association Canadienne des Fabricants de Fermes de Bois

Canadian Wood Council

Represents Over 1000 Manufacturers

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Outline

- Review of proposed changes to heights and areas requirements
- NRC/CWC/FPInnovations midrise wood construction research project
- Component Additive Method proposals and other activities

Division B – Subsection 3.2.2

Building Size and Construction Relative to Occupancy

- 3.2.2.20 to 3.2.2.83
- Combustible Construction, Heavy Timber Construction and Noncombustible Construction

2010 NBCC
Wood Construction

Occupancy Type	No. of storeys	Max. Allowable Building Area[1] (m^2) (unsprinklered)	Max. Allowable Building Area (m^2) (sprinklered)
Residential (Group C)	1	2400	7 200
	2	1200	3 600
	3	800	2 400
	4	-	1800

1. Facing one street, for buildings with 1hr. FRR. (Increases by 25% if facing two streets and 50% if facing 3 streets.)

Code references:

Unsprinklered – 3.2.2.51

Sprinklered – 3.2.2.50.

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2010 NBCC
Wood Construction

Occupancy Type	No. of storeys	Max. Allowable Building Area[1] (m^2) (unsprinklered)	Max. Allowable Building Area (m^2) (sprinklered)
Business and personal services (Group D)	1	7 200	14 400
	2	3 600	7 200
	3	2 400	4 800
	4	-	3 600

1. Facing three streets, 45-minute FRR

Code references:

Unsprinklered – 3.2.2.58.

Sprinklered – 3.2.2.57. & 3.2.2.59.

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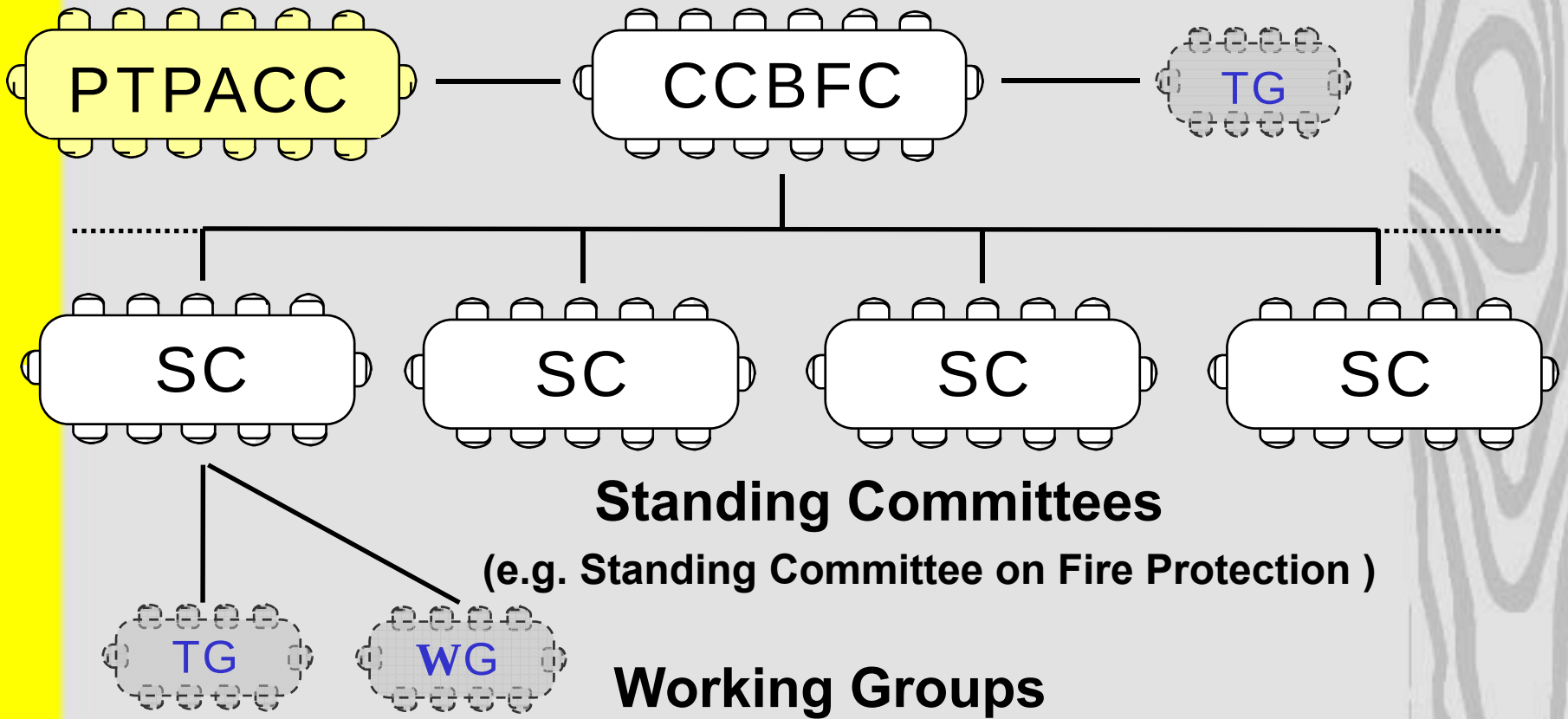
National Code Process



Standing Committees

(e.g. Standing Committee on Fire Protection)

Working Groups

(e.g. Working Group on Reference Standards)

Task Groups

(e.g. Task Group on Foam Plastics)

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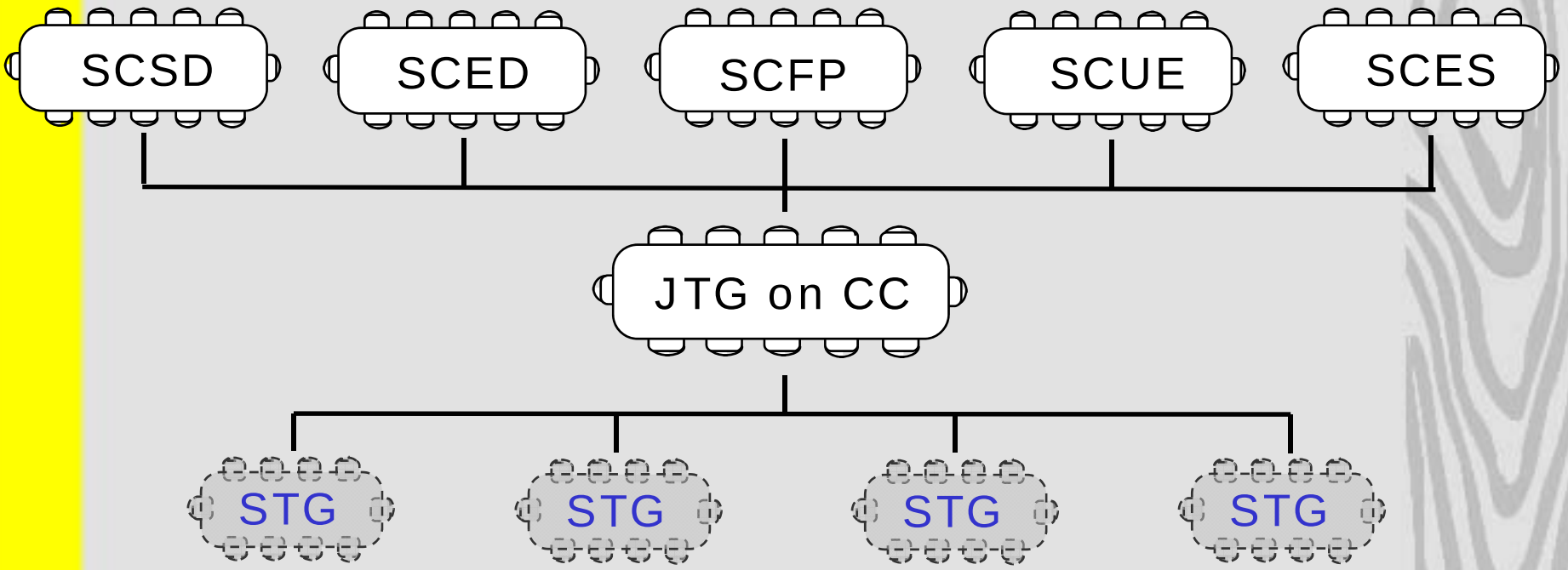
Joint Task Group on Combustible Construction



Sub-Task Group on Fire Code, Construction and Demolition Sites

Sub-Task Group on Structural, Earthquake, and Mechanical Systems

Sub-Task Group on Fire Protection

Sub-Task Group on Building Envelope and Environmental Separation

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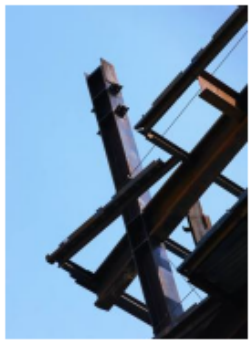
JTG on CC and STGs

Stakeholders

- Regulators, industry reps, general interest groups
- Fire services (CAFC, IAFC, various municipal FS)
- OFM, RBQ, Building and Safety Standards Branch BC
- Construction material industry groups (CWC, CSCC, CCMPA)
- List of 65 concerns addressed

National Code Change Proposals

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Fall 2013 public review on proposed Code changes

The Canadian Commission on Building and Fire Codes (CCBFC) will be conducting its annual public review of proposed changes to the 2010 National Model Construction Codes from **October 15 to December 13, 2013** on the National Codes website.

The purpose of this public review is to provide Code users and stakeholders with a detailed look at changes being considered for inclusion in the 2015 editions of the National Model Construction Codes and seek comment on each one as to whether it should be approved, altered, or rejected. An explanation of the proposed changes, as well as instructions on how to submit comments, will be provided on the website.

The proposed changes in this public review cover a variety of topics, including: mid-rise combustible construction; component additive method for determining fire resistance; hot works hazard reduction; laboratory hazards and dangerous goods storage; stairs, ramps and handrails; accessibility; water use efficiency; ground motions (seismicity design data); energy efficiency for buildings (building envelope; lighting; heating, ventilating and air-conditioning; service water heating); air sound transmission; and exterior insulation and finish systems.

Following the review, CCBFC Standing Committees will consider all comments and make final recommendations on each proposed change. Subject to approval by the CCBFC, the final changes will be published by NRC in the 2015 editions of the National Model Construction Codes.

Please mark your calendars and check the National Codes website to ensure you don't miss this window of opportunity. Alternatively, subscribe to the National Codes Web feed to receive an alert when the public review is launched.

For more information

Contact Anne Gribbon, Secretary to the CCBFC, at anne.gribbon@nrc-cnrc.gc.ca or 613-993-5569.

National Code Change Proposals

- www.nationalcodes.nrc.gc.ca
- October 15 – December ~~13~~ 23, 2013
- Much more than just 5- and 6-storey combustible construction

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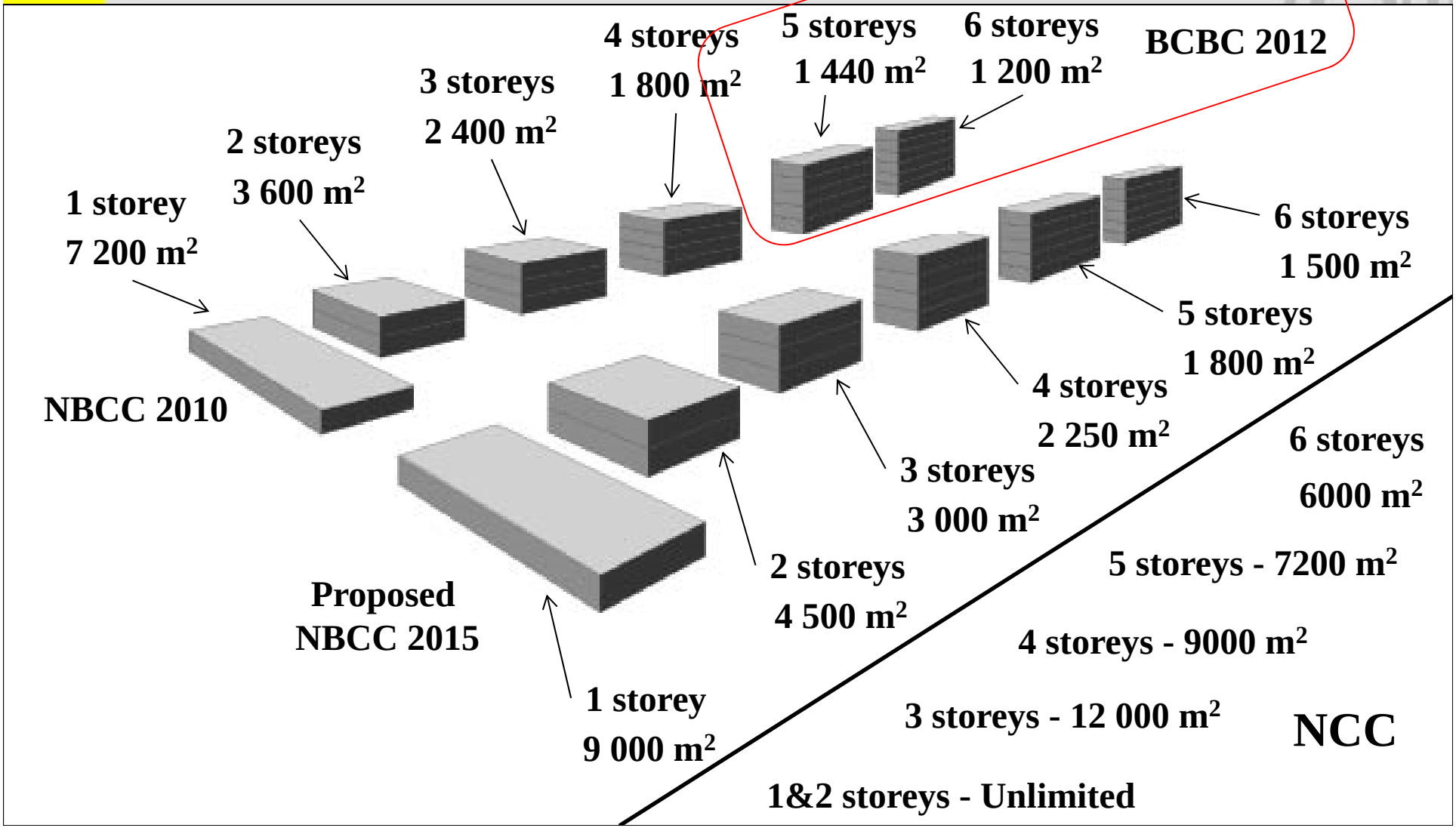
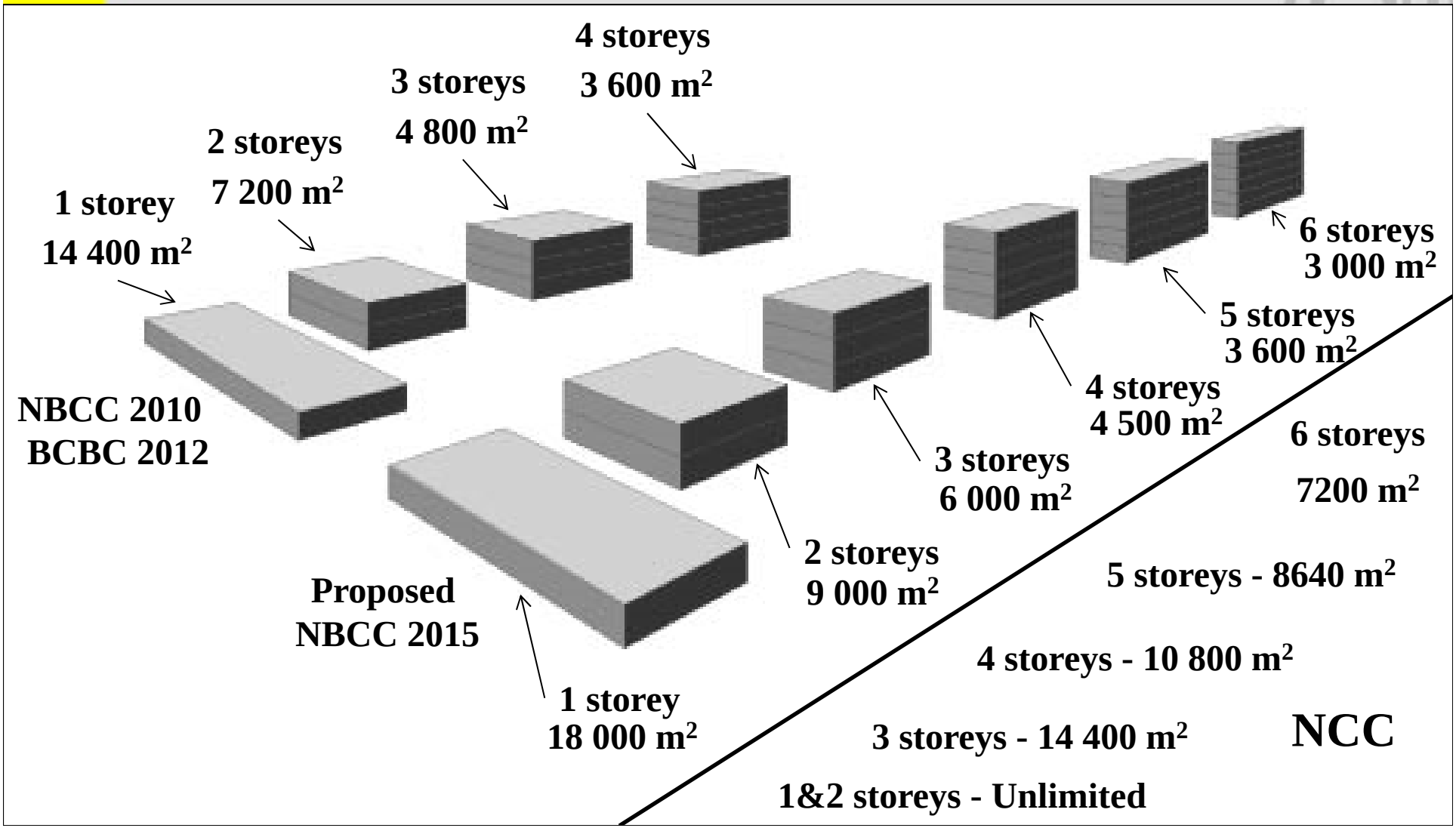
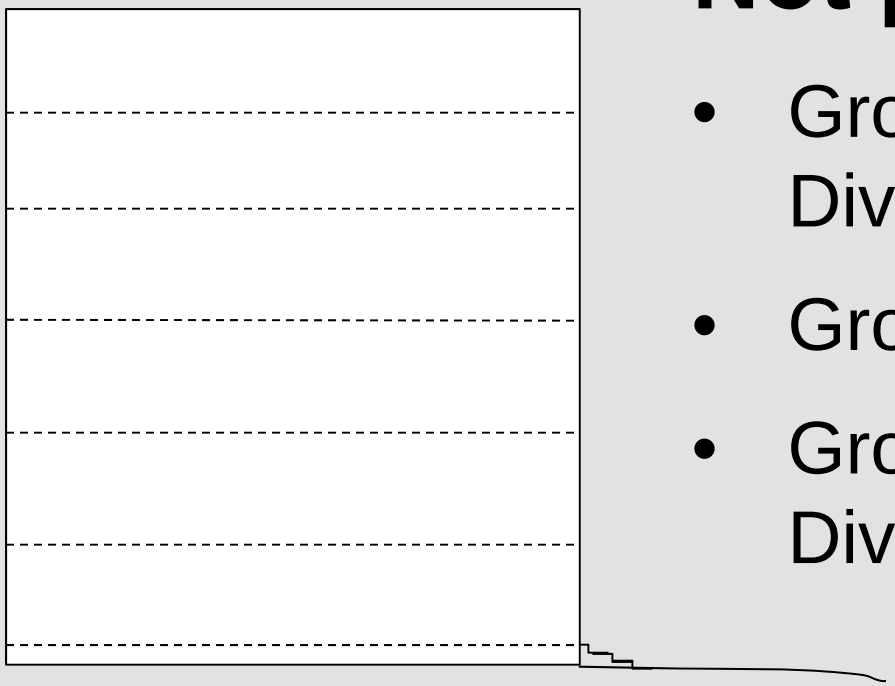
Group C - Residential



Group D – Business and Personal Services



Mixed Uses
Major Occupancies - Group C



Not permitted:

- Group A, Divisions 1 and 3
- Group B
- Group F, Divisions 1 and 2

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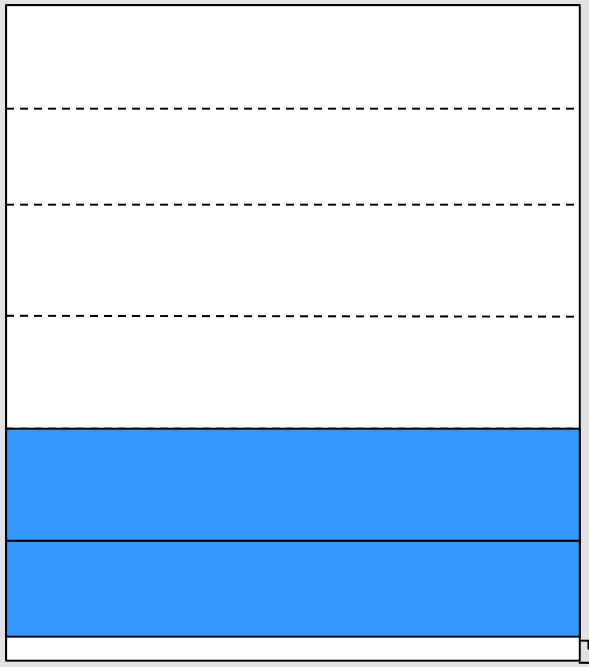
Mixed Uses
Major Occupancies - Group C

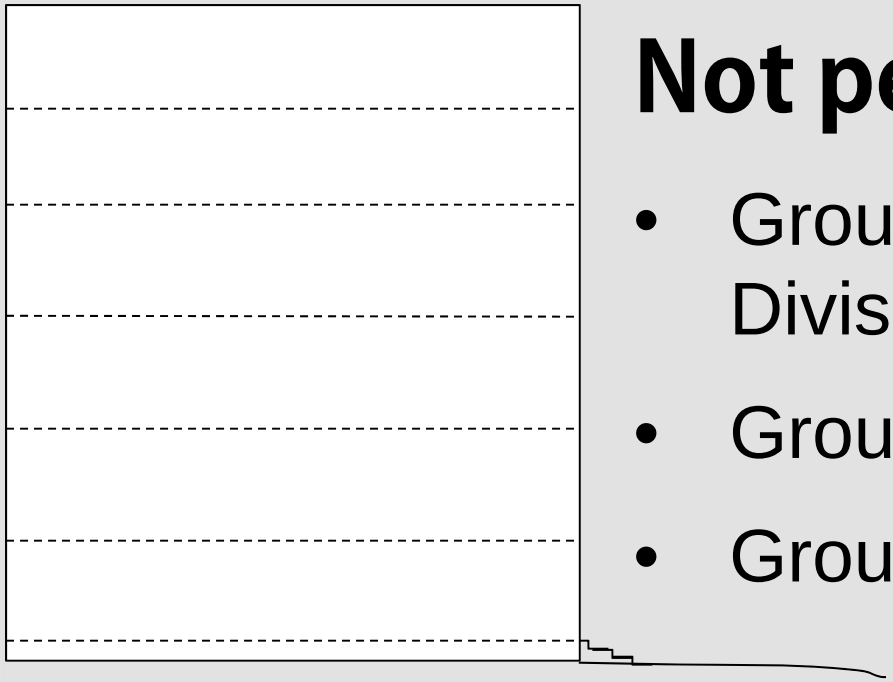


Permitted on 1st and 2nd storey:

- Group A, Division 2
- Group E
- Group F, Division 3 (also permitted on 3rd storey)

- Increased fire-resistance rating for separation between some major occupancies

Mixed Uses
Major Occupancies - Group D



Not permitted:

- Group A, Divisions 1 and 3
- Group B
- Group F, Division 1

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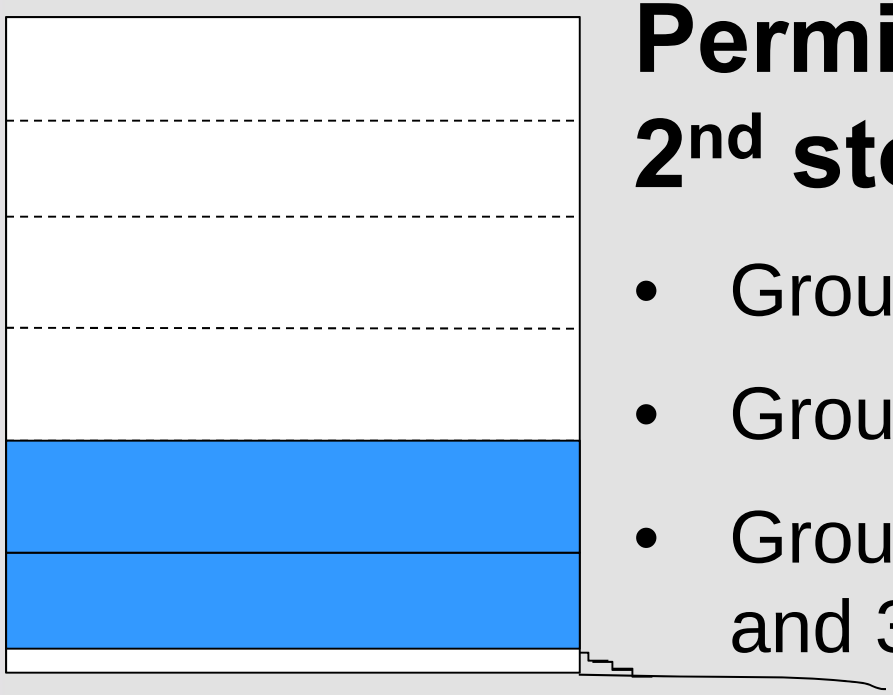
Mixed Uses
Major Occupancies - Group D



Permitted on 1st and 2nd storey:

- Group A, Division 2
- Group E
- Group F, Divisions 2 and 3 (F3 also on 3rd storey)

- Increased fire-resistance rating for separation between some major occupancies

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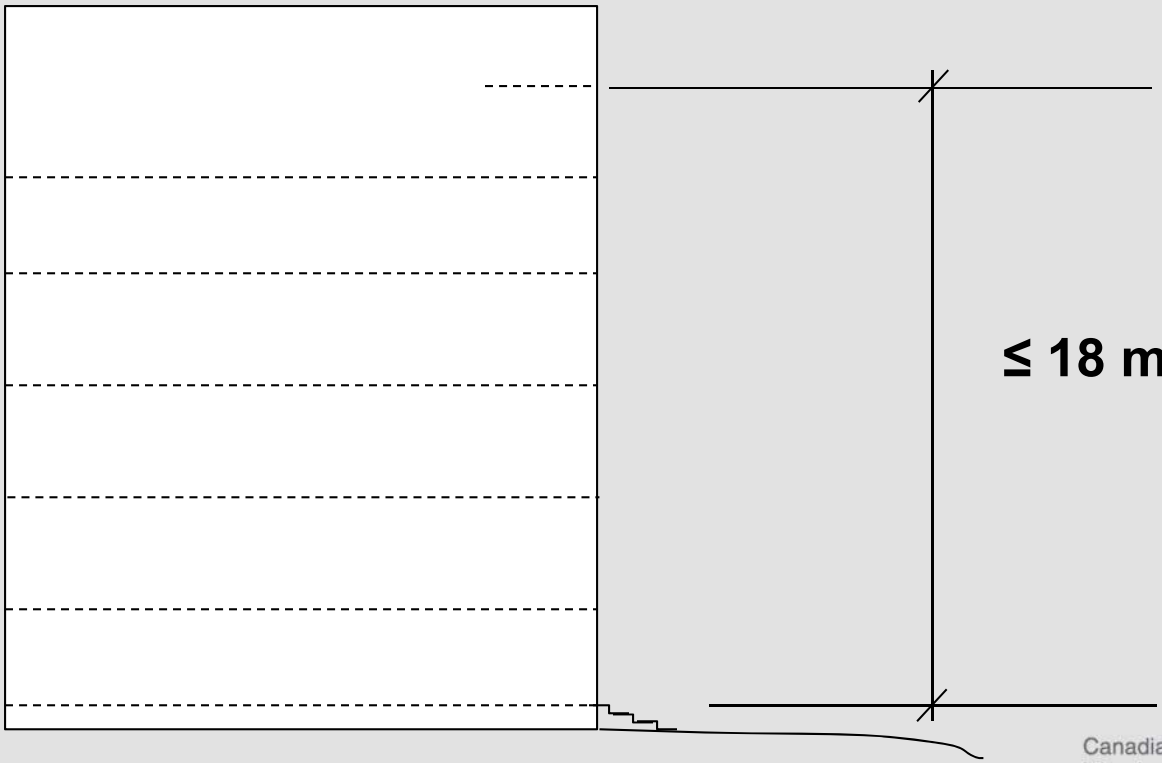
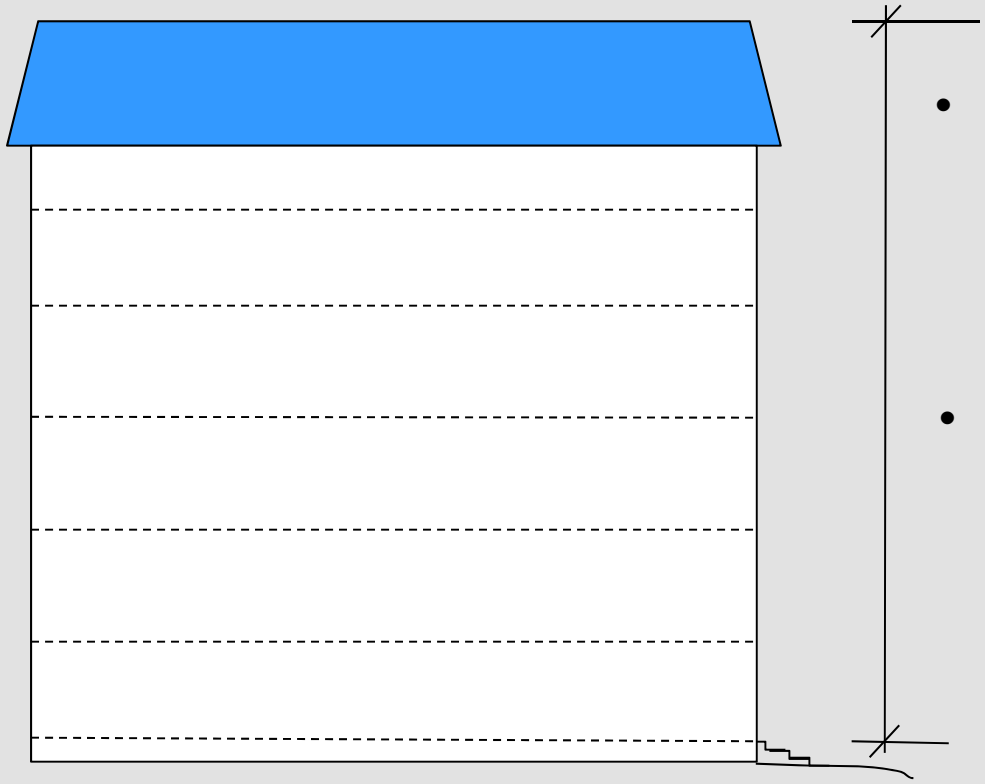
Height Limit

Limit height of uppermost floor level to 18 m above 1st floor.



Roof

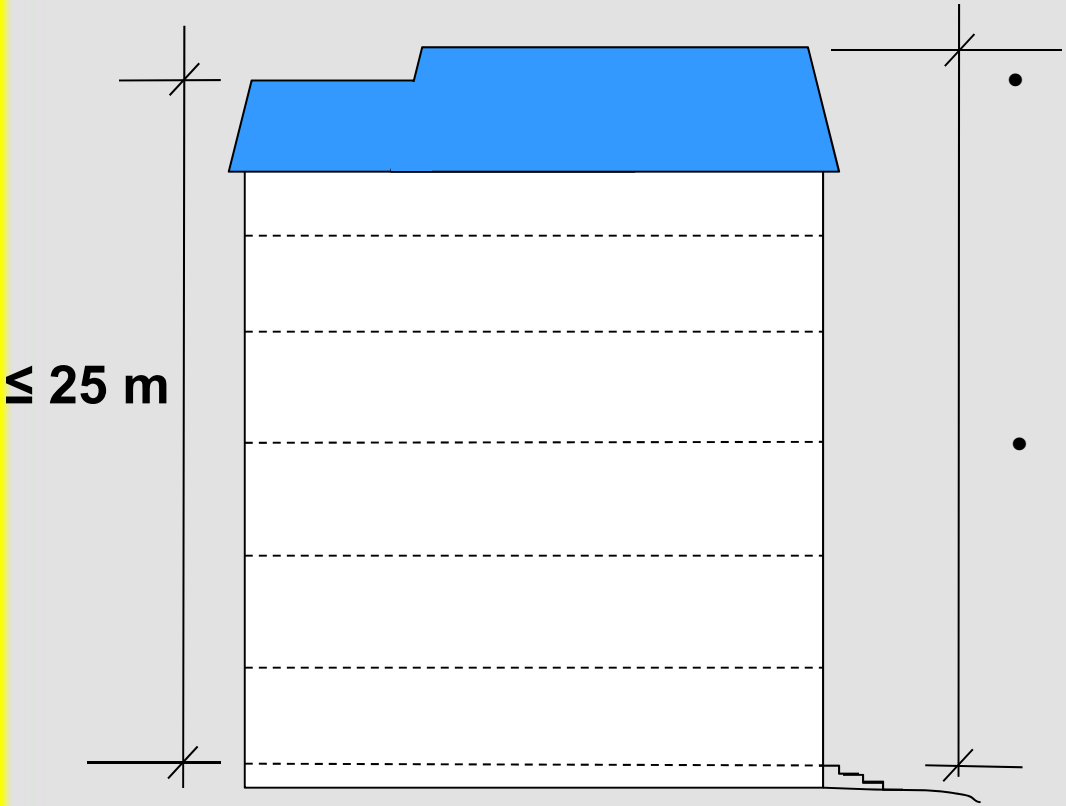
- 1-h fire-resistance rating



- **If height ≤ 25 m, combustible roof construction and roof covering (Class A, B or C)**
- **If height > 25 m, noncombustible or FRTW roof construction and Class A roof covering**

Roof

- 1-h fire-resistance rating



- **If height ≤ 25 m, whole roof: combustible roof construction and Class A,B,C roof covering**
- **If height > 25 m, whole roof: noncombustible or FRTW roof construction and Class A roof covering**

Sprinklers

Proposed larger residential buildings:

- NFPA 13 required, as well as additional sprinklering of exterior balconies

  (balconies or decks exceeding 610 mm)

Exterior Walls

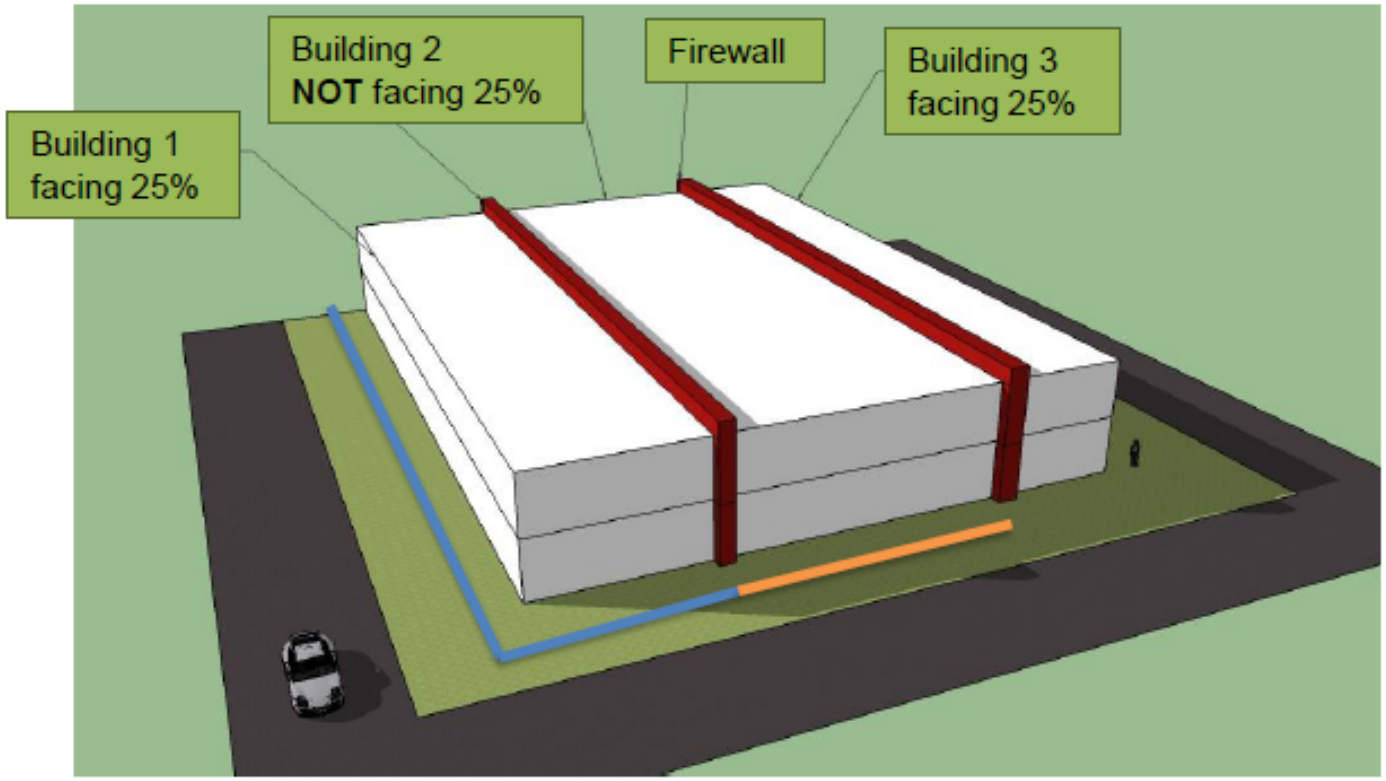
On 5th and 6th storeys:

- noncombustible cladding, or
- cladding which passes the requirements when tested in accordance with *CAN/ULC-S134 "Standard Method of Fire Test of Exterior Wall Assemblies"*

Firefighting Access

- Require 25% of the perimeter to be within 15 m of a street or access route

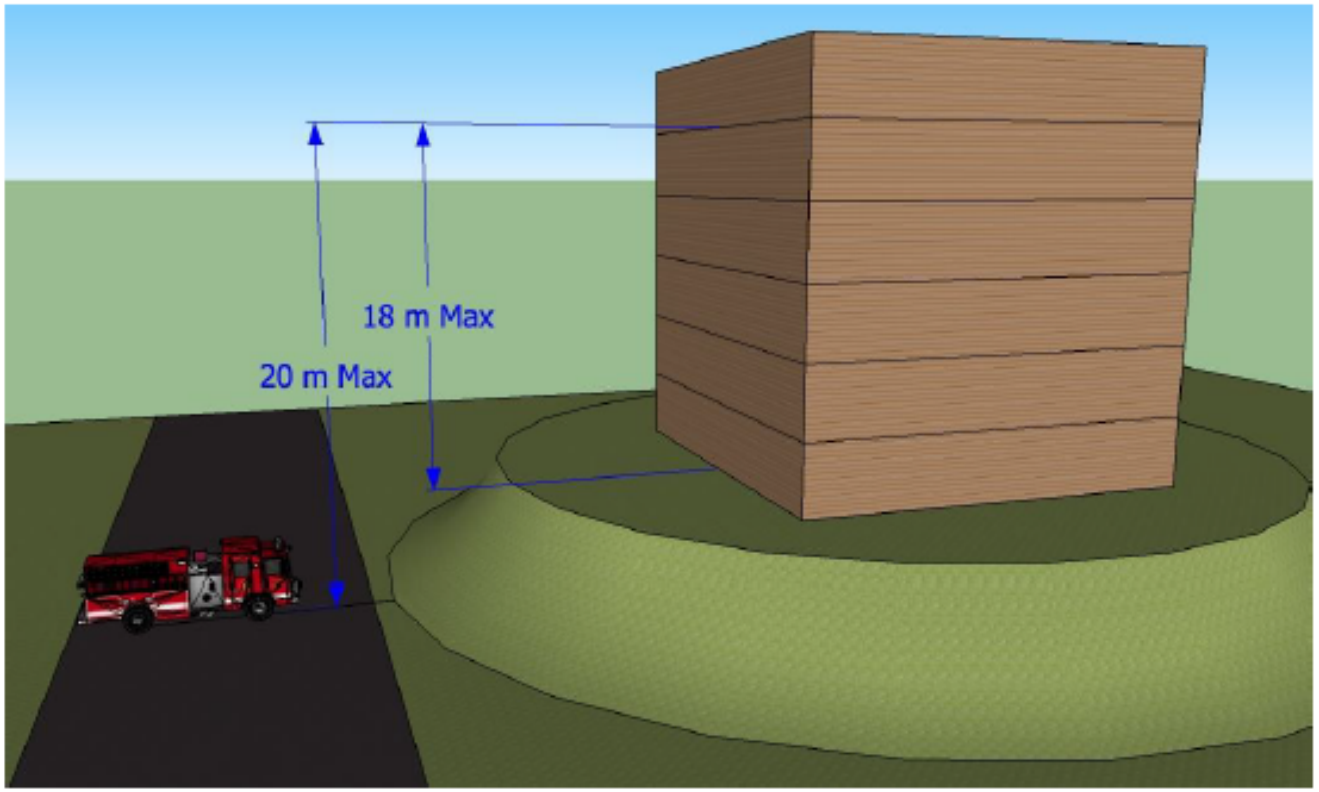
Firefighting Access



Firefighting Access

- Street or access route to have elevation not more than 2 m below the floor of the first storey

Firefighting Access



(Not to scale)

Additional Fire Protection Features

- More fire blocking in sprinklered combustible concealed spaces (unless filled with noncombustible insulation with max. 50 mm gap)
- Double duration of emergency power supply for lighting and fire alarm systems (1 hr.)

Construction and Demolition Sites (National Fire Code)

- Fencing, boarding or barricades
- Access control when site unattended
- Required water supply available when combustible material arrives on site
- Unobstructed clearance around hydrants

Construction and Demolition Sites (National Fire Code)

- Minimum clearance (3 m) maintained between exits and waste containers
- Smoking area requirements
- Minimum clearances between roofing kettles and exits, means of egress and exposed combustible materials

Additional Changes

Earthquake design

- Reduce risk of sway-storey seismic behaviour, which could lead to building collapse
- Improved safety factor for lateral earthquake force

Building Envelope

- Additional guidance for design to reduce risk of:
  - inadequate design features for increased wind loading for higher buildings
  - potential detrimental effects of moisture for higher building

Mid-rise Research

Wood Building Research

- National Research Council of Canada
- Canadian Wood Council
- FPInnovations
- Province of British Columbia
- Province of Ontario
- Province of Quebec

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Wood Building Research

- Building Envelope: Control of Heat, Air, Moisture and Precipitation (HAMP)
- Acoustics: STC Ratings, Sound Flanking
- Fire: Encapsulation, Fire Resistance and Exterior Walls

Building Envelope: HAMP

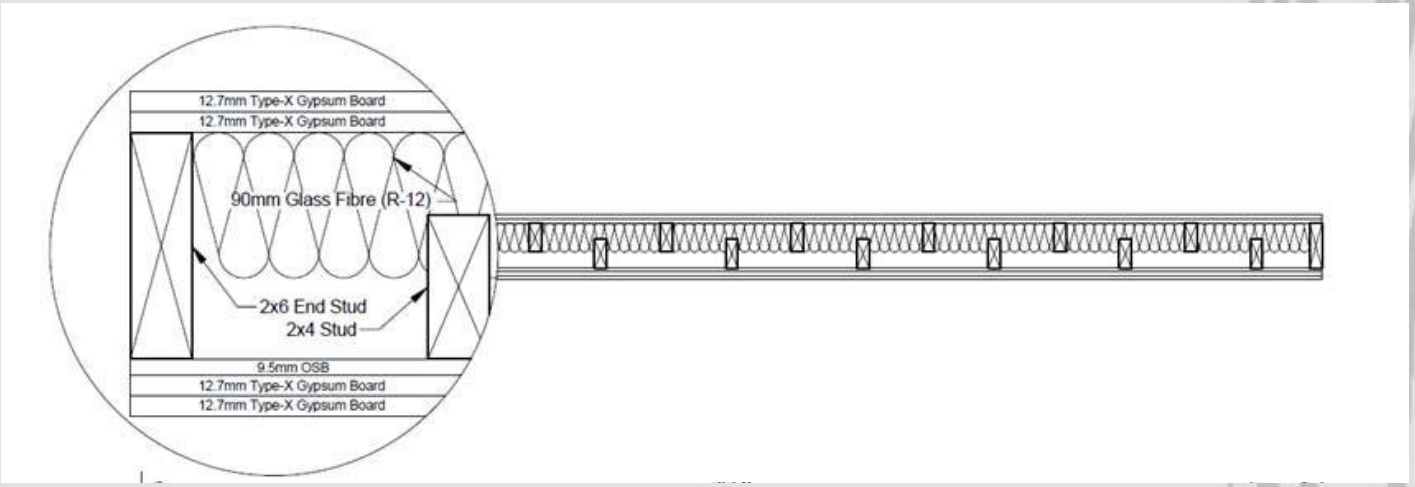
- Identify envelope details, climate locations and loads;
- Water penetration lab experiments
- Hygrothermal modeling and analysis

Building Envelope: HAMP

- Assess whether alternate wood-based building envelope solutions developed
  - Meet NBC 2010 Part 5 requirements
  - Meet NECB 2011 - maximum envelope overall heat transmission requirements

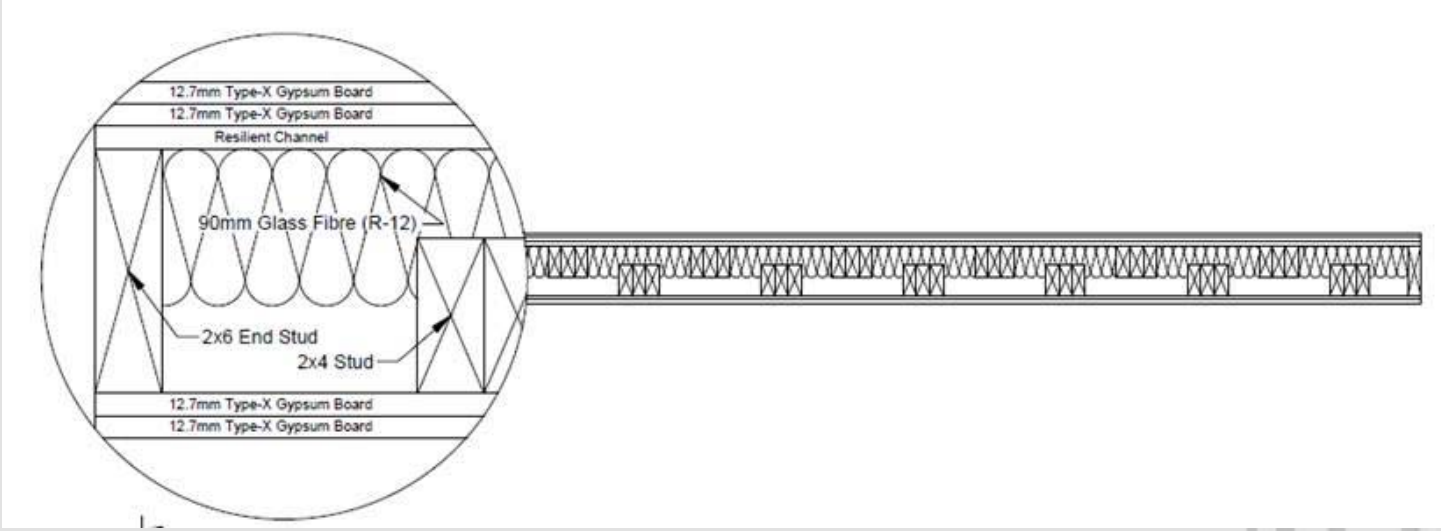
Acoustics: STC Ratings

- Light-frame wood wall assemblies - staggered studs
- e.g.



Acoustics: STC Ratings

- Light-frame wood wall assemblies - triple-studs, staggered
- e.g.



Acoustics: STC Ratings

- Cross-laminated Timber (CLT) wall and floor assemblies

NRC Acoustics Laboratory, Montreal Rd. Ottawa, ON
Photo Credit: National Research Council of Canada ©

Photo Credit: FPInnovations – Lindsay Osborne ©

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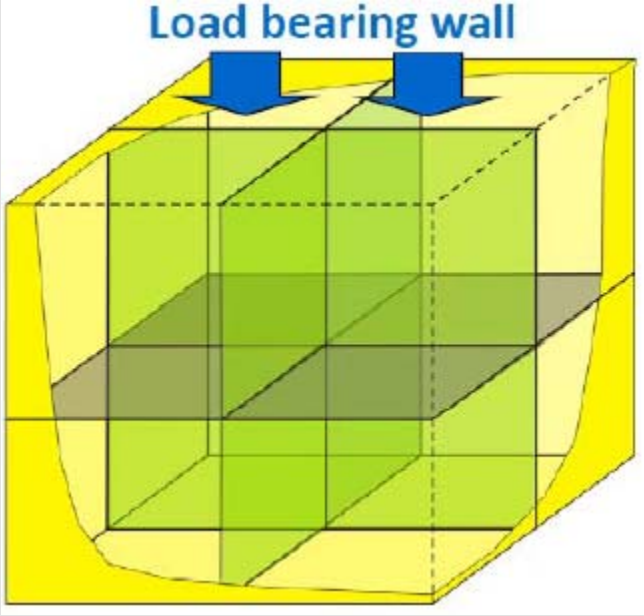
Acoustics: Sound Flanking

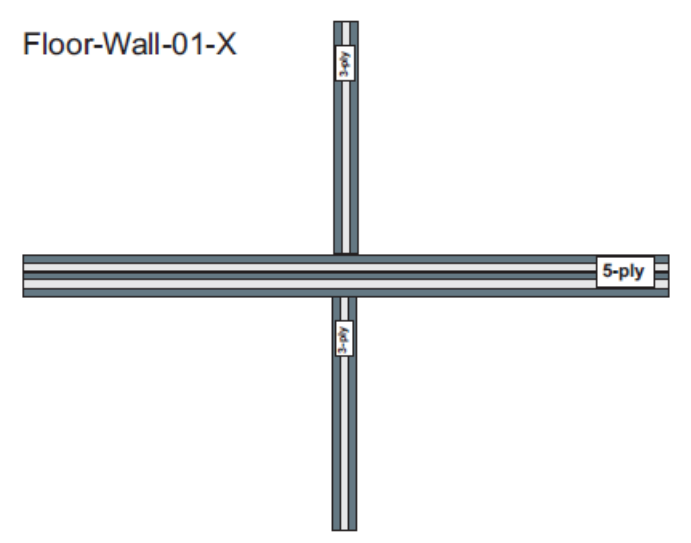
- Light-frame wood assemblies

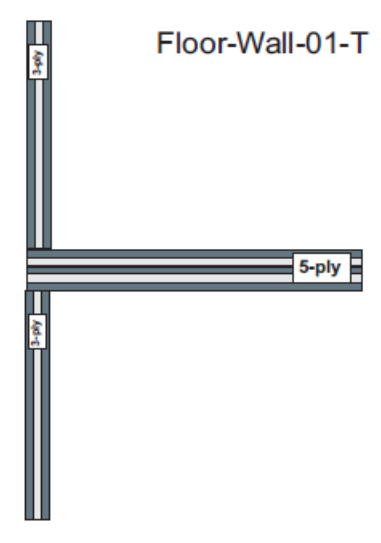


Schematic of NRC-IRC Flanking Sound Transmission Facility

Acoustics: Sound Flanking

- Cross-laminated Timber (CLT)



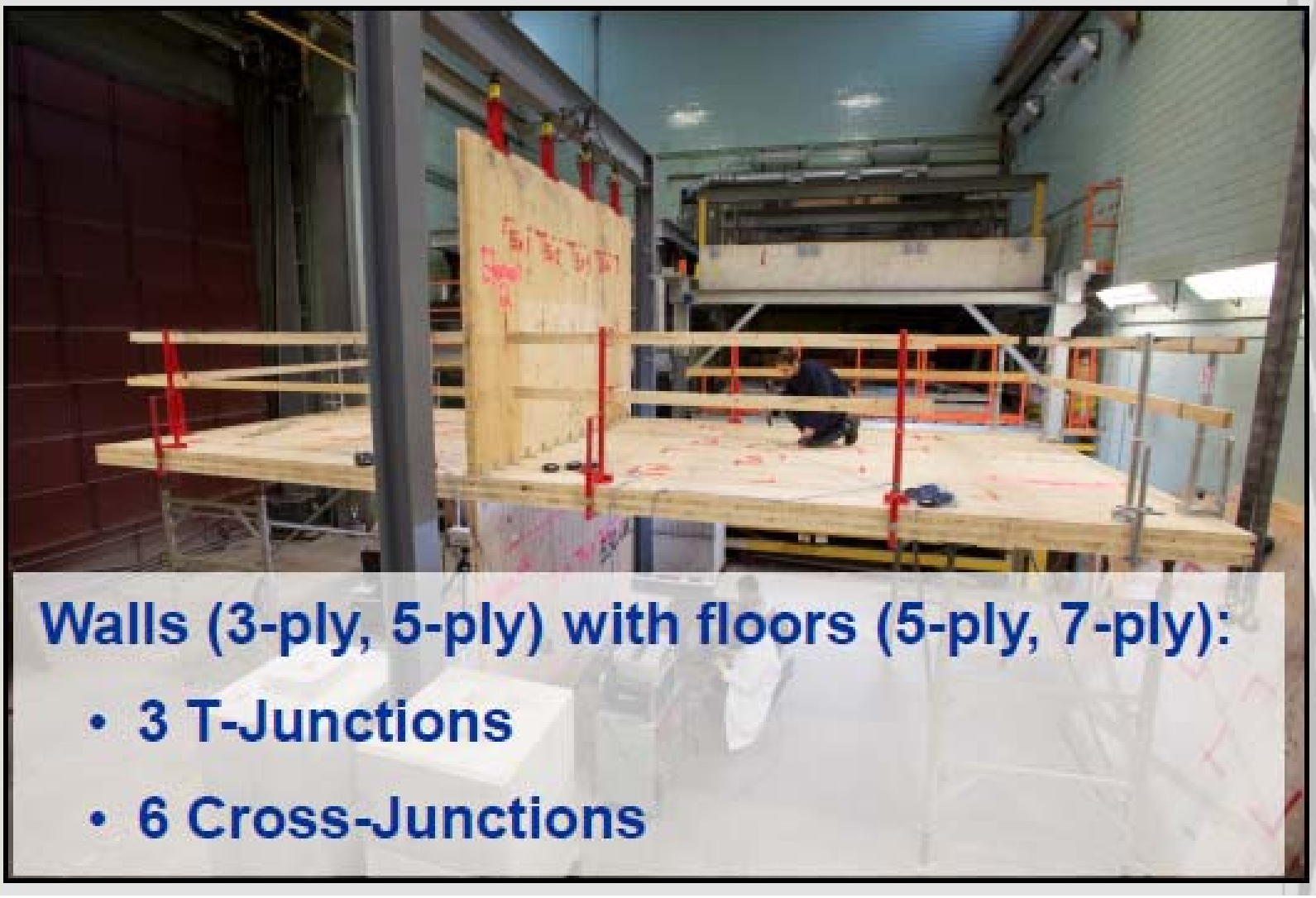


Acoustics: Sound Flanking

Junctions of 3-ply and 5-ply walls:

- 5 T-Junctions
- 4 Cross-Junctions

Acoustics: Sound Flanking



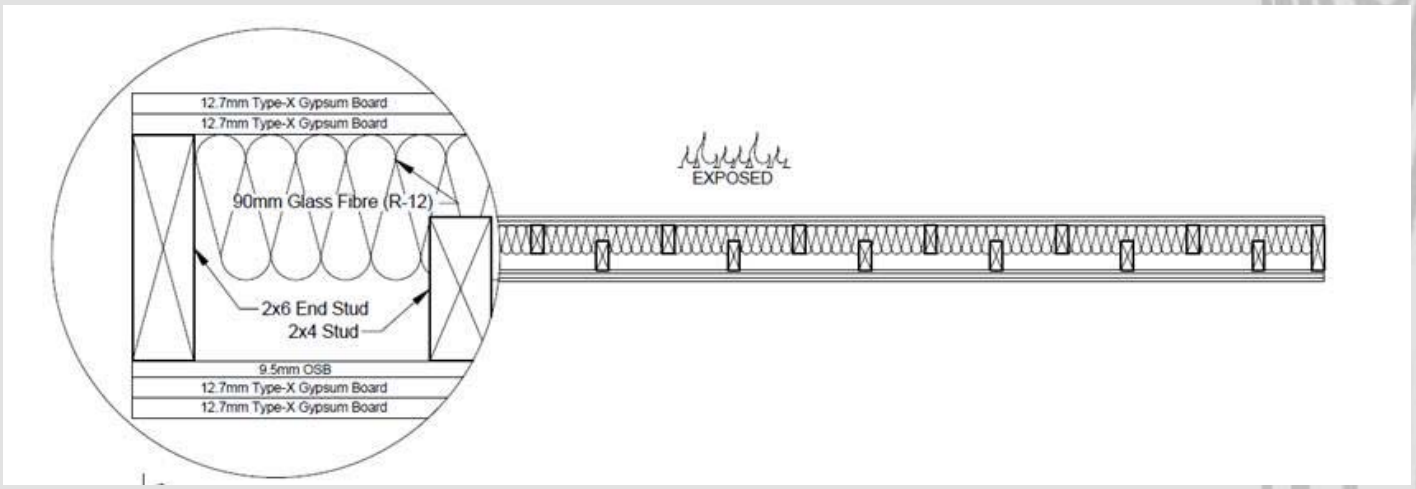
Walls (3-ply, 5-ply) with floors (5-ply, 7-ply):

- 3 T-Junctions
- 6 Cross-Junctions

Fire: Fire-Resistance Ratings

Full-scale standard fire tests: *CAN/ULC-S101*
(total of 5 tests)

- Light-frame wood wall assemblies - staggered single studs, wood shear panel
- e.g.



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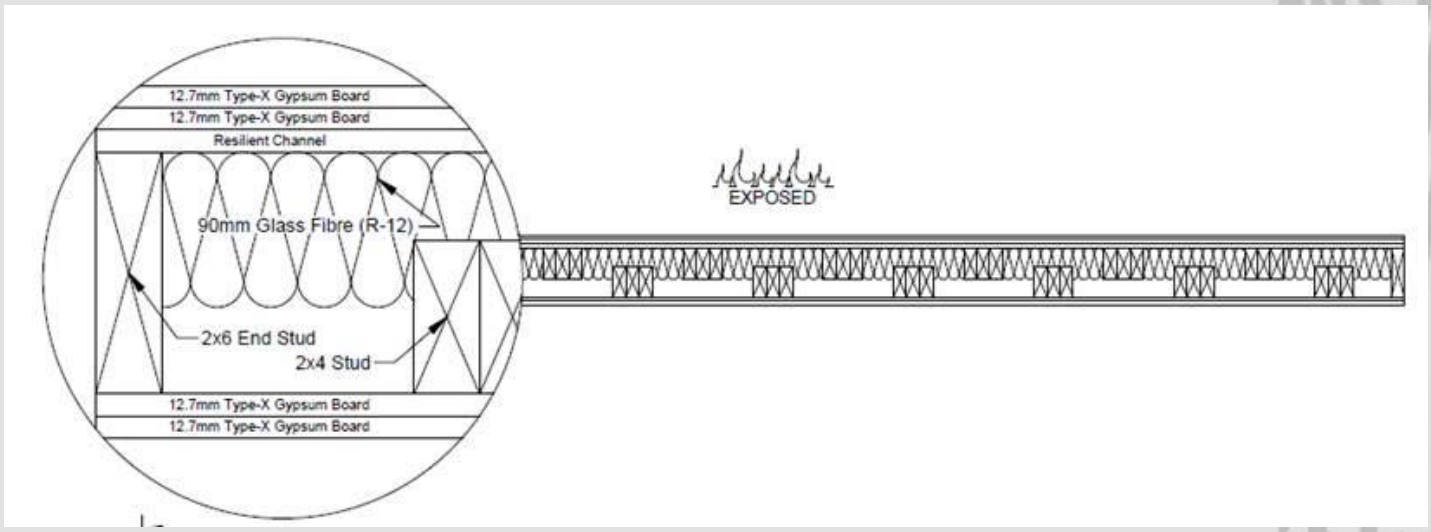

Fire: Exterior Walls

CAN/ULC-S134 Testing

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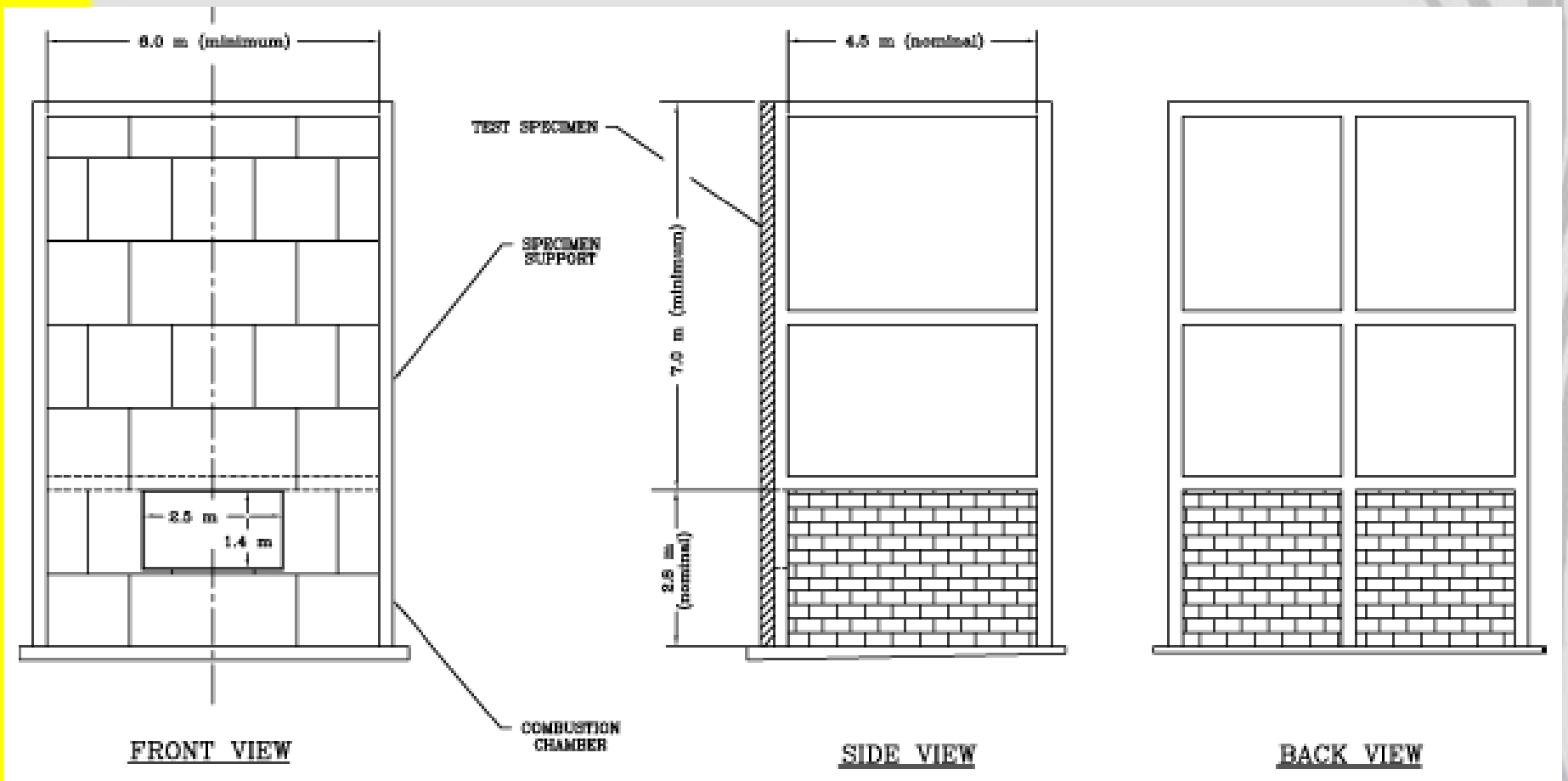
Combustible Components for Exterior Walls (3.1.5.5)

CAN/ULC-S134 – typical facility:



Midrise Research
CAN/ULC-S134

	Sheathing	Wall Construction	Insulation
1	12.7 mm Gypsum Sheathing	Untreated wood 2 x 6, 400 mm o.c.	Spray Polyurethane Foam
2		Simulated CLT + 2 x 6, 600 mm o.c. furring	XPS Foam Insulation
3	15.9 mm FRTW Plywood	Simulated CLT + 2 x 6, 600 mm o.c. furring	XPS Foam Insulation
4		Untreated wood 2 x 6, 400 mm o.c.	Spray Polyurethane Foam

Fire: Encapsulation

- Intermediate-scale fire testing
  - horizontal furnace

- Large-scale fire testing -
  - Light-frame wood
  - Cross-laminated timber
  - Light-frame steel

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Fire: Encapsulation

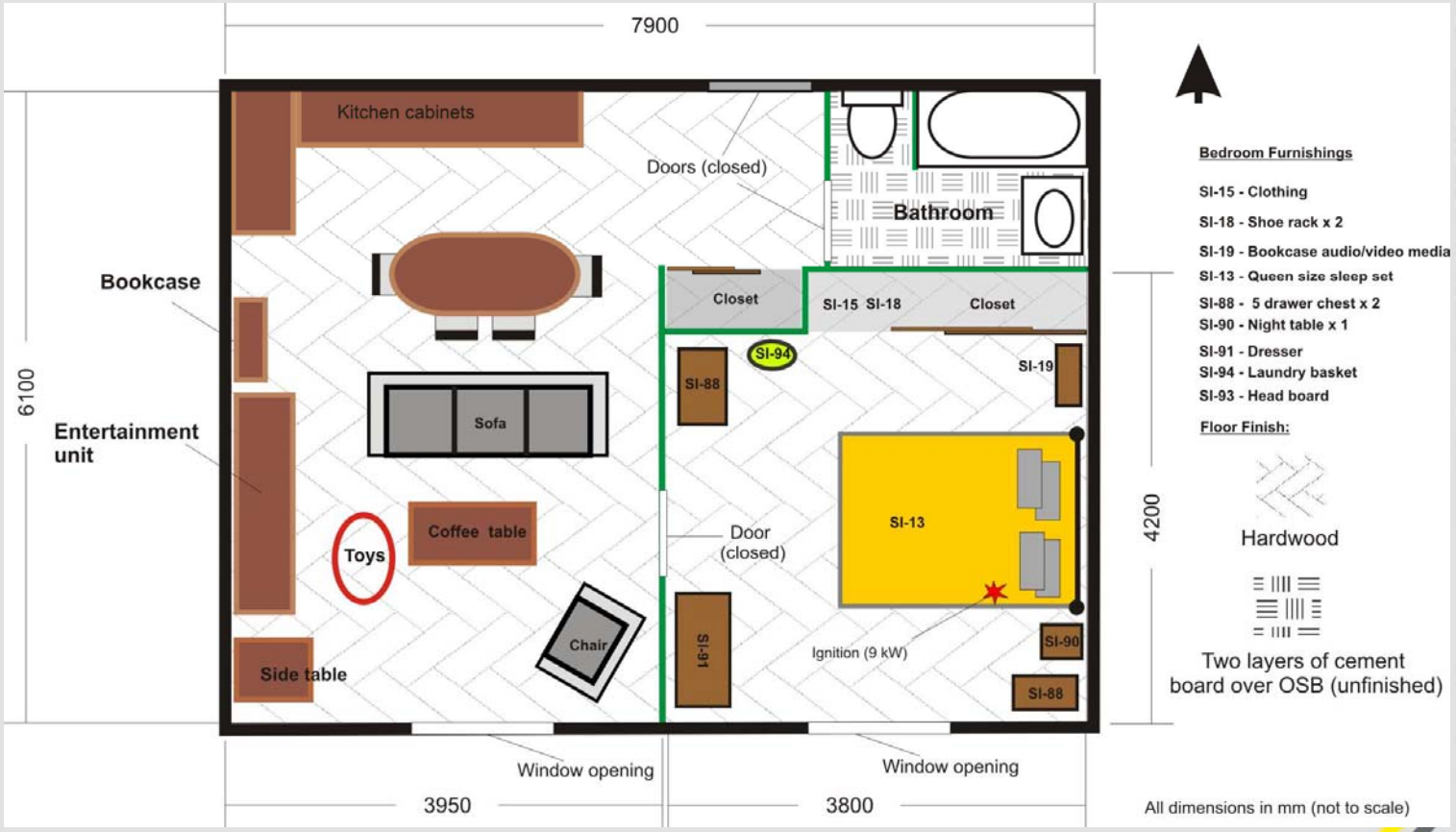
Large-scale fire testing - Light-frame wood

Fire: Encapsulation

Large-scale fire testing – Cross-laminated timber

Fire: Encapsulation

- Large-scale fire testing:



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Fire Resistance Ratings
Wood-frame Construction

Component Additive Method (CAM)

- NBCC 2010, Division B, Appendix D-2.3 for Framed Walls, Floors and Roofs
- Last revised for 1995 NBCC
- National Codes Public Consultation proposals

Fire Resistance Ratings
Wood-frame Construction

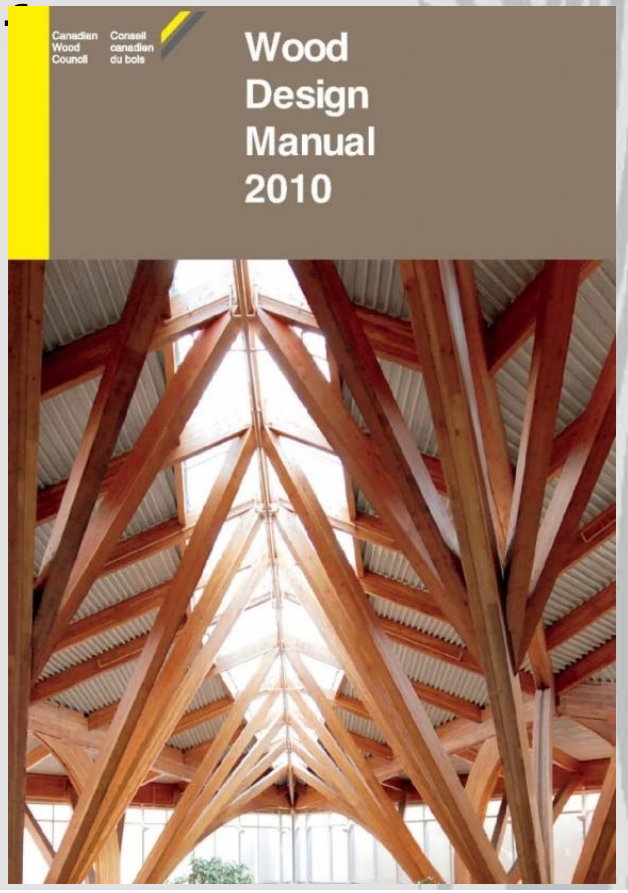
CAM values proposed for:

- **Double layers of gypsum board**
- **Loadbearing cold-formed steel studs**
- **Wood I-joists, more wood truss types, cold-formed steel joists**
- **Additional insulation types/locations and floor toppings**
- **Use of resilient metal channels**

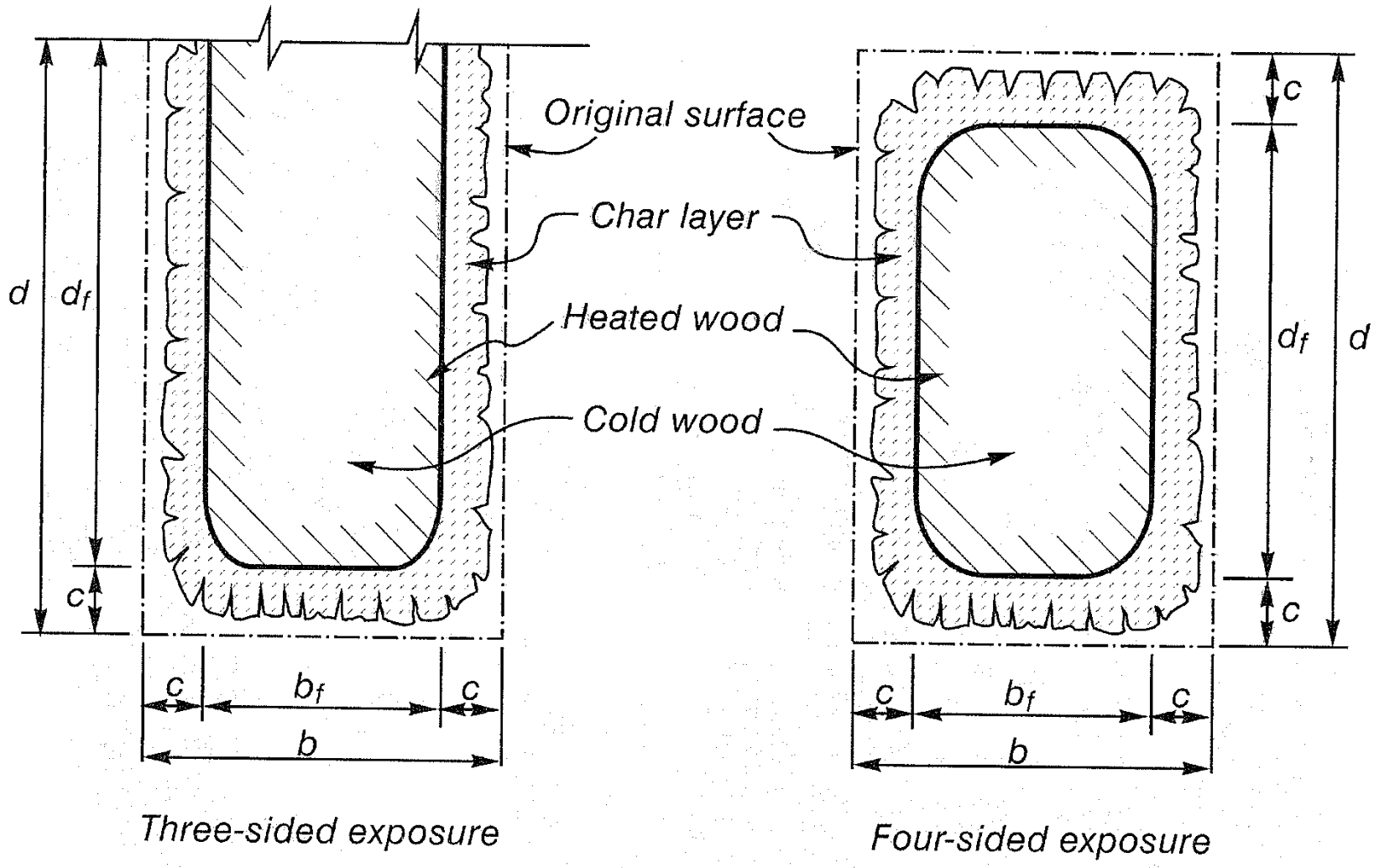
Fire Resistance Ratings Massive Timber

CSA O86 - 2014 edition

- Annex B:“Fire resistance of large cross-section wood elements”
- (Informative)
- Public comment closed Nov. 4th, 2013



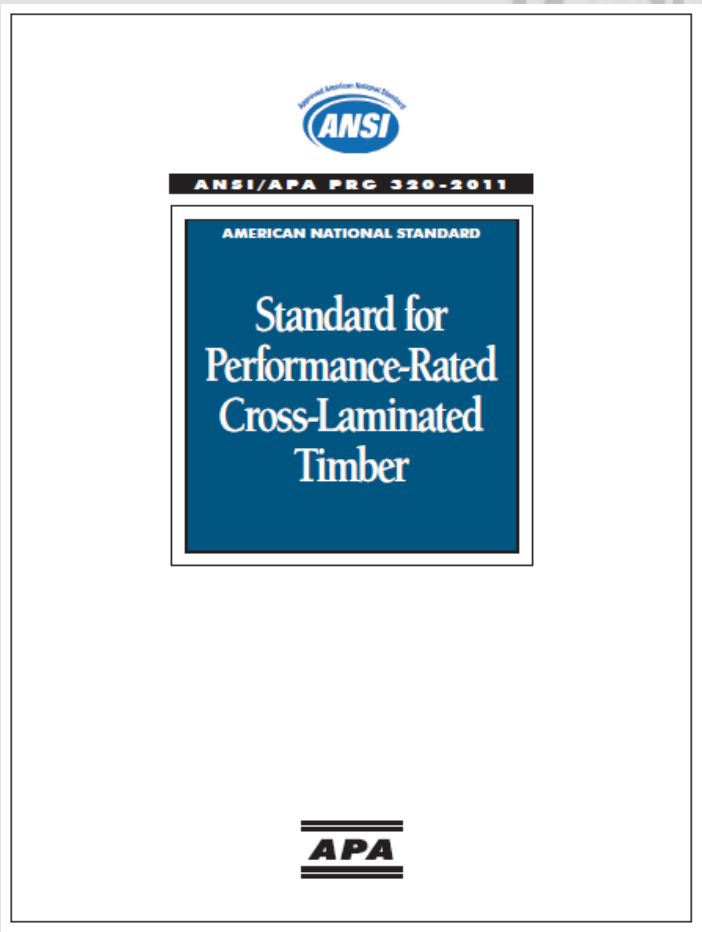
Fire Resistance Ratings
Massive Timber



Cross-Laminated Timber (CLT)

Product Standard:

ANSI/APA PRG 320-2011
Standard for Performance-Rated Cross-Laminated Timber



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Additional Activities

- Fire Protection Research Foundation (NFPA) – Fire Safety Challenges of Tall Wood Buildings Report (November 2013)
- CWC - Heights & Areas Historic Fact-finding Report (early 2014)
- FPInnovations Tall Wood Building Guide (March 2014)
- 2nd Ed. of FPInnovations CLT Handbook Fire Chapter (Spring 2014)
- NSERC NEWBuildS - PROJECT T3–3–C7: FIRE BEHAVIOUR OF CROSS LAMINATED TIMBER PANELS

Technical Information and Tools

www.cwc.ca

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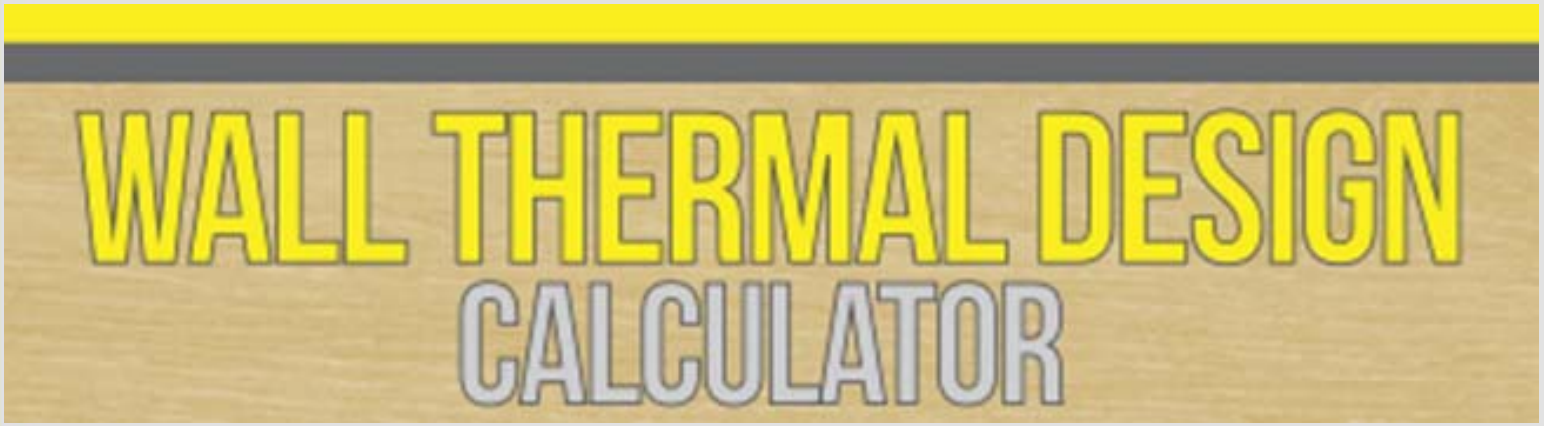
Technical Information and Tools



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Purpose of Wall Thermal Design Calculator

To provide designers with climate-zone appropriate insulated wall assembly solutions:

- easily comparable with prescriptive energy efficiency requirements (NECB, NBC, Provincial)
- with a climate specific durability assessment

WALL THERMAL DESIGN CALCULATOR

www.cwc.ca/wtd

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