AMERICAN WOOD COUNCIL

Outcome of ICC Tall Wood Ad Hoc Committee

DES 607

Raymond O'Brocki, CBO. Manager- Fire Service Relations

ICC INTERNATIONAL CODE COUNCIL® PREFERRED PROVIDER

AMERICAN WOOD COUNCIL

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- **Codes and Standards**
- **Green Building**
- **Manufacturing Environmental Regulation**
- **Advocacy and Public Policy**

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CONSTRUCTION FIRE SAFETY COALITION

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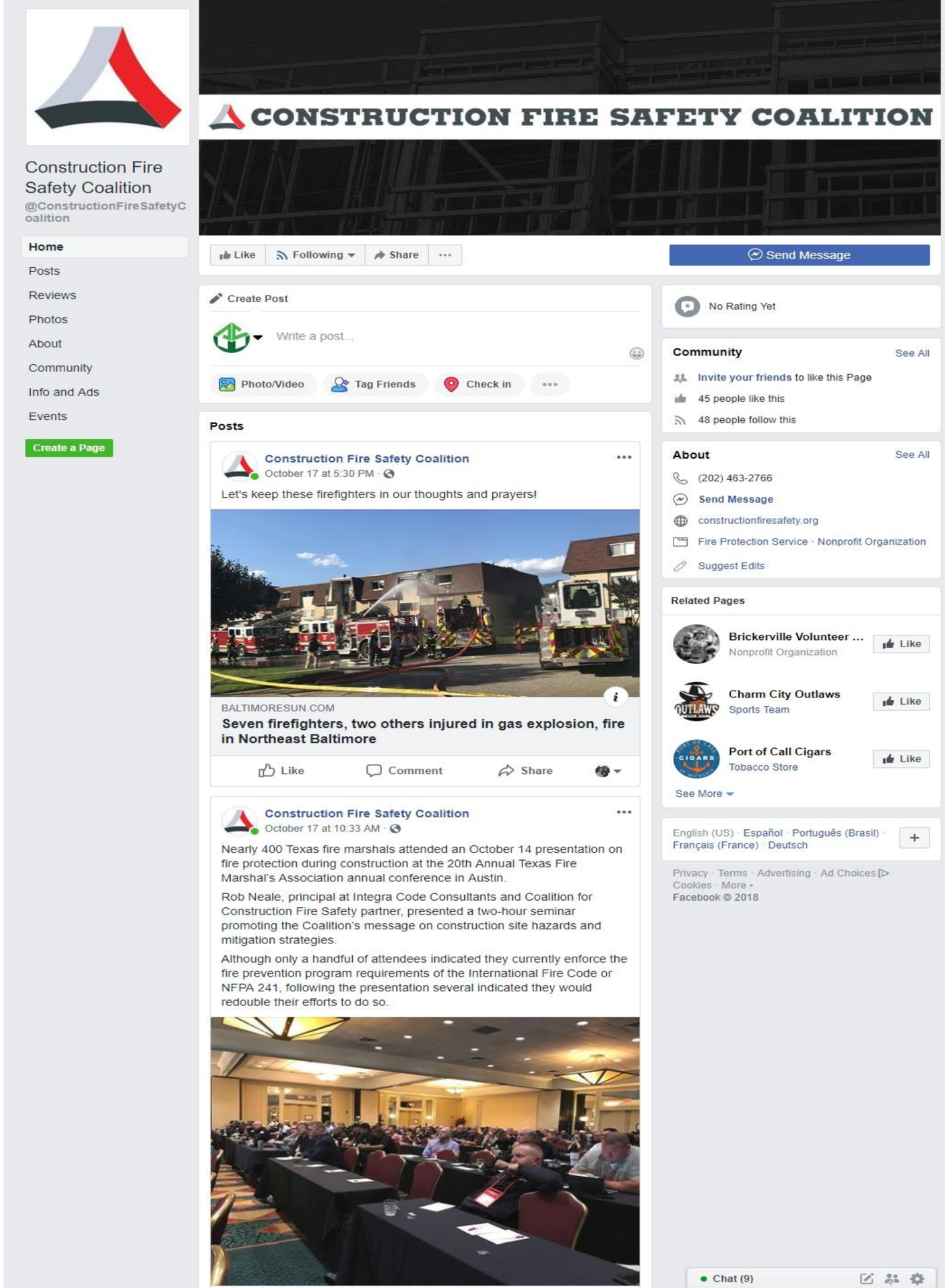


COURSE DESCRIPTION

In early 2016, the ICC Board of Directors approved the creation of an ad hoc committee to explore the building science of tall wood buildings with the scope being to investigate the feasibility of and take action to develop code changes for tall wood buildings. Since that time, the Tall Wood Building (TWB) Ad Hoc Committee has reviewed voluminous materials regarding tall wood buildings, including results of various testing around the world, as well as studies domestically in support of the TWB charge to conduct a thorough review of the science of tall wood. The TWB developed its own test scenario(s) to substantiate any code change proposals (testing was carried out at ATF labs); and worked to develop a comprehensive set of technically-substantiated code changes for consideration during the 2018 Group A code development process. The intensive research performed by the Committee was submitted under the ICC Code Development Process, along with the resulting proposals developed by Committee consensus. All of the Group A TWB proposals have been approved. The TWB has also developed a set of Group B proposals, submitted in January 2019.

Learning Objectives

Upon completion, participants will be able to:

1

TWB Ad Hoc Committee

Identify the make-up of the TWB Ad Hoc Committee and the process used to reach consensus on code changes.

2

IBC Construction Types

Recognize how the new types of construction compare with existing types of construction in the *International Building Code* and specify the inherent differences and conservative approaches the new types have.

3

Building Sizes

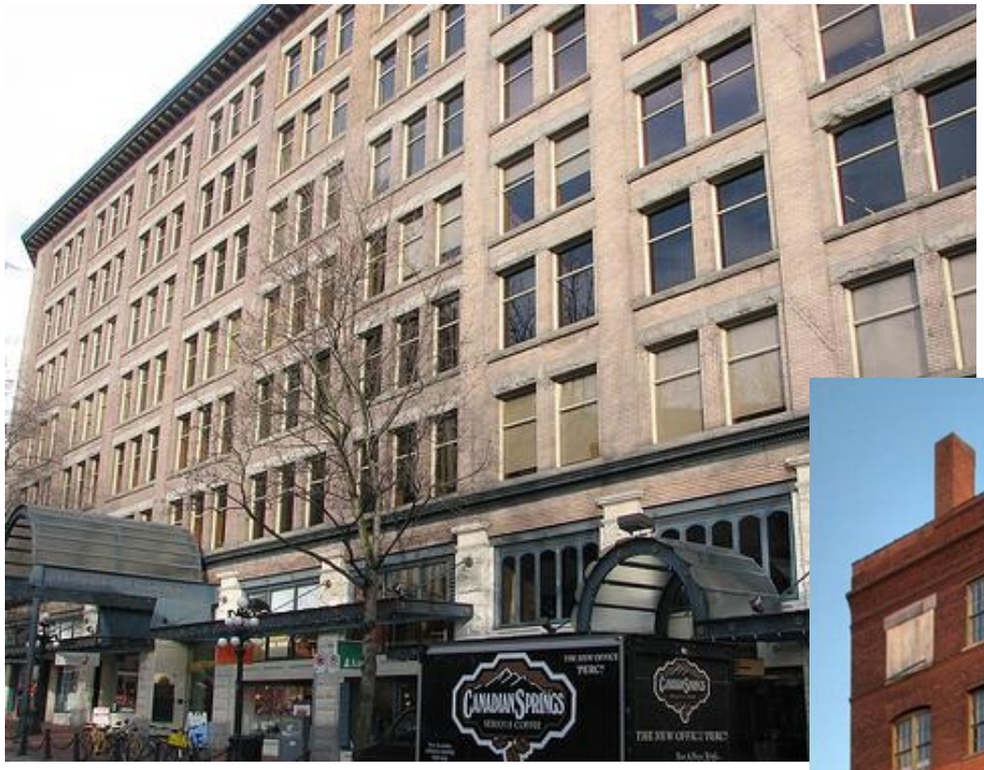
Understand the process by which the allowable heights, areas, and number of stories permitted for the mass timber types of construction were developed and will be able to utilize the information for building design.

4

Fire Resistance

State the fire resistance requirements for mass timber building elements. Further, they will be able to distinguish when and where non-combustible protection can be omitted.

Historical Tall Wood: Heavy Timber
(Type IV-HT)



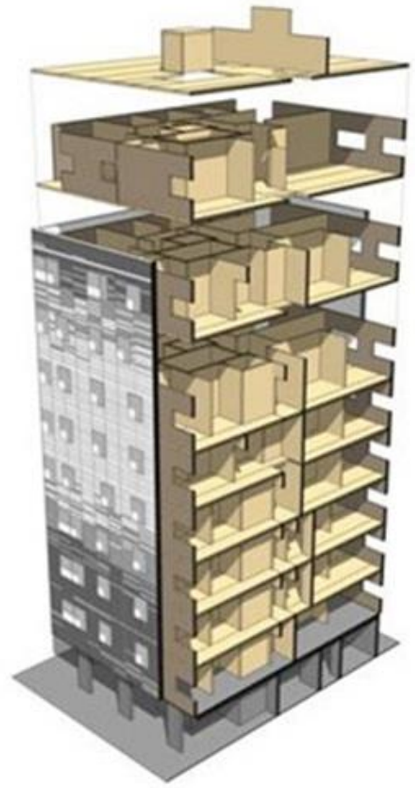
Kelly, Douglas and Co. Warehouse; Vancouver , BC (c. 1905)

The Purse Building, Dallas, TX, (c. 1905)

Leckie Building, Vancouver, BC (c. 1908)

Glued-laminated Timber (GLT)

IBC principles for heavy timber and mass timber



Cross-Laminated Timber (CLT)

Recently-Developed Forms of Mass Timber:
Cross-Laminated Timber (CLT)

- 1985 1st CLT patent - France
- 1993 1st CLT projects - Switzerland and Germany
- 1995-1996 Improved press technology
- 1998 1st multi-story res building - Austria
- Early 2000's
  - CLT use (Europe) increased significantly
  - Green building movement driven
  - Better efficiencies, product approvals, improvec marketing and distribution channels
  - Over 500 CLT buildings in England
- Recent - US and Canadian use of CLT

Adhesives

- **The adhesive typically used in CLT in North America is polyurethane-based. This polymer is commonly used in modern furnishings.**

- **The first adhesive bondline within CLT would not even start to combust until the char front reaches the depth of the bondline within the CLT.**

- **Must meet the new PRG 320 standard per the code**

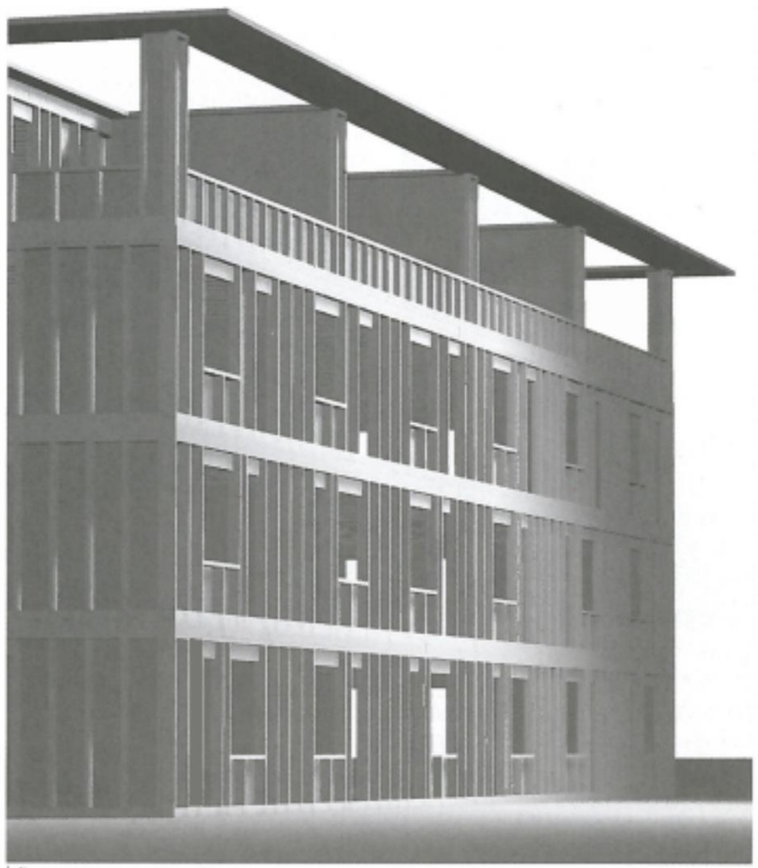
- **Meets the NYS LC_{50} Standard. No different from solid wood!**

Nail Laminated Timber (NLT)

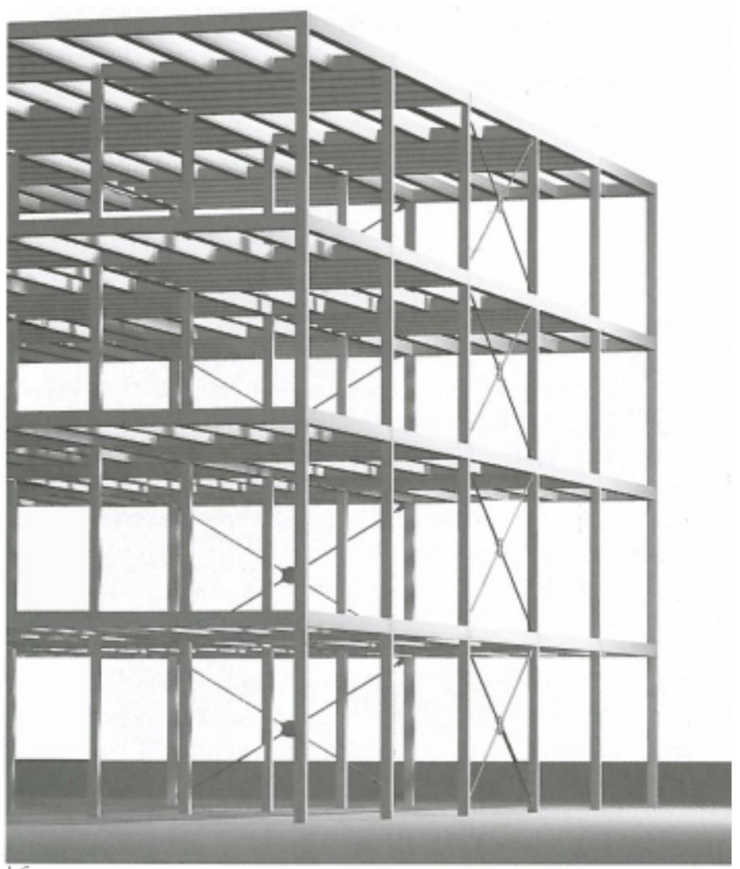
Photo courtesy of Structurecraft

IBC principles for heavy timber and mass timber

LIGHT WOOD-FRAME



POST + BEAM



MASS TIMBER

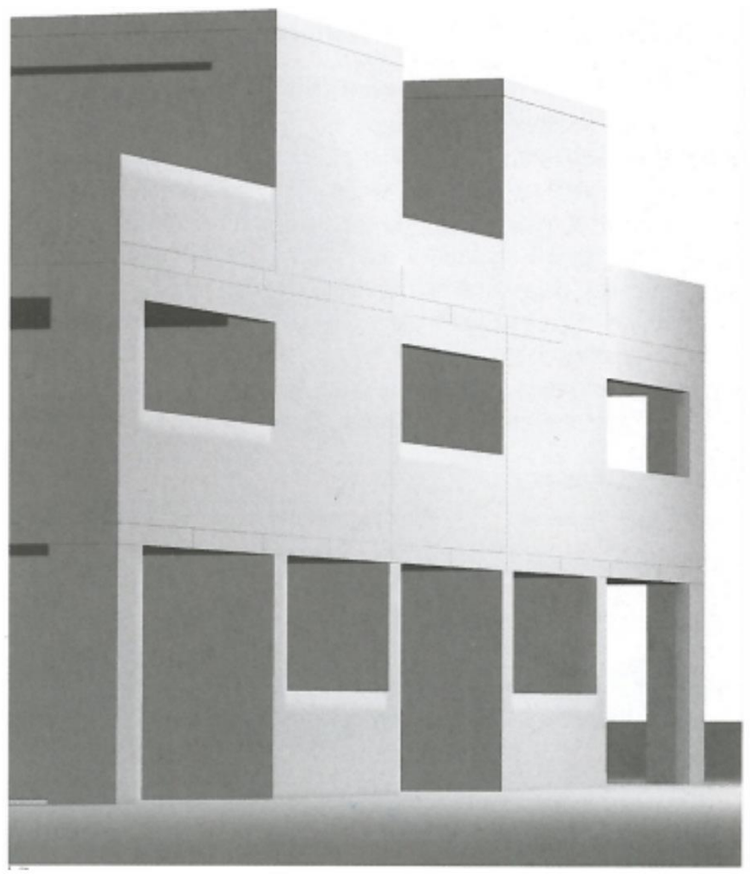
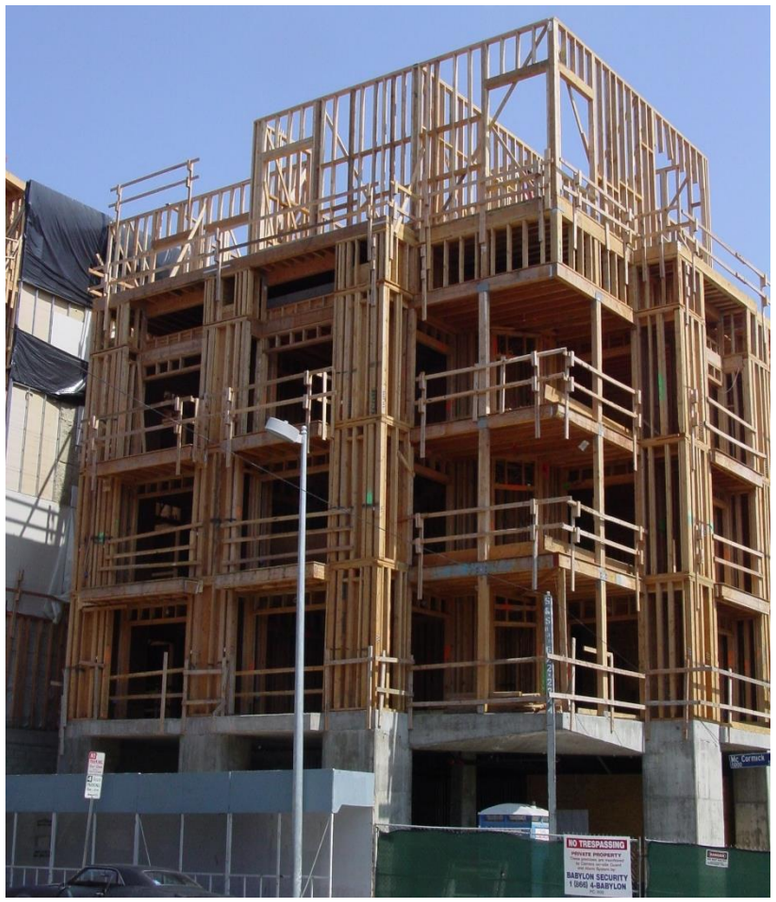


Image courtesy of Fast + Epp

Mass Timber ≠ Conventional Light-Frame

≠

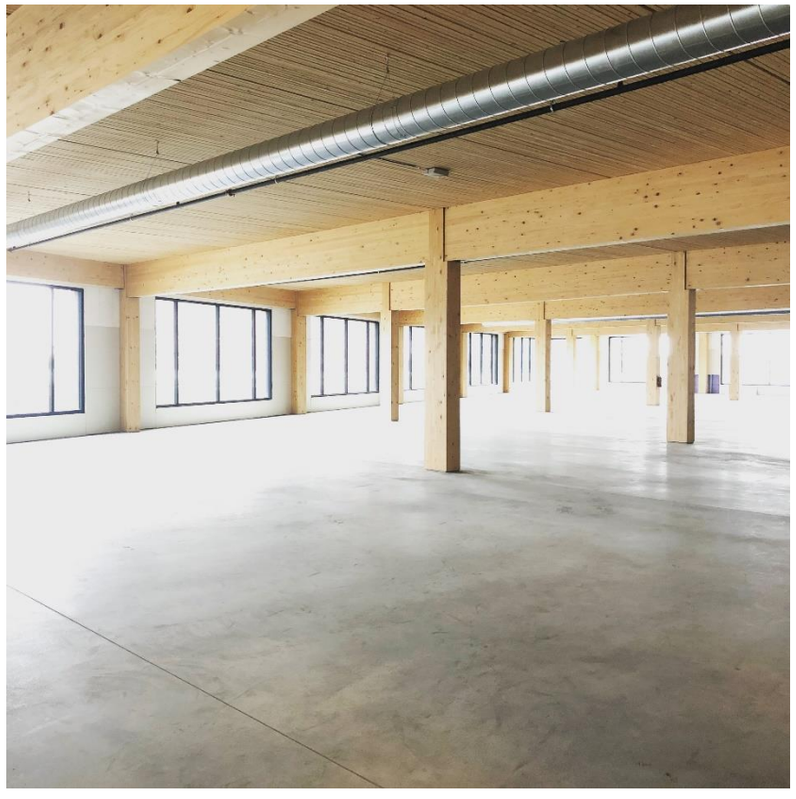


mass timber ≠ conventional frame

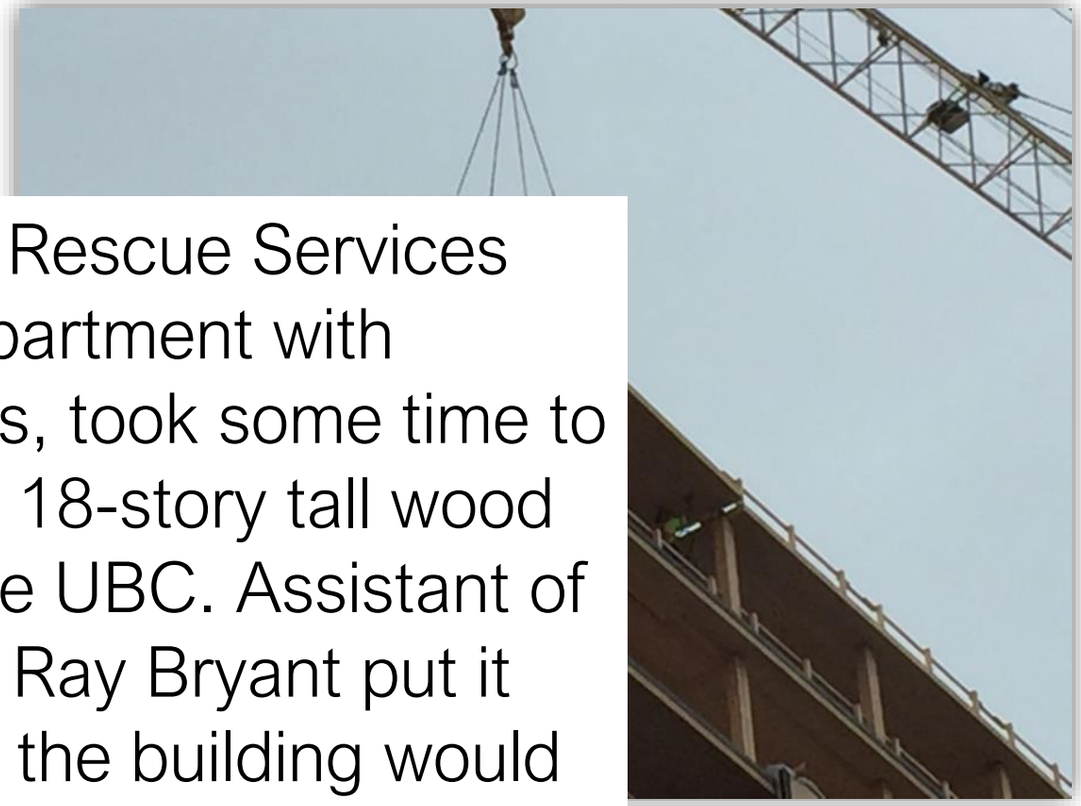
Carbon 12

Portland, Oregon- 8 stories

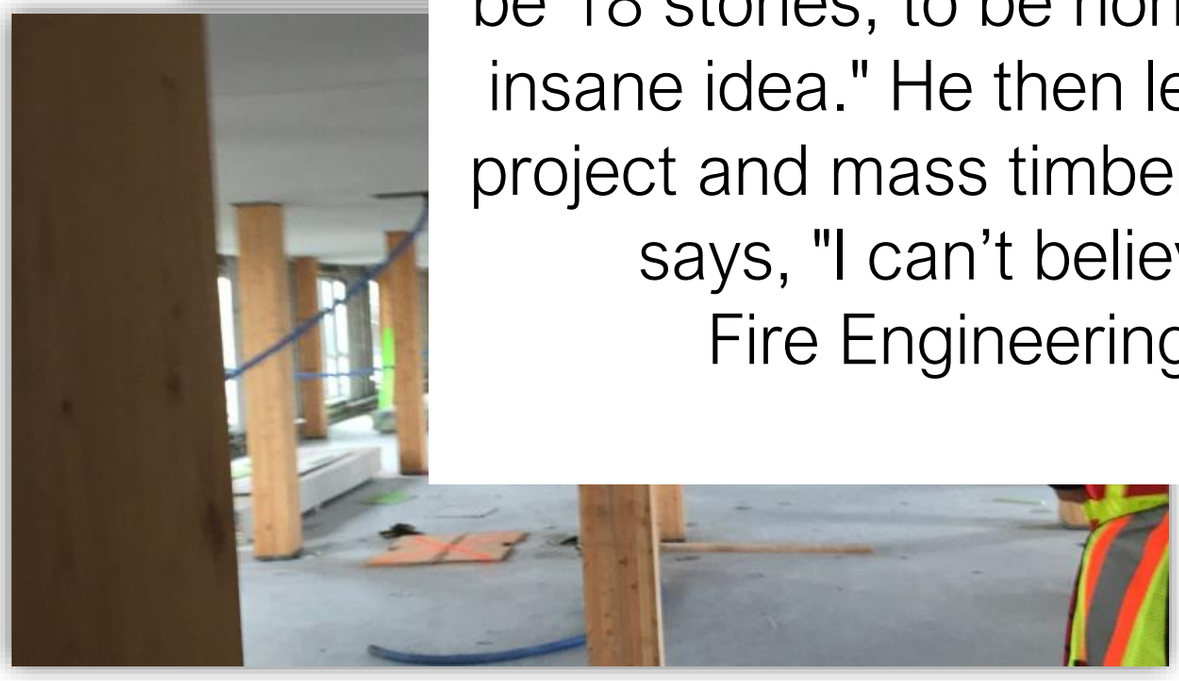
Minneapolis, Minnesota 7 stories



UBC - Brock Commons



The Vancouver Fire and Rescue Services (VFRS), a career department with approximately 800 members, took some time to adjust to the news that an 18-story tall wood building was going up at the UBC. Assistant of Community Safety Chief Ray Bryant put it bluntly: "When I first heard the building would be 18 stories, to be honest, I thought it was an insane idea." He then learned more about the project and mass timber construction and now says, "I can’t believe how safe it is.“
Fire Engineering January 2018



ICC TALL WOOD AD HOC COMMITTEE

Project Scope

In December 2015, the ICC Board established the ICC Ad Hoc Committee on Tall Wood Buildings noting the purpose of the ad hoc committee was to

1. **explore the science of tall wood buildings**
2. **investigate the feasibility, and**
3. **take action on developing code changes for tall wood buildings.**

This scope required further refinement by the committee.

ICC TALL WOOD AD HOC COMMITTEE

Membership

The ICC Board determined the effort was to be undertaken by the Ad Hoc Committee on Tall Wood Buildings (AH-TWB). In making the committee appointments, the Board recognized the need to have a consensus committee comprised of the necessary balance of stakeholders including:

- **Representatives from building construction material industries**
- **Building and Fire Officials**
- **Architects and engineers**
- **Fire protection experts**
- **Other construction related stakeholders**

ICC TALL WOOD AD HOC COMMITTEE

Meetings and Structure

Their task was to research and design fire testing of mass timber and to draft code changes that ensure that tall mass timber buildings have redundant and rigorous fire safety systems that will protect the public that occupy them and the first responders that respond to them during emergencies.

Organized into Four Working Group

1. **Definitions and Standards**
2. **Fire**
3. **Structural**
4. **Codes**

- **82 major issues identified**
- **Hundreds of reports reviewed and collected via ICC TWB webpage**
- **Performance Objectives discussed and listed**

TWB Ad Hoc Objectives

- **TWB identified performance objectives to be met**
- **No collapse under reasonable scenarios of complete burn-out of fuel without automatic sprinkler protection being considered**
- **No unusually high radiation exposure from the subject building to adjoining properties to present a risk of ignition under reasonably severe fire scenarios**
- **No unusual response from typical radiation exposure from adjacent properties to present a risk of ignition of the subject building under reasonably severe fire scenarios**

TWB Ad Hoc Objectives (cont'd)

- **No unusual fire department access issues**
- **Egress systems designed to protect building occupants during design escape time, plus a factor of safety**
- **Highly reliable fire suppression systems to reduce risk of failure during reasonably expected fire scenarios. Degree of reliability proportional to evacuation time (height) and risk of collapse.**

The TWB determined that its comprehensive package of proposals met these performance objectives

TWB COMMITTEE

Fire Work Group created fire test scenarios to study and validate the TWB code change proposals

- Test structure represented multi-story condo
- 30 ft x 30 ft interior dimensions
- Corridor and stair included in the structure
- UL "modern furnishings" fuel load imposed → 570 MJ/m^2
- fuel load was approximately 85th percentile of Group R fuel loads from survey of Group R's

Two-Story Fire Tests

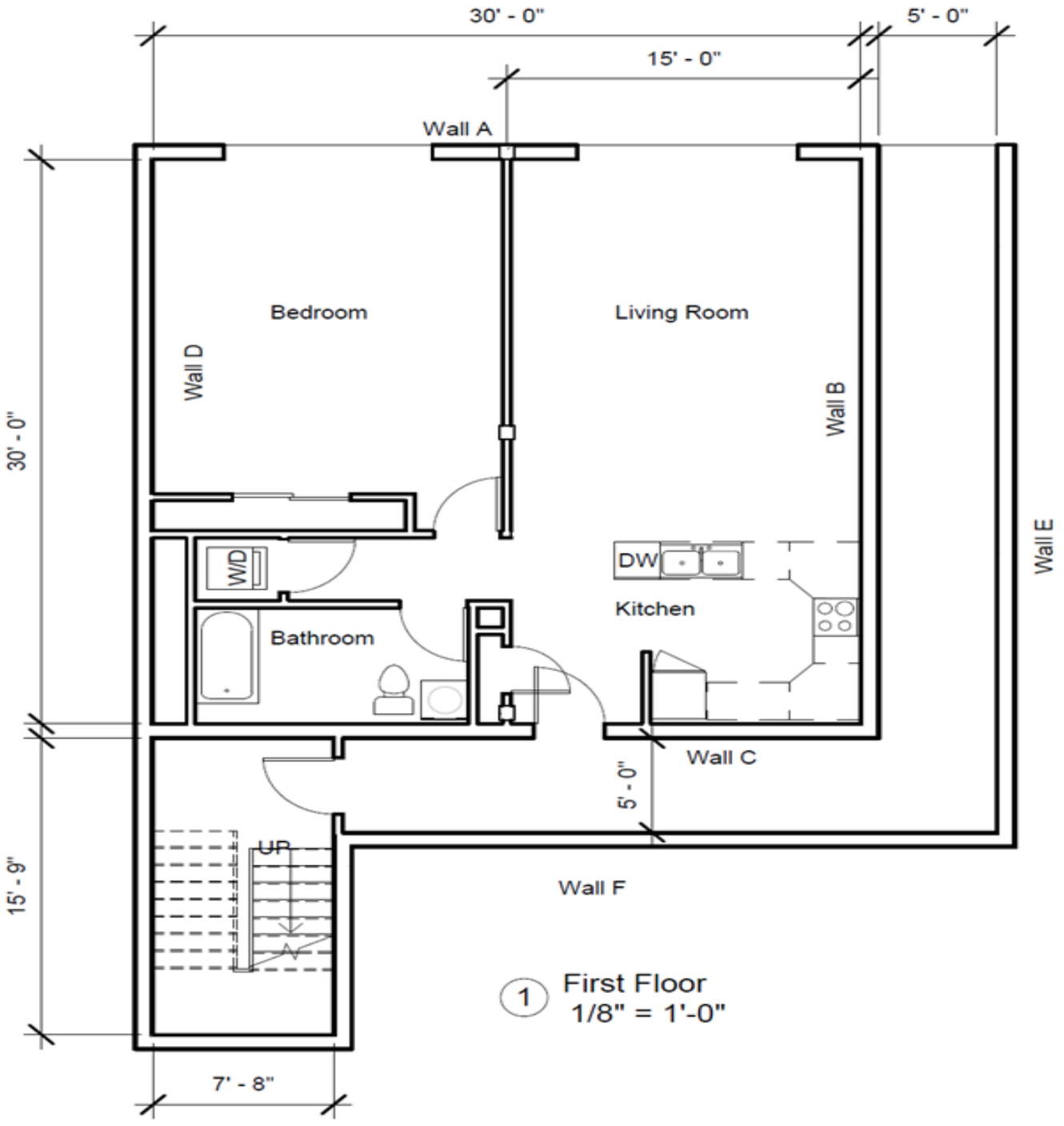
- Purpose: Perform tests of realistic fire scenarios applicable to tall wood construction in order to evaluate occupant and firefighter tenability for egress and suppression efforts, and to provide data necessary to guide further development of relevant code and standard provisions

- Conducted at U.S. government facilities (ATF)
- Supervised by U.S. Forest Product Laboratory staff

Test Structure Floor Plan

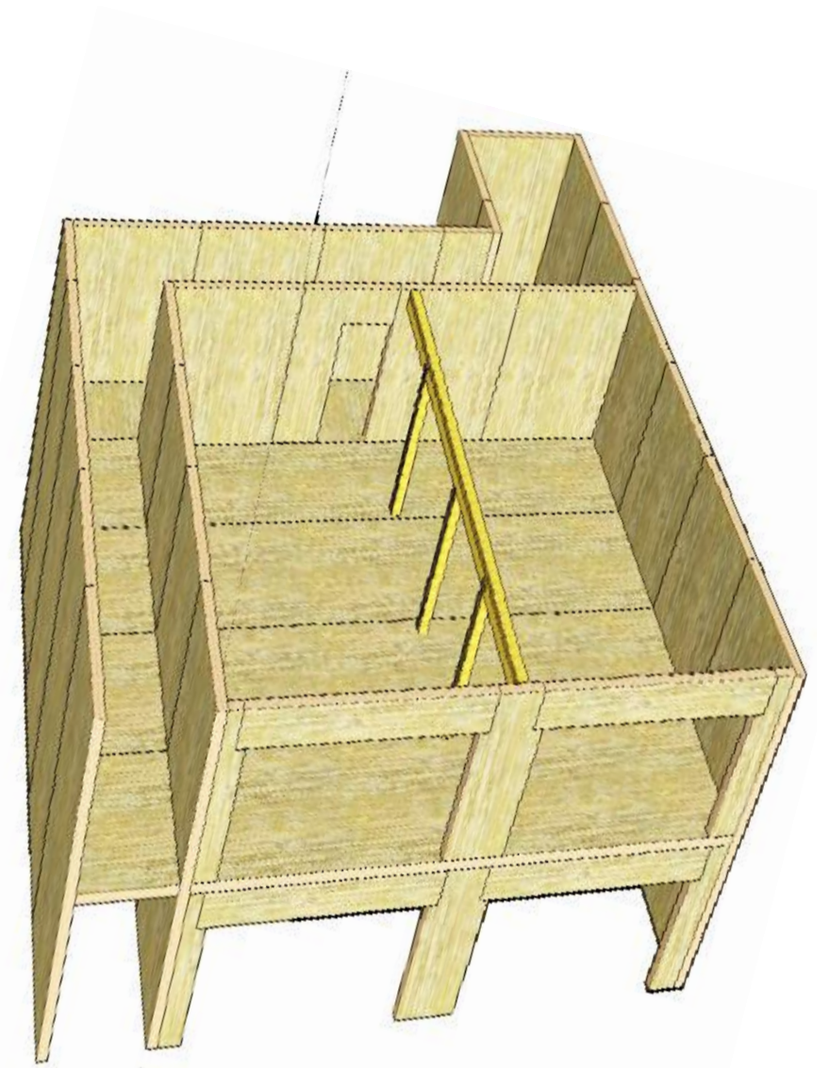
Fire Work Group Plan

- One bedroom apartment
- 30 feet X 30 feet interior dimensions.
- UL “modern furnishings” fuel load imposed 570 mj/m^2
- Fuel load was approximately 95 percentile of Group R
- 20-minute rated door between compartment and corridor
- 90-minute rated door between corridor and stairwell



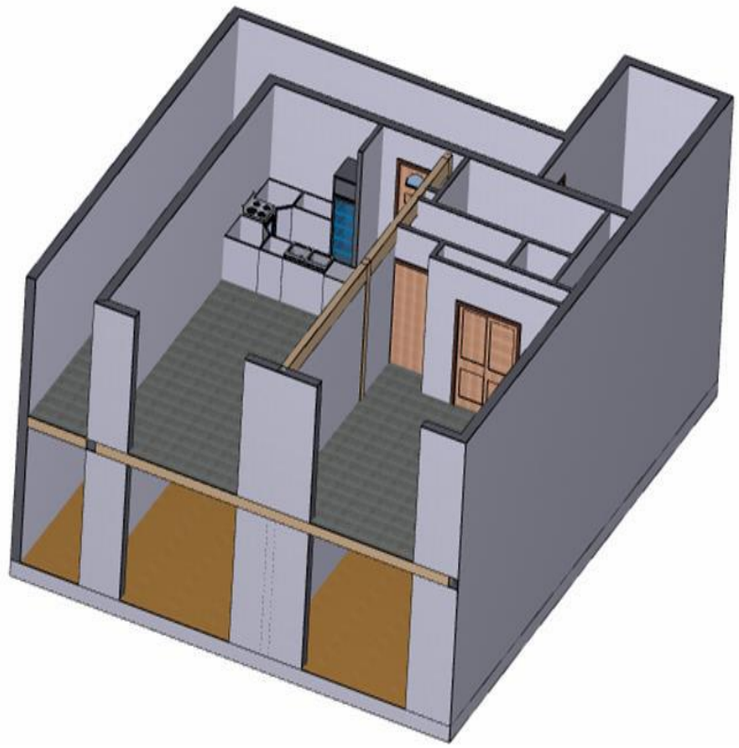
Two-Story Structure

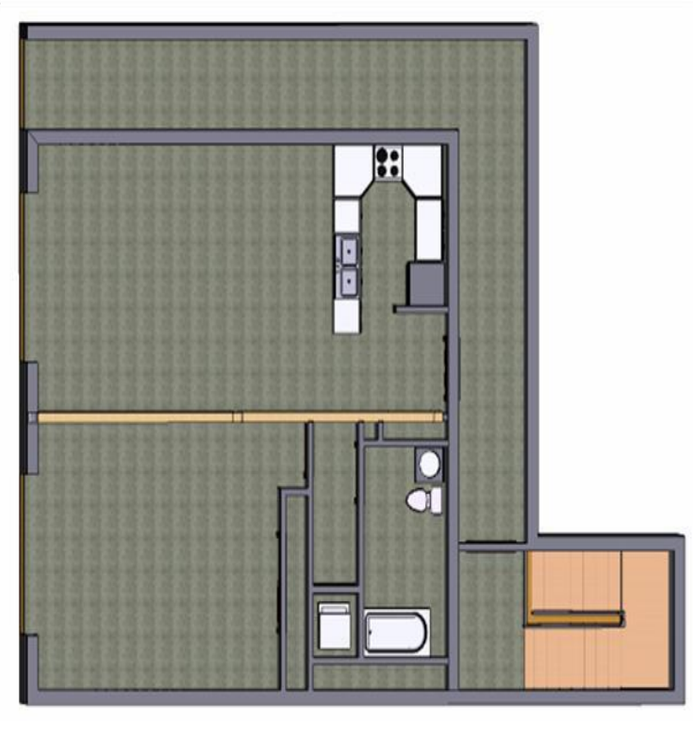
- Ceiling height: 9 ft (2.7 m)
- 5-ply CLT
  - Douglas-Fir – Larch species group
  - Lamination Thickness: 1.375 inches(35 mm)
  - CLT Thickness: 6.875 inches (175 mm)
  - Polyurethane Adhesive
- Corridor around each apartment and a stairwell
- Ceiling loaded to 20 PSF



Apartment Layout

- Partitions used unrated ½” gypsum wallboard
- Kitchen & Living Room: 15 ft x 30 ft
- Bedroom & Bath: 15 ft x 30 ft
- 20-min rated door between compartment and corridor
- 90-min rated door between corridor and stairwell
- Fuel load ~570 MJ/m^2





Fire Test Scenarios

Test	Description	Date
Test 1	All mass timber surfaces protected with 2 layers of 5/8" Type X GWB	5/23/17
Test 2	30% of CLT ceiling area in living room and bedroom exposed	5/31/17
Test 3	Two opposing CLT walls exposed – one in bedroom and one in living room (there is a partition wall)	6/20/17
Test 4	All mass timber surfaces fully exposed in bedroom and living room. Sprinklered – normal activation	6/27/17
Test 5	All mass timber surfaces fully exposed in bedroom and living room (except bathroom). Sprinklered – 20 min delayed activation	6/29/17

Apartment Furnishings – Kitchen & Living Room

Photos provided by U.S. Forest Products Laboratory, USDA

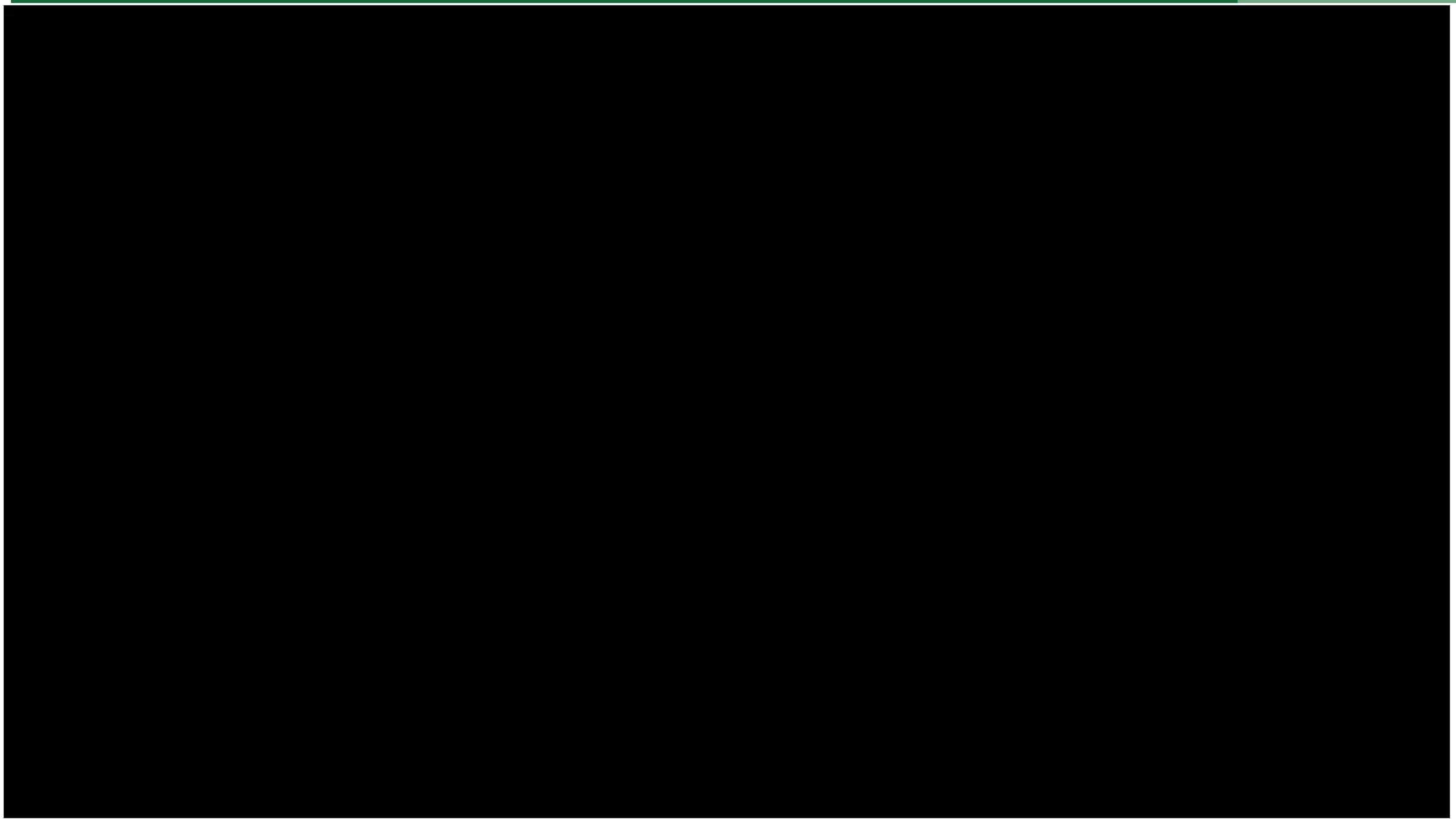
Apartment Furnishings – Bedroom & Bath

Photos provided by U.S. Forest Products Laboratory, USDA

ATF FIRE TEST #1 - ALL MASS TIMBER PROTECTED

All mass timber surfaces protected with 2 layers of 5/8” Type X GWB

ATF Fire Test #1 - 2 Layers GWB



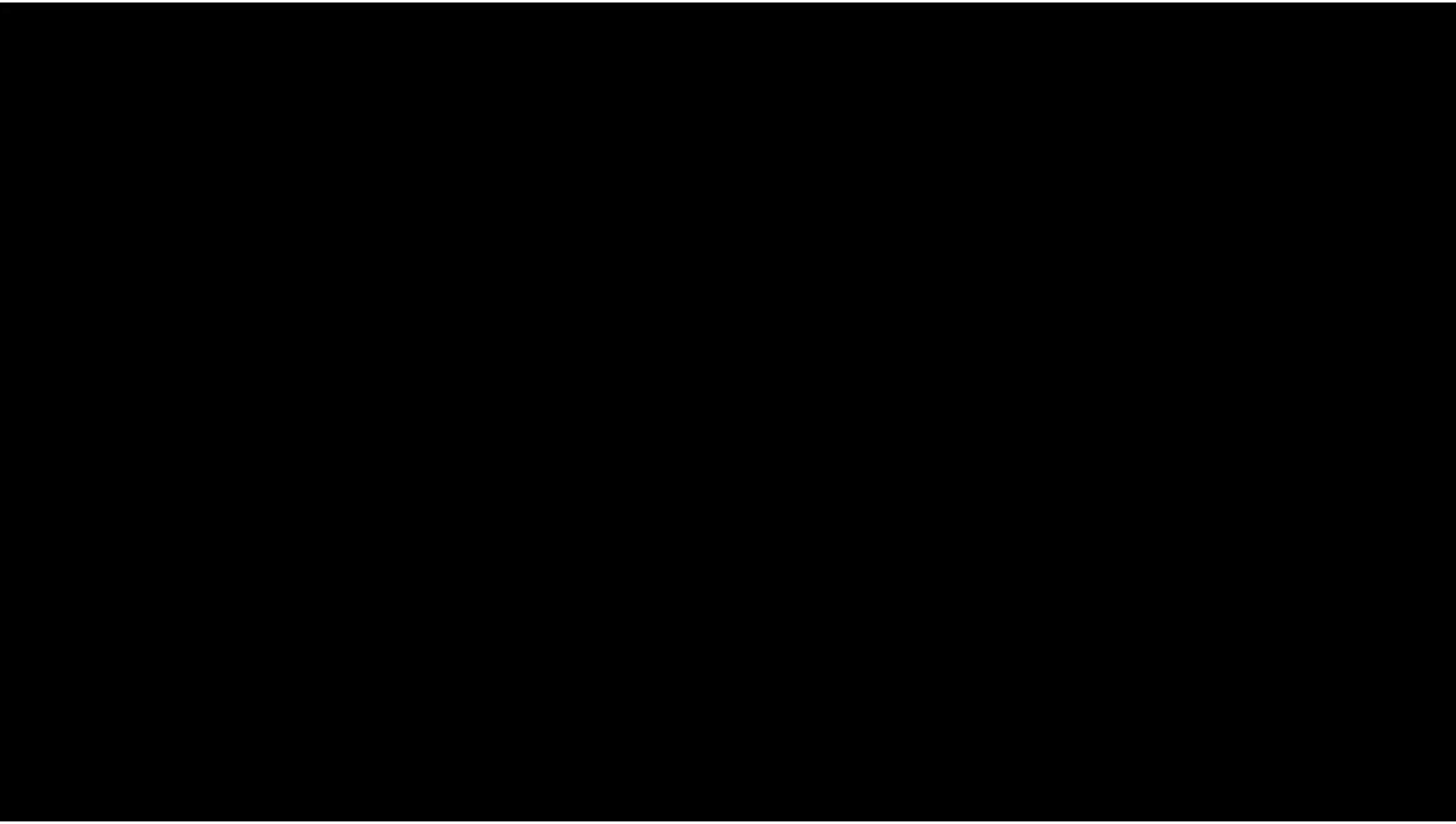
Test #1 - All Mass Timber Protected

Photos provided by U.S. Forest Products Laboratory, USDA

Test #2 – 30% CLT Ceilings Exposed

- **30% of CLT ceiling area in living room and bedroom exposed**
- **Live load applied using water barrels**

ATF Fire Test #2 – 30% Exposed Ceiling



Test #2 – 30% CLT Ceilings Exposed


Ignition


Living Room / Kitchen Flashover


Bedroom Flashover


Decay Phase


Living Room Ceiling


Bedroom Ceiling

Photos provided by U.S. Forest Products Laboratory, USDA

ATF FIRE TEST #2 – 30% CLT CEILINGS EXPOSED

Post-Fire Condition of Glulam After Gypsum Removal

- Fire intensity decreased subsequent to consumption of furnishings and contents (known as *decay phase*)

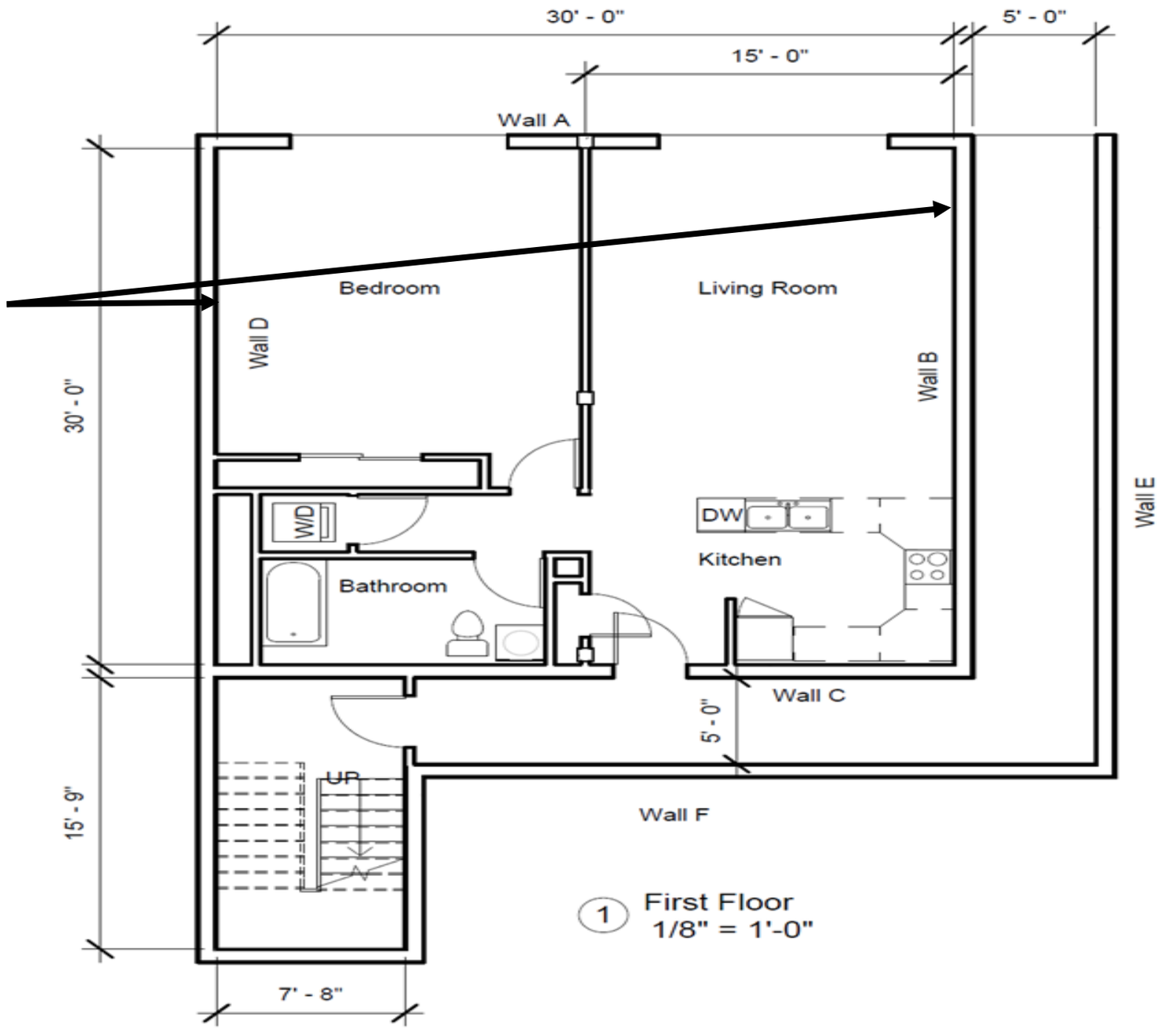
- Exposed mass timber surfaces self-extinguished in the decay phase

- Mass timber surfaces protected with 2 layers of 5/8” Type X GWB remained mostly uncharred

Section of exposed ceiling (90º angle)

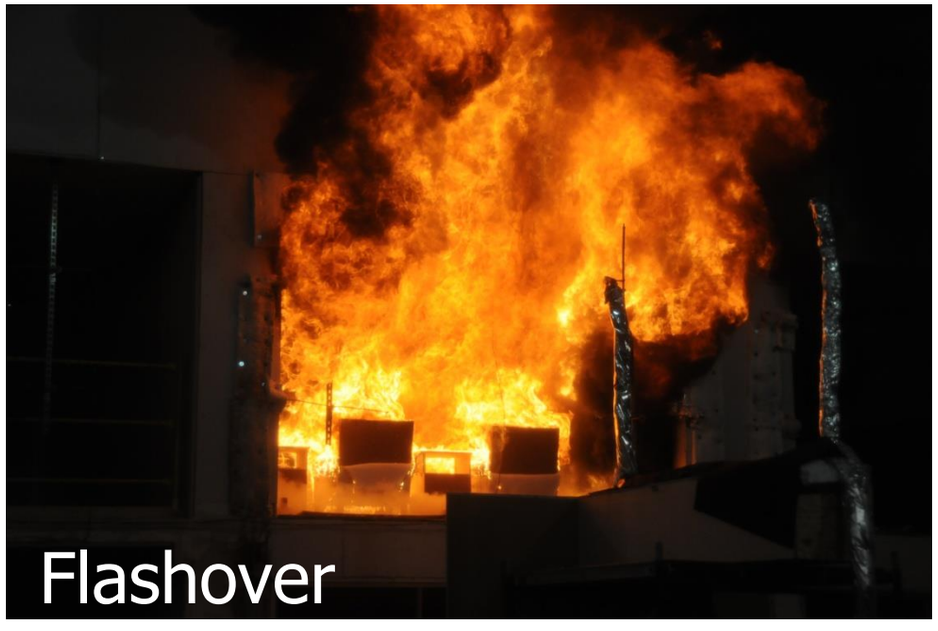
Test #3 – Exposed Walls

Two opposing CLT walls exposed one in bedroom and one in living room



ATF Test #3 – 2 Exposed CLT Walls

ATF FIRE TEST #3 WALLS EXPOSED



Mass Timber Contribution declining

Test #4- Sprinkler Protected, Exposed

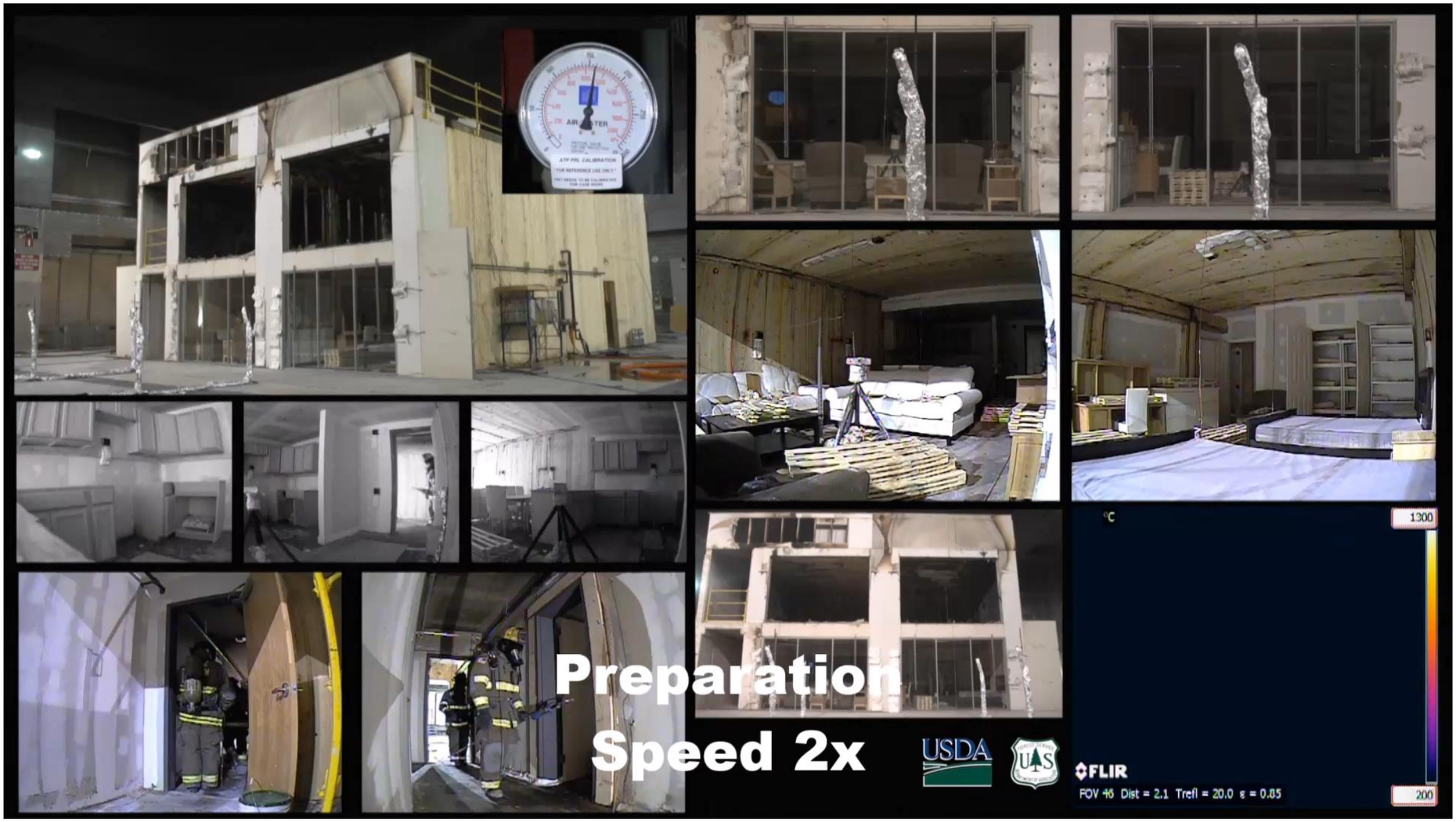
Test #4 – Sprinklers Protected, Exposed

All mass timber surfaces fully exposed in bedroom and living room.

Sprinkler – normal activation

Photos provided by U.S. Forest Products Laboratory, USDA

Test #5- Delayed Sprinkler



TEST #5 – DELAYED SPRINKLERS

All mass timber surfaces fully exposed in bedroom and living room.

Sprinkler – water delayed for 20 minutes after sprinkler activation within the test compartment…approximately 23 minutes from ignition

- Flashover conditions were reached in the kitchen, and the bedroom was very near reaching flashover
- The sprinkler system effectively suppressed the fire

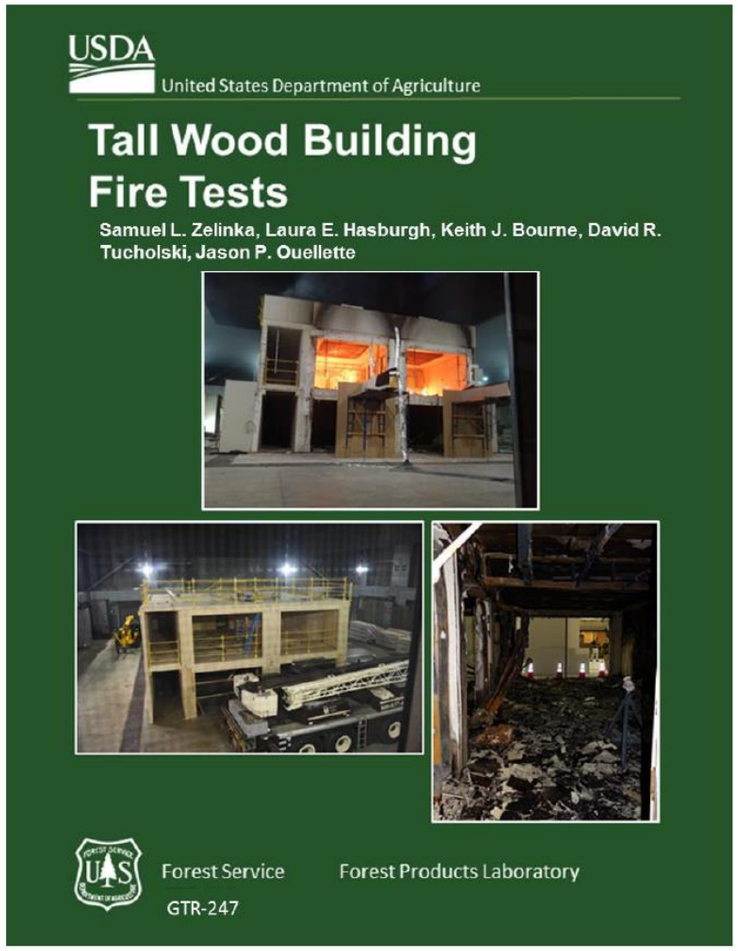
Results – Event Log

Test No.	Time After Ignition (mm:ss)				
	Flashover (600°C) Living Room	Flashover (600°C) Bedroom	Flames in Hallway	Compartment door Fails	Sprinkler Activation
1 1st floor	**13:27**	**17:20**	**26:51**	**57:46**	**N/A**
2 2nd floor	**11:42**	**17:20**	**30:38**	**63:59**	**N/A**
3 2nd floor	**12:37**	**17:00**	**13:06** **(door frame installation error)**	**29:42** **(door frame installation error)**	**N/A**
4 1st floor	**-**	**-**	**-**	**-**	**2:37**
5 1st floor	**-**	**-**	**-**	**-**	**23:00**

ATF FIRE TESTS

Full Report on FPL Website:

https://www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr247.pdf



Fire Test Videos on AWC Website:

www.awc.org/tallmasstimber

Link to you tube videos available on this page

TWB COMMITTEE PROPOSALS

TWB PRODUCT

- 14 code change proposals to-date; hundreds of code sections reviewed
- 3 new types of construction proposed
- New entries in Height (feet), Height (stories) and Area for the IBC
- Multiple new requirements for safety while under construction
- Existing exterior wall test standard still required (currently NFPA 285 per IBC)

ALL 14 PROPOSALS WERE APPROVED AS RECOMMENDED

TWB COMMITTEE PROPOSALS

- **G108** New types of construction
- **G75** Height in feet
- **G80** Height in stories
- **G84** Allowable area per floor
- **G89** Fire barriers
- **G146** Membrane structures with mass timber
- **G152** Appendix
- **G28** Redundant water supply
- **FS5** Performance based noncombustible protection
- **FS6** Sealing of Splices and intersections
- **FS73** mass timber as fire blocking
- **FS81** Prescriptive noncombustible protection
- **IFC F88** Owners responsibility
- **IFC F266** Fire safety during construction

SO LET'S LOOK AT THOSE NEW CODE SECTIONS…

DEFINITIONS

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

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

[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.

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DEFINITIONS

PRIMARY STRUCTURAL FRAME. The primary structural frame shall include all of the following structural members:

1. The columns.

2. Structural members having direct connections to the columns, including girders, beams, trusses and spandrels.

3. Members of the floor construction and roof construction having direct connections to the columns.

4. ~~Bracing~~ Members that are essential to the vertical stability of the primary structural frame under gravity loading ~~shall be considered part of the primary structural frame whether or not the bracing member carries gravity *loads.*~~

SECONDARY MEMBERS. The following structural members shall be considered secondary members and not part of the *primary structural frame*:

1. Structural members not having direct connections to the columns.

2. Members of the floor construction and roof construction not having direct connections to the columns.

3. Bracing members ~~other than those that are part of the *primary structural frame*~~. that are not designated as part of a primary structural frame or bearing wall.

TYPE OF CONSTRUCTION

TYPE IV-A Mass Timber with noncombustible protection

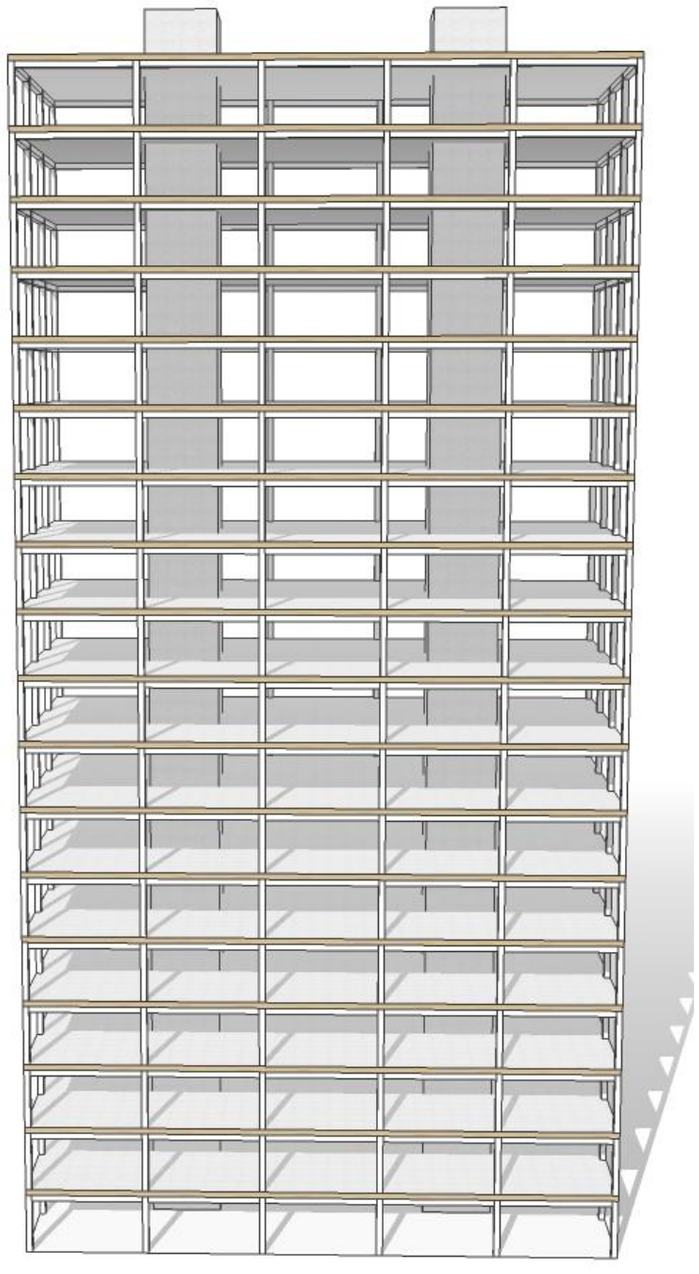
- Noncombustible protection shall provide 2/3 of the required Fire Resistance Rating for Building Elements (Table 601, 602)
- Taller buildings therefore not permitted to have exposed mass timber

TYPE IV-B Mass Timber with limited portions of noncombustible protection omitted

- limits on how much mass timber can be exposed
- limits on how close exposed areas can be to one another

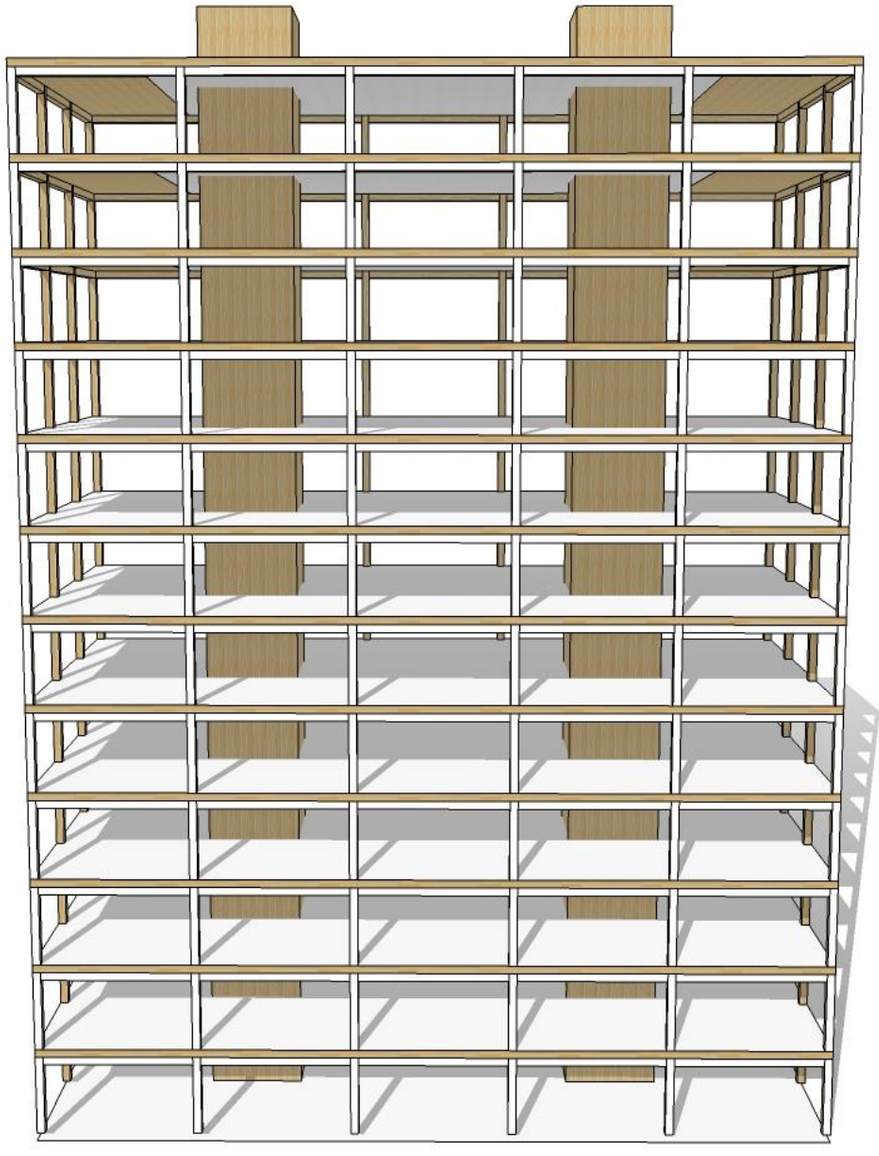
TYPE IV-C Mass Timber with no requirement for noncombustible protection, except certain features

Type of Construction IV-A



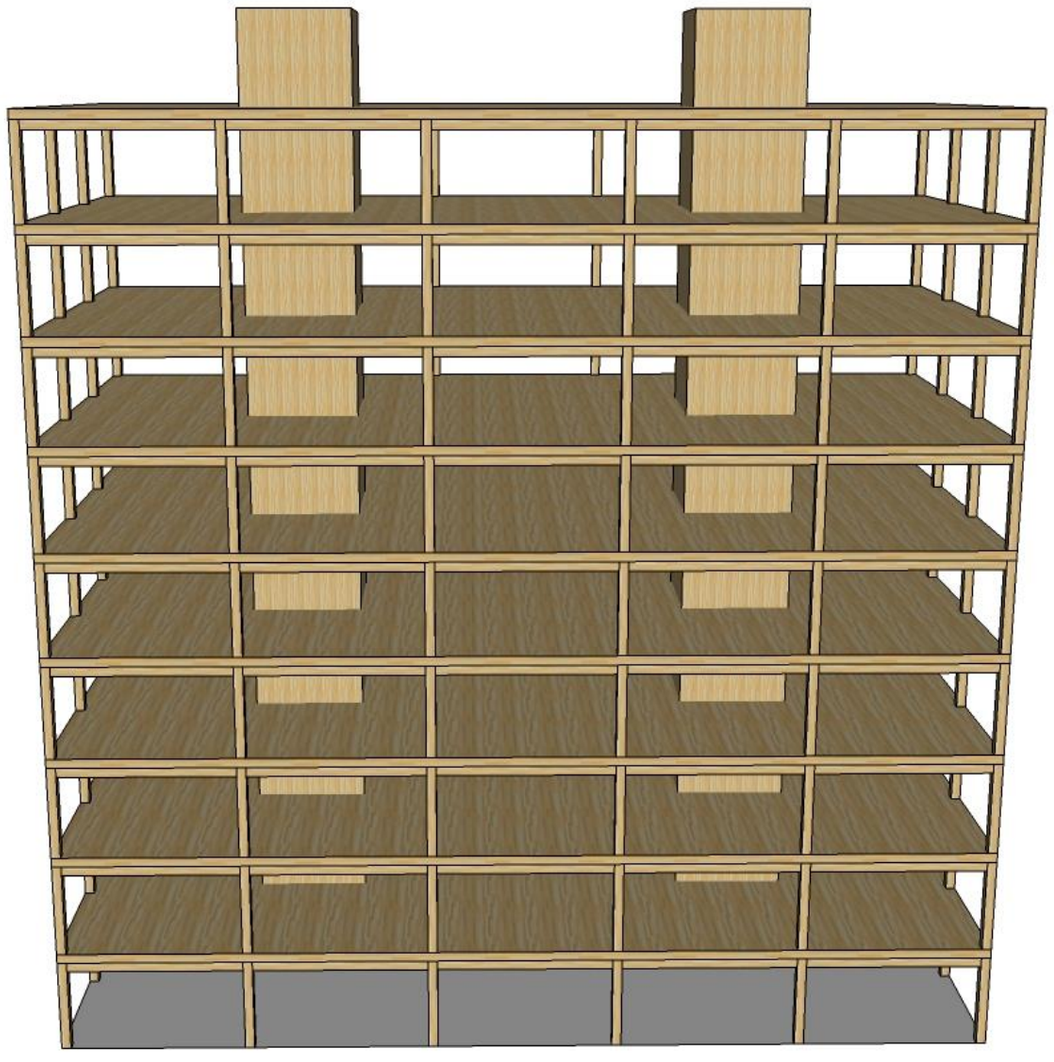
Building Elements	
Maximum Height	270’
Number of Stories (except H’s)	9 - 18
Exposed Mass Timber	Fully Protected
Sprinklers	Yes
Primary Frame FRR	3 hours
Floor FRR	3 hours
Fire Resistance from Non-com	120 minutes
Stairs Tower	Non-combustible
Concealed Spaces	Permitted
Floor Topping	Noncombustible

Type of Construction IV-B



Building Elements	
Maximum Height	180’
Number of Stories (except H’s)	6 - 12
Exposed Mass Timber	Partially
Sprinklers	Yes
Primary Frame FRR	2 hours
Floor FRR	2 hours
Fire Resistance from Non-com	80 minutes
Stairs Tower	Mass Timber
Concealed Spaces	OK if Protected
Floor topping	Noncombustible

Type of Construction IV-C



Building Element	
Maximum Height	85’
Number of Stories	4 - 9
Exposed Mass Timber	Fully Exposed
Sprinklers	Yes
Primary Frame FRR	2 hours
Floor FRR	2 hours
Stairs Tower	Mass Timber
FRR from Non-combustibles	0 hours
Concealed Spaces	OK if Protected
Floor topping	No requirement

BUILDING ELEMENT FIRE RESISTANCE RATINGS

TABLE 601

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]	2[a]	1	0	1	0	3[a]	2[a]	2[a]	HT	1	0
Bearing walls Exterior [e, f] Interior	3 3[a]	2 2[a]	1 1	0 0	2 1	2 0	3 3	2 2	2 2	2 1/HT	1 1	0 0
Nonbearing walls and partitions Exterior	See Table 602											
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 members (see Section 202)	2	2	1	0	1	0	2	2	2	HT	1	0
Roof construction and associated secondary 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

BUILDING ELEMENT FIRE RESISTANCE RATINGS

TABLE 602

FIRE SEPARATION DISTANCE = X(feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H	OCCUPANCY GROUP F-1, M, S-1	OCCUPANCY GROUP A, B, E, F-2, I, R, S-2, U
X<5[b]	ALL	3	2	1
5≤X<10	IA, IVA Others	3 2	2 1	1 1
10≤X<30	IA, IB, IVA, IVB IIB, VB Others	2 1 1	1 0 1	1[c] 0 1[c]
X≥30	ALL	0	0	0

TYPE OF CONSTRUCTION

- Each Type of Construction based on test conditions in at least 1 of the 5 ATF fire tests

- Fire Test Plan developed by TWB Fire Work Group

- Test Plan included testing of various “generic” connections as recommended by the Structural Work Group

- Both panel mass timber (CLT) and other mass timber (glulam beams and columns) were tested

TWB PRODUCT

Revise IBC Section 602.4 to reflect 3 new types of construction

IV-A, IV-B, and IV-C

"Do no harm" to existing heavy timber (formerly known at Type IV)

- rename heavy timber to IV-HT (throughout code where referring to heavy timber as a type of construction)
- be sure to say heavy timber in sections where building elements are permitted to be "heavy timber" such as roof structure in Types I & II

IBC SECTION 602.4 REQUIREMENTS

- Mass Timber elements shall have noncombustible protection as specified in 602.4.
- Mass Timber elements shall have a fire resistance rating shown in Tables 601 & 602
- Mass Timber CLT elements shall be tested and labeled for Heat Performing Adhesives
- All building elements including load-bearing and non load-bearing walls and partitions must be mass timber or noncombustible construction (no combustible light frame)
- No combustibles allowed in concealed spaces except those currently allowed in plenums (e.g., insulated wires, etc.)
- In Types IV-A and IV-B, floors must have minimum 1-inch noncombustible material above the mass timber

Concealed Spaces

No exposed combustibles permitted in concealed space other than plenum exception material

TWB Committee proposals

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 determined in Section 722.7.1(a).

602.4.3.6 Shafts. Shafts shall be permitted in accordance with Section 713 and Section 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 determined in Section 722.7.1(a), on both the inside of the shaft and the outside of the shaft.

NONCOMBUSTIBLE PROTECTION

Table 722.7.1(a) Protection Required From Noncombustible Covering Material

Fire Resistance Rating of Building Elements (Per Tables 601 and 602) (hours)	Minimum Protection Required from Noncombustible Protection (minutes)
1	40
2	80
3 or more	120

Table 722.7.1(b) Protection Provided by Noncombustible Covering Material

Noncombustible Protection	Protection Contribution (minutes)
1/2 inch Type X Gypsum Board	~~30~~ 25
5/8 Type X Gypsum Board	40

NONCOMBUSTIBLE PROTECTION

Attachment of Type X Gypsum Board Used as Noncombustible Protection:

- Screws shall penetrate ≥1” into mass timber
- Screws shall be spaced no more than 12” o.c. in each direction
- Screws at panel edges shall be between 1” and 2” from the edge
- Panel edges shall be offset 18” from those of adjacent layers
- Stair-step profile required at wall-to-wall & wall-to-ceiling intersections
- Screw heads and panel joints shall be covered with joint compound

TWB COMMITTEE PROPOSALS

Type IV-B

602.4.2.2.2 Protected Area

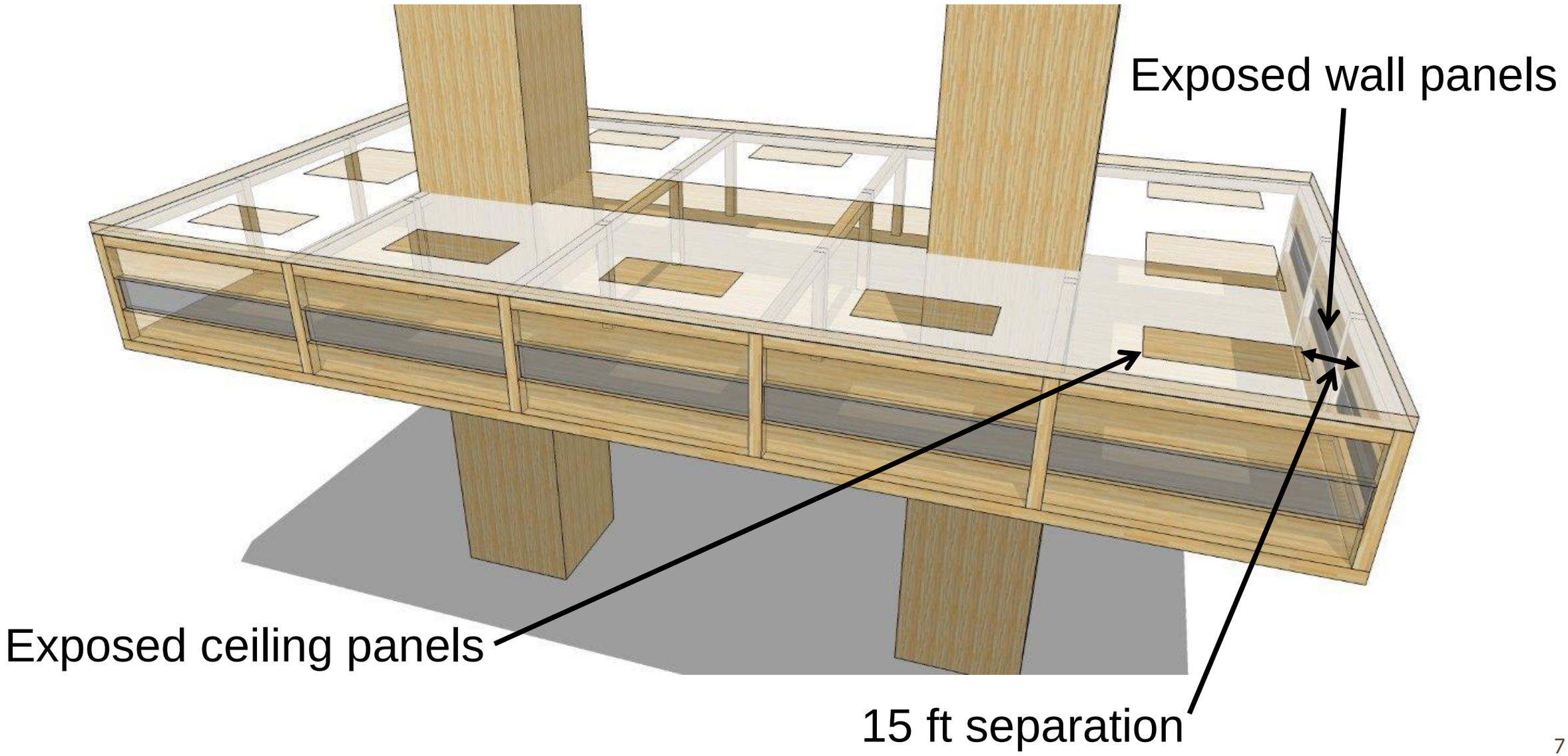
Exceptions

Mass timber columns and beams which are not an integral portion of walls or ceilings, respectively, shall be permitted to be unprotected without restriction of either aggregate area or separation from one another.

But only 1 or 2 or 3 may be used in any dwelling unit or fire area. However, different dwelling units or fire areas may have a different choice.

TWB COMMITTEE PROPOSALS

602.4.2.2.4 Separation Distance Between Unprotected Mass Timber Elements. In each *dwelling unit* or *fire area*, unprotected portions of mass timber walls and ceilings shall be not less than 15 feet from unprotected portions of other walls and ceilings, measured horizontally along the ceiling and from other unprotected portions of walls measured horizontally along the floor.



FIRE PROTECTION REQUIREMENTS

- Redundant water supply for “super-tall” buildings (>420 Ft) applies to mass timber buildings of more than 120 ft.

- Mandatory sealing of adjacent mass timber elements in Section 703.9.
  - Mass timber to mass timber
  - Mass timber to other materials

- Owner is responsible to visually inspect all fire resistance rated construction and keep a record

ADDITIONAL FIRE PROTECTION REQUIREMENTS

- Requirements for fire protection during construction:
  - Standpipes in accordance with IFC 3313
  - Water supply for fire department operations
  - One layer of noncom protection, if required, on all mass timber more than 4 stories below uppermost floor under construction
  - Exterior wall coverings on all floor levels more than 4 levels below floor under construction – includes mezzanines

IBC 2021 Code Changes

Owner's responsibility

701.6 Owner's responsibility. 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 602.4.1, 602.4.2 and Sections 703 through 707. Such construction shall be visually inspected by the owner annually and properly repaired, restored or replaced where damaged, altered, breached or penetrated. Records of inspections and repairs shall be maintained. 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.

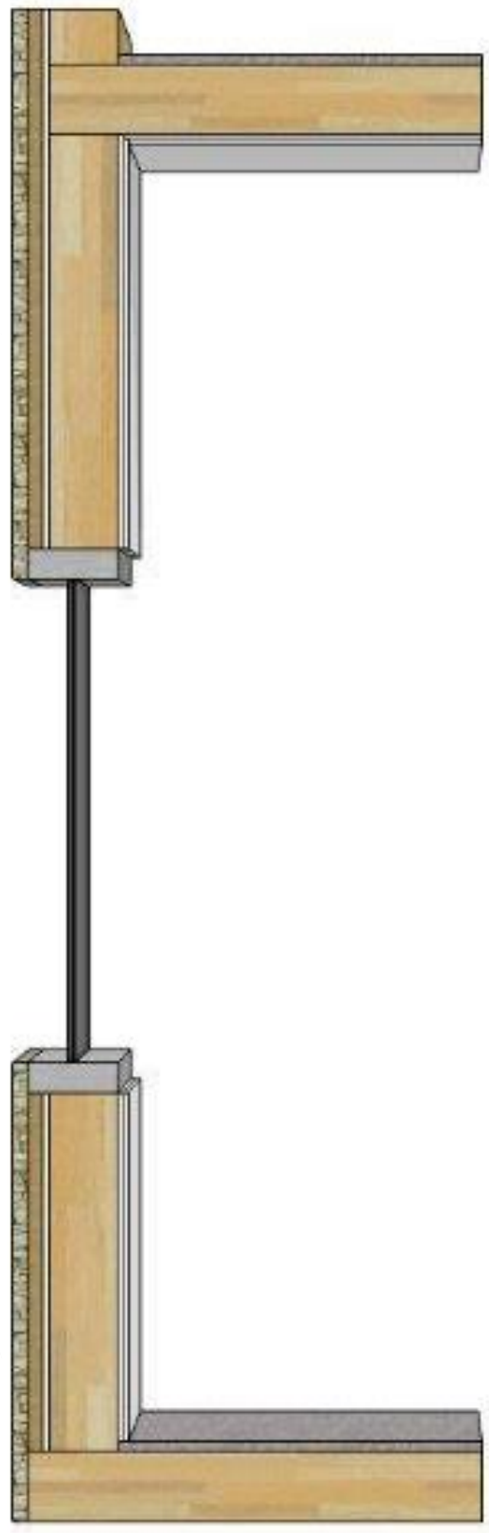
TWB COMMITTEE PROPOSALS

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

EXTERIOR WALL SECTION

All material outboard of the
Mass Timber
MUST BE NONCOMBUSTIBLE
Except: water resistive barrier

1 layer
5/8 in. Type X GWB
Required on outside
Of exterior walls for
Type IV-A, B and C



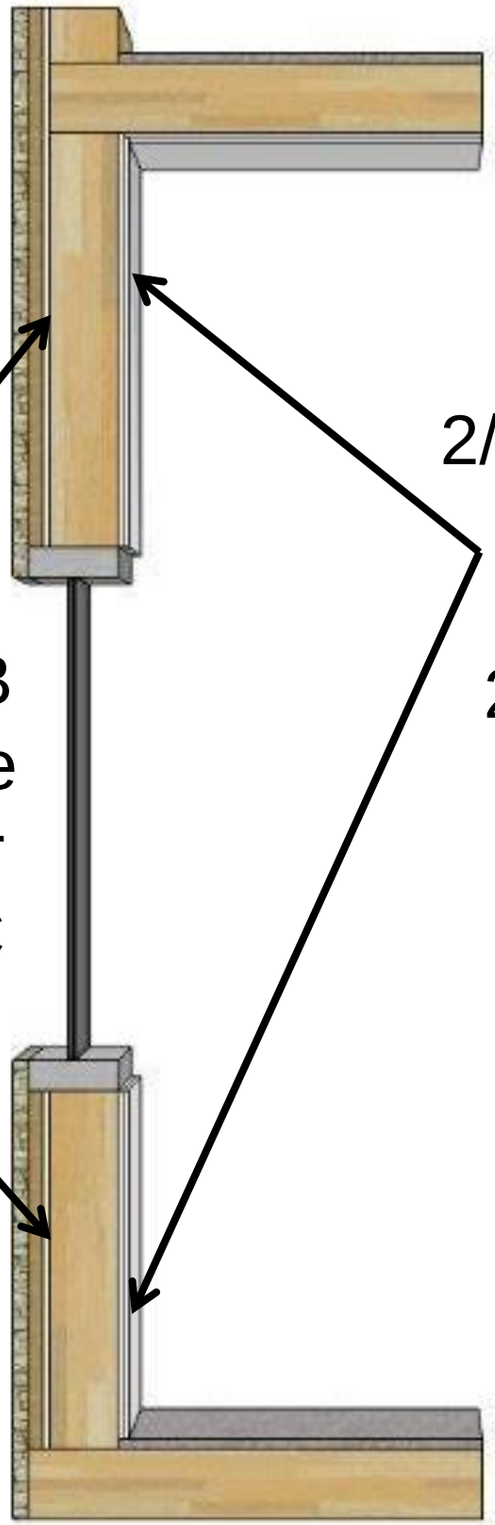
TWB COMMITTEE PROPOSALS

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

1. Galvanized nails of minimum 12 Gage with a 7/16 inch head of sufficient length to penetrate the mass timber a minimum of 1 inch.

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

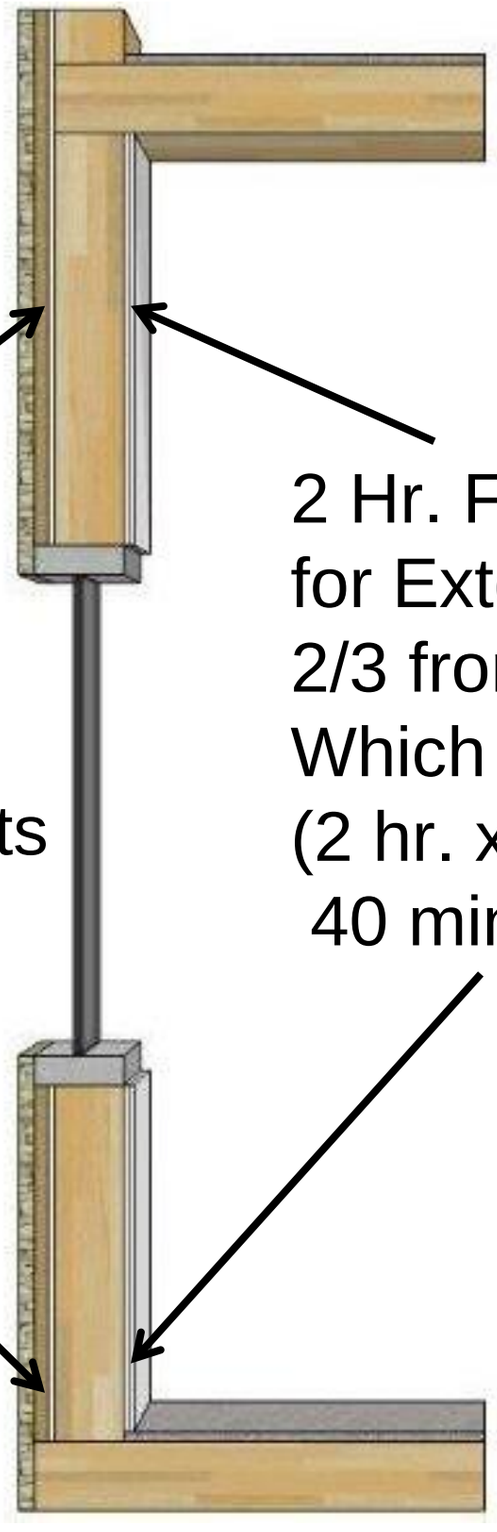
IBC Type IV-A Exterior Wall Section



1 layer
5/8 in. Type X GWB
Required on outside
Of exterior walls for
Type IV-A, B and C

3 Hr. Fire Resistance Rating (Table 601)
2/3 must be from noncombustible protection
2 Hr. Fire Resistance rating from
noncombustible protection
2 Hr. FRR = 3 layers 5/8 in. Type X GWB
40 min. X 3 layers = 120 min or 2 hrs.

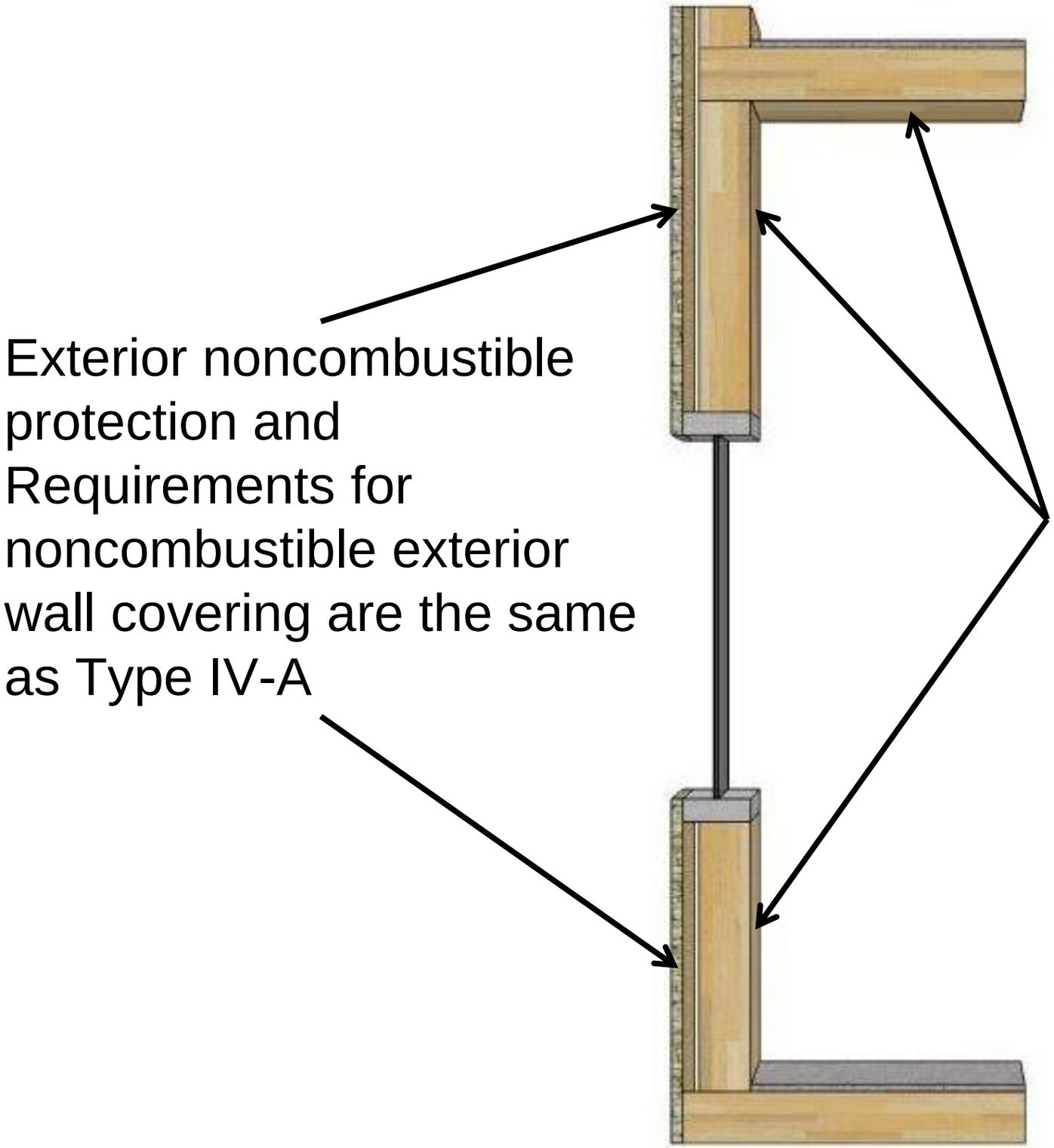
IBC Type IV-B Exterior Wall Section



Exterior noncombustible protection and noncombustible requirements of exterior wall covering are the same as Type IV-A

2 Hr. Fire Resistance Rating required for Exterior and Interior bearing walls 2/3 from noncom protection Which = 2 layers 5/8 in. GWB (2 hr. x 2/3 = 4/3 hr or 80 min. and 40 min x 2 = 80 min)

IBC TYPE IV-C EXTERIOR WALL SECTION



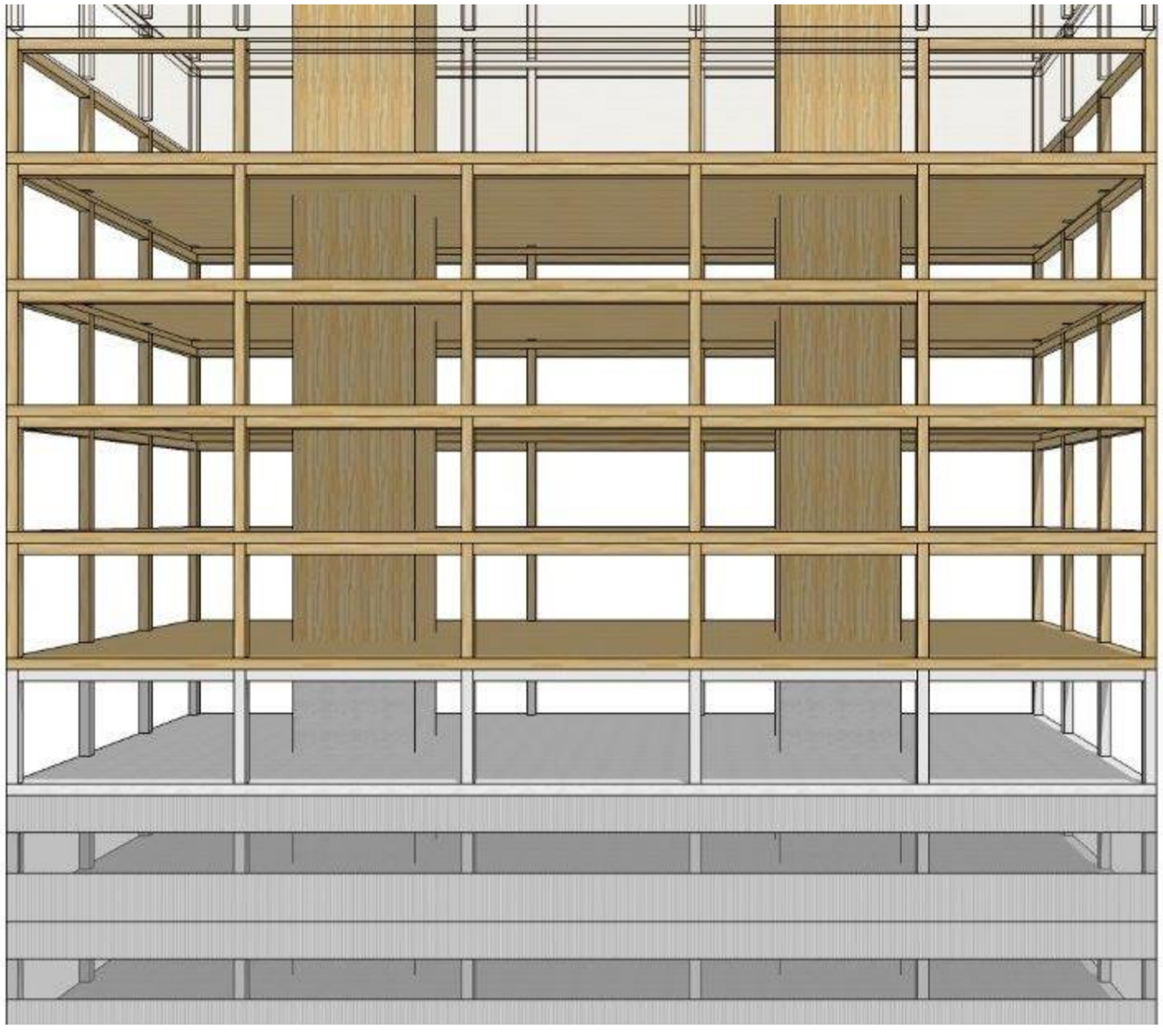
IBC 2021 Code Changes

IFC 3314.7 Fire safety requirements for buildings of Types IVA, IVB, and IVC construction. Buildings of Types IVA, IVB, and IVC construction **designed to be greater than six stories ABOVE GRADE PLANE** shall meet the following requirements during construction unless otherwise approved by the *fire code official.*

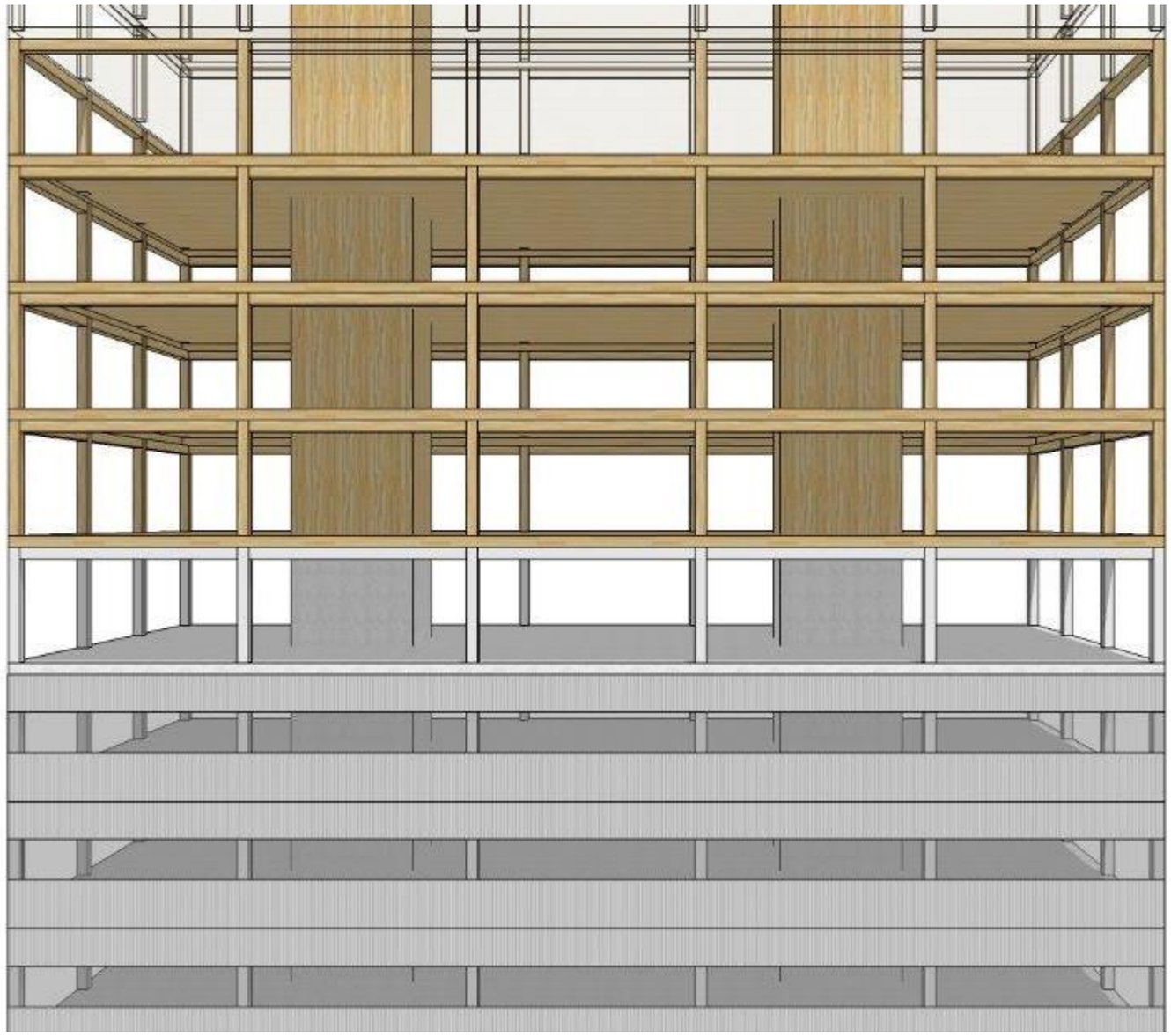
1. Standpipes shall be provided during construction in accordance with Section 3311.
2. A water supply for fire department operations, as approved by the fire chief.
3. Where building construction exceeds six stories ABOVE GRADE PLANE, at least one layer of the noncombustible protection required by Section 602.4 shall be installed on all building elements more than 4 floor levels, including mezzanines, below active mass timber construction 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 more than 4 floor levels, including mezzanines, below active mass timber construction before erecting additional floor level.

Exception: Shafts and vertical exit enclosures.

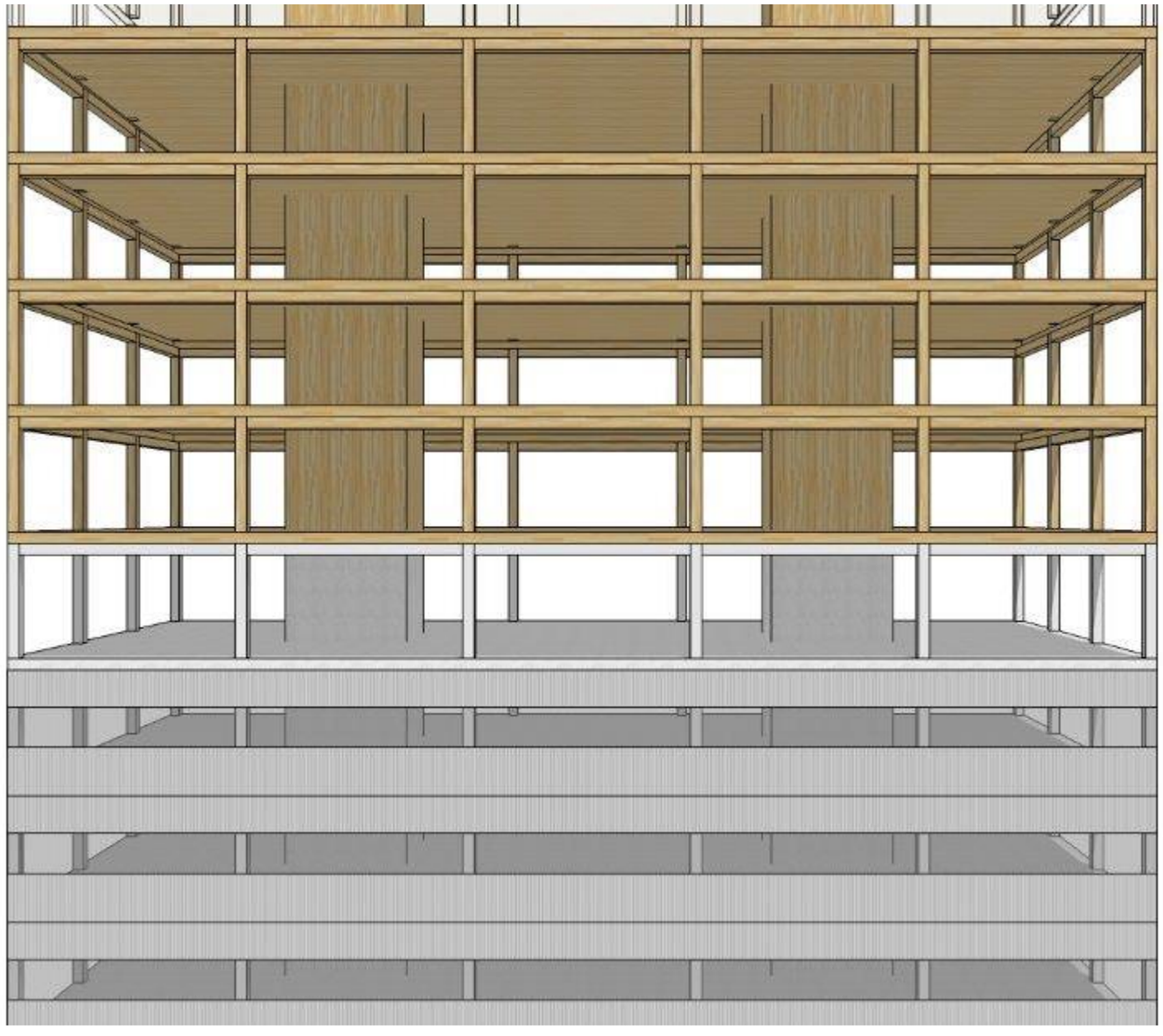
Fire safety during construction



Fire safety during construction



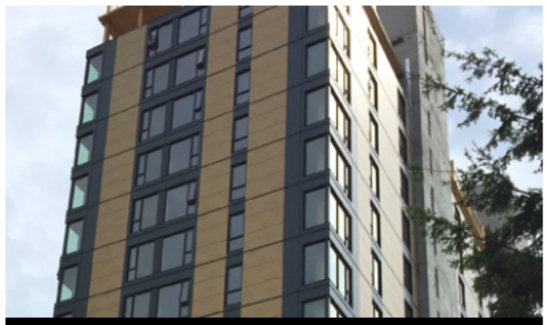
Fire safety during construction



www.woodaware.info

WOOD AWARE

Fighting Fire with Facts



Tall Mass Timber

Tall mass timber is an industry term to identify mass timber buildings, constructed of mass timber elements, that exceed current height limits for wood buildings set by the International Building Code (IBC). Mass timber includes any product currently permitted for use in Type IV construction, such as Cross Laminated Timber (CLT), Structural Composite Lumber, glued-laminated timber, and large section sawn lumber. Because of the unique structural and fire resistance characteristics of solid timber walls and floors (CLT) and mass timber structures, new provisions have been approved for the 2021 Edition of the IBC for tall mass timber buildings up to 18 stories.

More

Codes & Standards

AWC is committed to ensuring a resilient, safe, and sustainable built environment. To achieve these objectives, AWC contributes to development of building and fire codes and standards which allow for the safe and responsible use of wood products. We support utilization of wood products by developing and disseminating consensus standards, comprehensive technical guidelines, and tools for wood design and construction, as well as providing education regarding their application.

More

News & Events

Presenting Tall Mass Timber
Jun 28, 2019

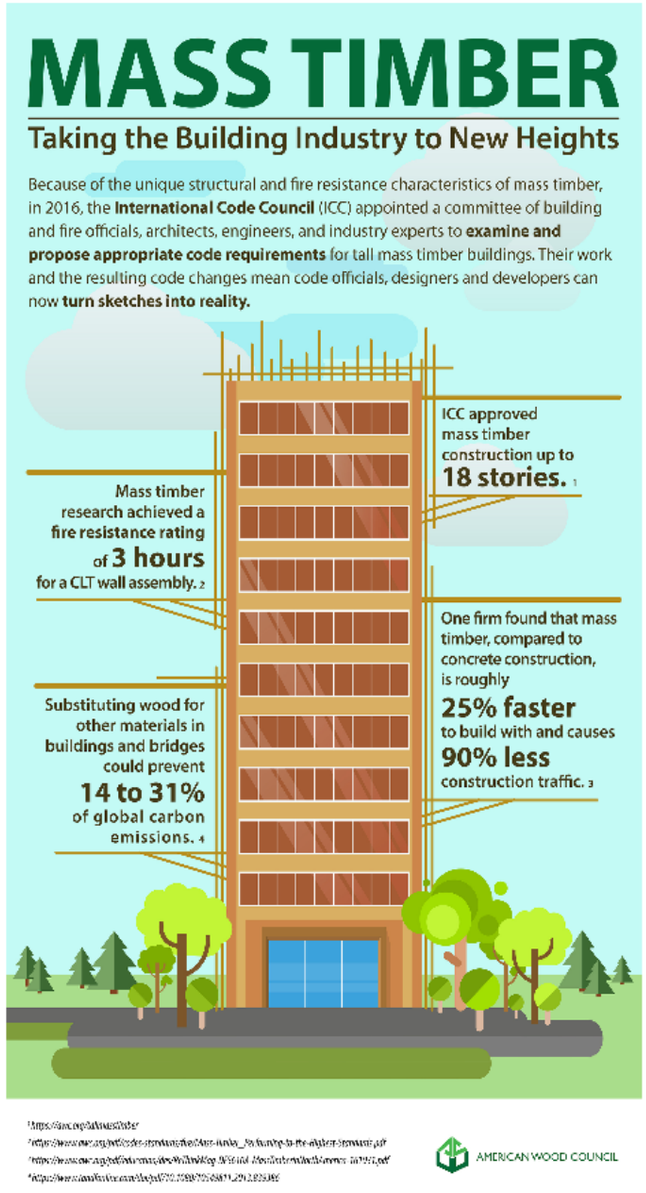
Presenting Tall Mass Timber
Jun 19, 2019

Presenting Tall Mass Timber & Construction Fire Safety Best Practices
Jun 11, 2019

Tall Mass Timber Buildings and Fire Service Concerns
May 31, 2019

MBOIA Conference
May 20, 2019

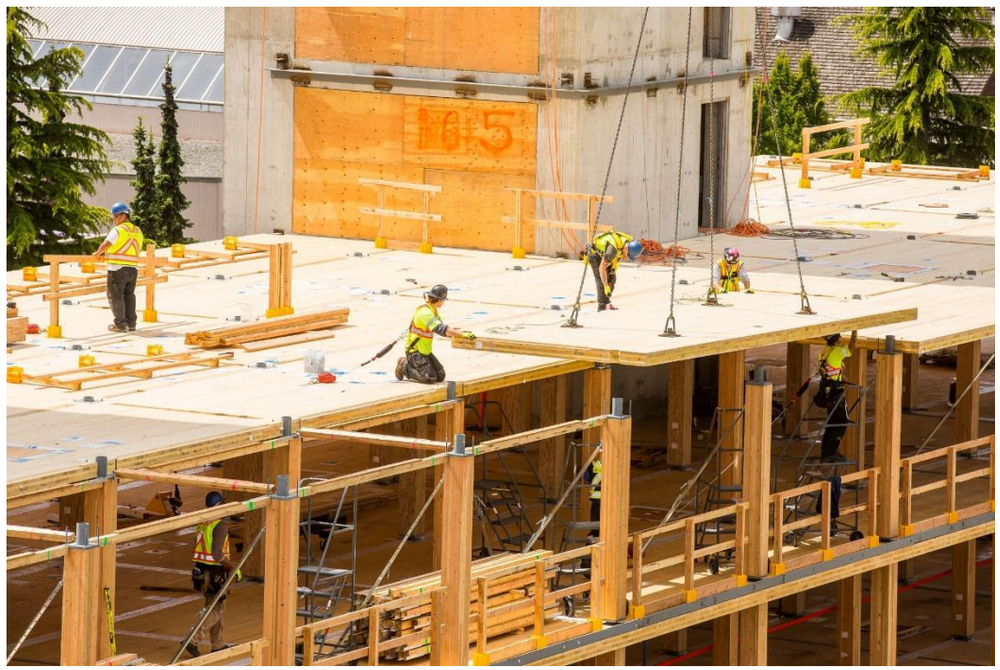
Presenting Tall Mass Timber
May 17, 2019



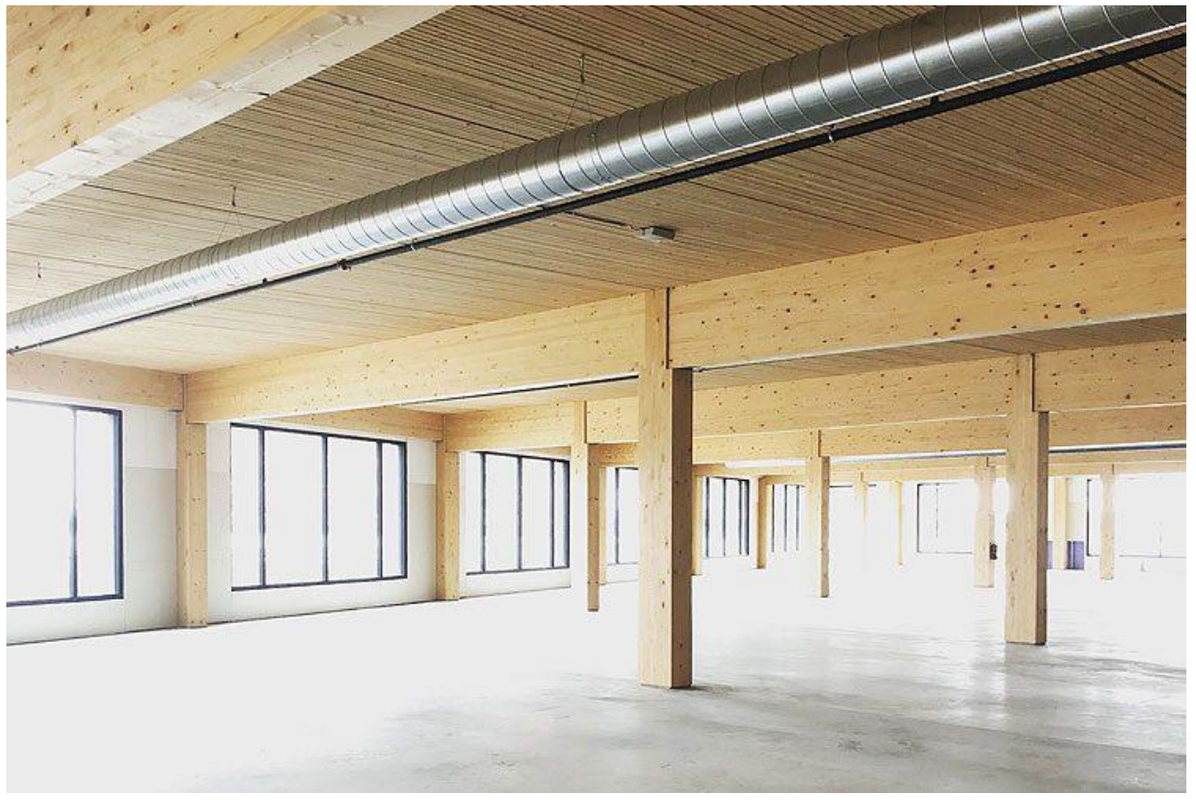
- **Tall Wood Webinars**
  - **Fire Tests**
  - **Adhesive Test**
  - **Code Changes**

- **Websites**
  - **www.awc.org/codeconnections**
  - **www.constructionfiresafety.org**
  - **www.WoodAware.info**

- **FIREHOUSE ARTICLE ON TMT**
  - **https://www.firehouse.com/operations-training/structures/article/21008544/what-the-fire-service-needs-to-know-about-tall-wood-buildings**



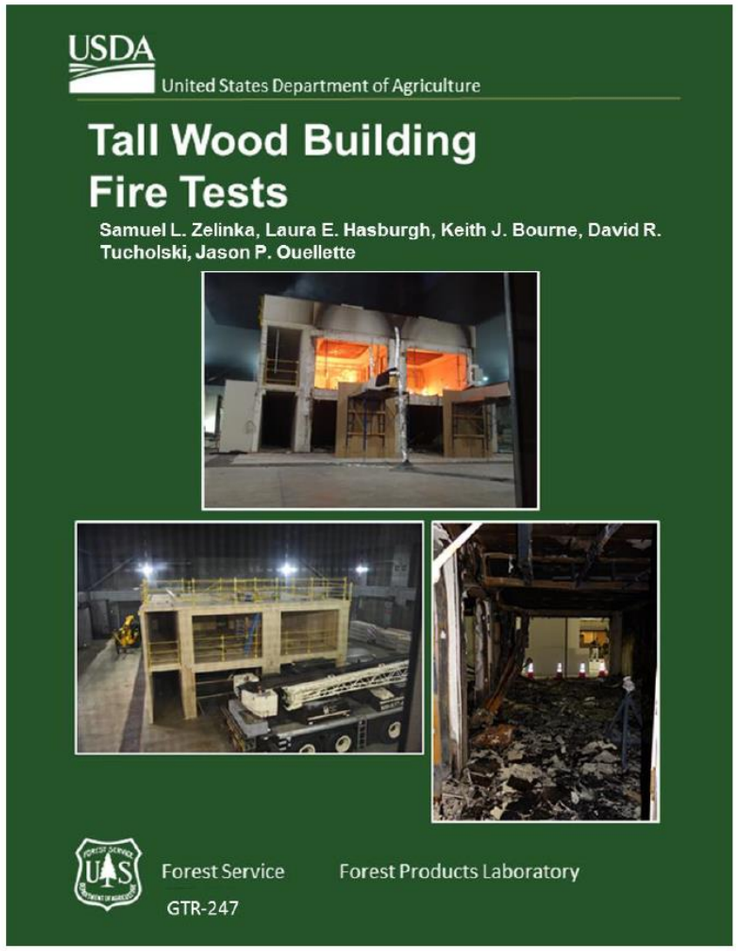
- **Fire Engineering article on TMT**
  - **https://www.fireengineering.com/articles/2019/05/tall-mass-timber-buildings-and-fire-service-concerns.html**



ATF FIRE TESTS

Full Report on FPL Website:

https://www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr247.pdf



Fire Test Videos on AWC Website:

www.awc.org/tallmasstimber

Link to you tube videos available on this page

Ray O'Brocki, CBO
Manager of Fire Service Relations
American Wood Council
ROBrocki@awc.org
410.299.9681

AMERICAN WOOD COUNCIL

info@awc.org | www.awc.org