Canadian Wood Council

Conseil canadien du bois

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Fire-Retardant-Treated Wood and the Building Code

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Division A - Part 1
"Fire-retardant-treated wood"

1.4.1.2 "...means wood or a wood product that has had its surface-burning characteristics, such as flame spread, rate of fuel contribution and density of smoke developed, reduced by <u>impregnation</u> with fire-retardant chemicals."

3.1.4.4.(1) Fire-retardant-treated wood

- Pressure impregnated with fire-retardant chemicals
- CSA O80 Series, “Wood Preservation”
- Flame-spread rating (FSR) ≤ 25

Division A – Part 1 “Flame-spread rating”

1.4.1.2: ***“…an index or classification indicating the extent of spread of flame on the surface of a material or an assembly of materials, as determined in a standard fire test prescribed in this Code.”***

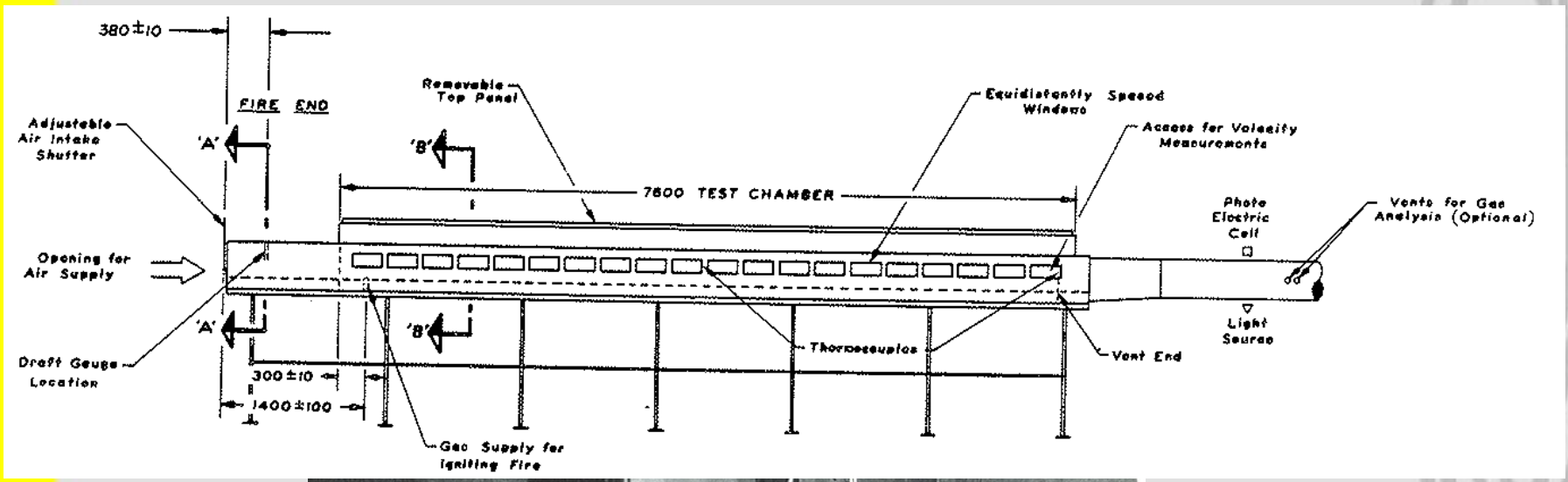
Division B
Subsection 3.1.12

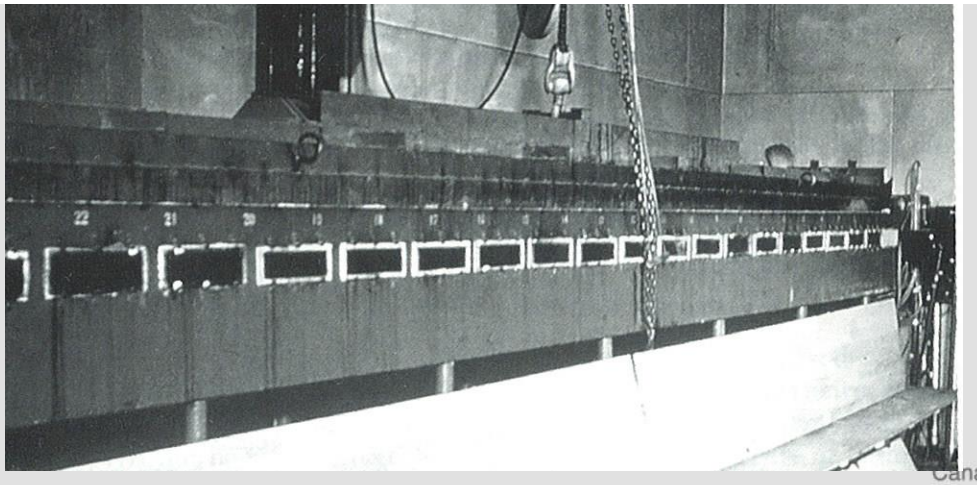
Flame-Spread Rating

- **CAN/ULC-S102, *"Test for Surface Burning Characteristics of Building Materials and Assemblies"***
- **CAN/ULC-S102.2, *"Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies"***
- **NBCC - Appendix D**

Flame-Spread Rating

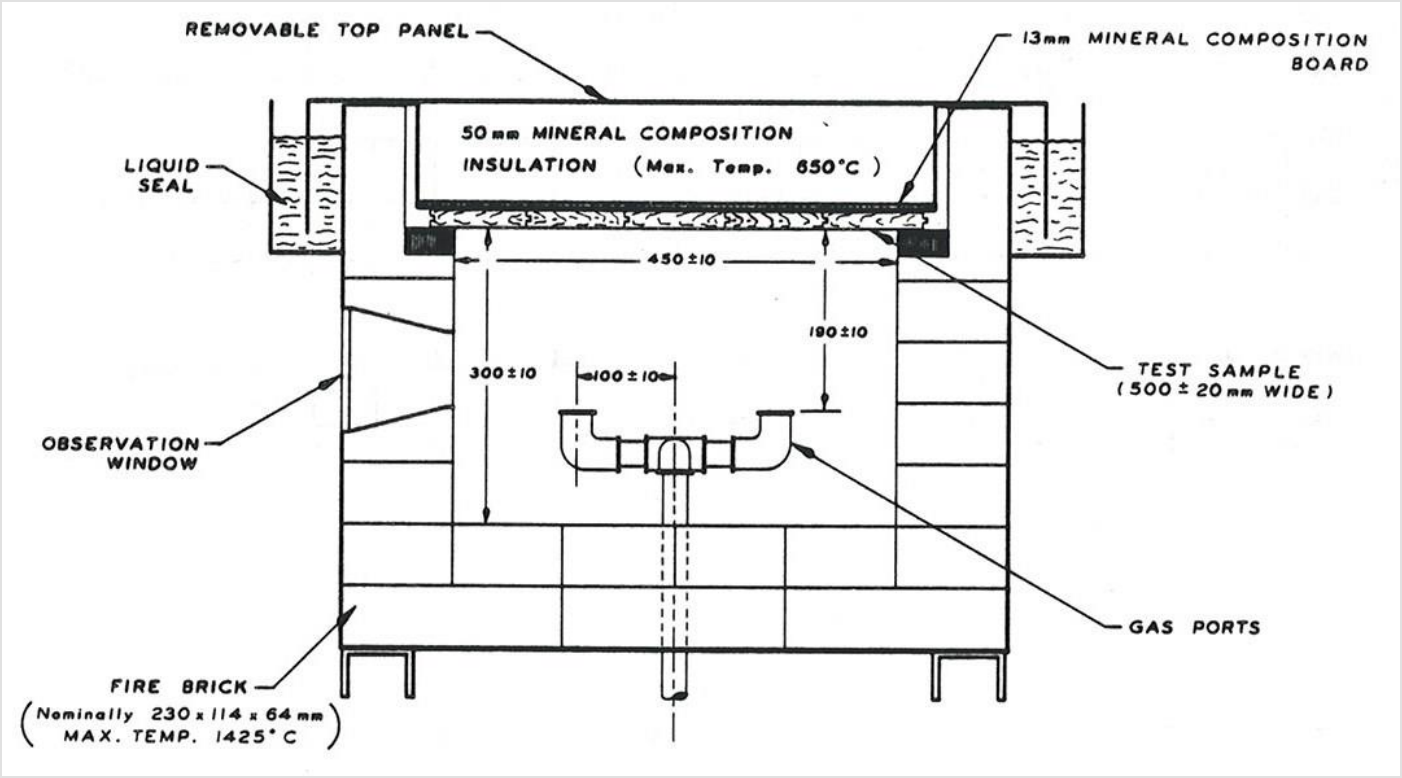
CAN/ULC-S102 and CAN/ULC-S102.2





Flame-Spread Rating

CAN/ULC-S102 and CAN/ULC-S102.2



Subsection 3.1.13 Interior Finishes

Flame Spread Requirements:

- Apply to combustible and noncombustible construction
- Level required is relative to importance of a space as a means of escape

Subsection 3.1.13. Combustible & Noncombustible Construction

Walls

- Generally FSR ≤ 150
- Restrictions to FSR ≤ 150
  - Exits: 10% of total wall area
  - Some lobbies: 25% of total wall area
  - Vertical service spaces: 10% of total wall area
  - Otherwise, FSR ≤ 25

Subsection 3.1.13 Combustible Construction

Ceilings

- Generally FSR ≤ 150
- Restrictions to FSR ≤ 150
  - Exits: 10% of total ceiling area
  - Lobbies: 10% of total ceiling area
  - Vertical service spaces: 10% of total ceiling area
  - Otherwise, FSR ≤ 25

Subsection 3.1.13 Noncombustible Construction

Ceilings

- FSR ≤ 150 only allowed:
  - 10% of ceiling area in fire compartment
  - 10% of ceiling area in exits, lobbies and corridors
- Otherwise, FSR ≤ 25

Appendix D-3.1.1

Table D-3.1.1.A.
Assigned Flame-Spread Ratings and Smoke Developed Classifications for Combinations of Wall and Ceiling Finish Materials and Surface Coatings[1]

Materials	Applicable Material Standard	Minimum Thickness, mm	Surface Coating	
			Unfinished	Paint or Varnish not more than 1.3 mm Thick, Cellulosic Wallpaper not more than One Layer[2][3]
Asbestos cement board	CAN/CGSB-34.16-M	None	0/0	25/50
Brick, concrete, tile	None	None		
Steel, copper, aluminum	None	0.33		
Gypsum plaster	CSA A82.22-M	None		
Gypsum wallboard	CAN/CSA-A82.27-M ASTM C 36/C 36M ASTM C 442/C 442M ASTM C 588/C 588M ASTM C 630/C 630M ASTM C 931/C 931M	9.5	25/50	25/50
Lumber	None	16	150/300	150/300
Douglas Fir plywood[4]	CSA O121-M	11	150/100	150/300
Poplar plywood[4]	CSA O153-M			
Plywood with Spruce face veneer[4]	CSA O151-M			
Douglas Fir plywood[4]	CSA O121-M	6	150/100	150/100
Fiberboard low density	CAN/ULC-S706	11	X/100	150/100
Hardboard	CAN/CGSB-11.3-M			
Type 1		9	150/X	[5]
Standard		6	150/300	150/300
Particleboard	ANSI A208.1	12.7	150/300	[5]
Waferboard	CSA O437.0	—	[5]	[5]

Typical Flame Spread Ratings for Wood Products

Product		FSR
Cedar	Western Red	73
	Pacific Coast Yellow	78
Fir	Amabilis	69
Hemlock	Western	60–75
Oak	Red or White	100
Pine	Eastern White	85
	Lodgepole	93
	Red	142
	Western White	75
Spruce	White	65
	Sitka	74
Shakes	Western Red Cedar	69
Shingles	Western Red Cedar	49

FRTW and Flame-Spread Rating

- **FSR ≤ 25, CAN/ULC-S102 "*Test for Surface Burning Characteristics of Building Materials and Assemblies*"**
- **Qualifies as interior finish for any application in combustible construction**

Article 3.1.5.10 Combustible Interior Finish

In buildings required to be of noncombustible construction:

- **No more than 25 mm thick**
- **Exception: fire-retardant-treated battens**

Subsection 3.1.5 Noncombustible Construction

Flame Spread Rating – *"...on any exposed surface, or any surface that would be exposed in cutting through the material in any direction."*

FRTW in Subsection 3.1.13 Interior Finish

- **FRTW chemicals do not penetrate entire wood member**
- **Maximum depth achieved usually 13 mm**
- **FRTW exempt from “cutting” requirements [3.1.13.8.(1)(b)]**

Division B – Subsection 3.1.4

Combustible Construction:

"3.1.4.1.(1) A building permitted to be of combustible construction is permitted to be constructed of combustible materials..."

Division B – Subsection 3.1.5

Noncombustible Construction:

"3.1.5.1.(1) ...a building [...] required to be of noncombustible construction shall be constructed with noncombustible materials."

Division A - Part 1 "Combustible"

"1.4.1.2 Combustible means that a material fails to meet the acceptance criteria of CAN4-S114-M Test for Determination of Non-Combustibility in Building Materials."

Division A - Part 1 “Noncombustible”

“1.4.1.2 Noncombustible means that a material meets the acceptance criteria of CAN/ULC-S114 Test for Determination of Non-Combustibility in Building Materials.”

CAN/ULC-S114

- **Heat specimens at 750°C for 15 min.**
- **Noncombustible, if:**
  - **maximum temperature rise does not exceed 36°C; and**
  - **no flaming of any specimen during the test; and**
  - **maximum mass loss of any specimen does not exceed 20 per cent.**

Use of FRTW in Building Code Roof Assemblies

CAN/ULC-S126 "*Standard Method of Test for Fire Spread under Roof-Deck Assemblies.*"

- **used to qualify FRTW roof deck construction systems**
- **test period is 30 minutes**
- **FRTW requires superior fire-retardant chemical retention**

Use of FRTW in Building Code Roof Assemblies

- 3.1.14.1 FRTW Roof Systems used to comply with 3.2.2
- FRTW roof deck assemblies must meet criteria of CAN/ULC-S126
- Supports for roof deck shall be:
  - FRTW
  - Heavy timber construction
  - Noncombustible construction
  - combination

Use of FRTW in Building Code Roof Assemblies

- **(3.2.2) Permitted to be alternative to:**
  - **Noncombustible roof assembly**
  - **Ordinary wood roof assembly required to have 45-min fire-resistance rating**
- **In buildings not more than 1 storey in building height**
- **In Groups A-2, A-3, D, & F-3, with half allowable building area**
- **In Groups E and F-2, with no change to allowable building area**

Use of FRTW in Building Code Roof Assemblies

Group A, Division 2
1 storey, unsprinklered
Maximum Allowable Building Area

	Noncombustible or 45-min FRR combustible	Fire-retardant-treated wood
Facing 1 street	1600 m^2	800 m^2
Facing 2 streets	2000 m^2	1000 m^2
Facing 3 streets	2400 m^2	1200 m^2

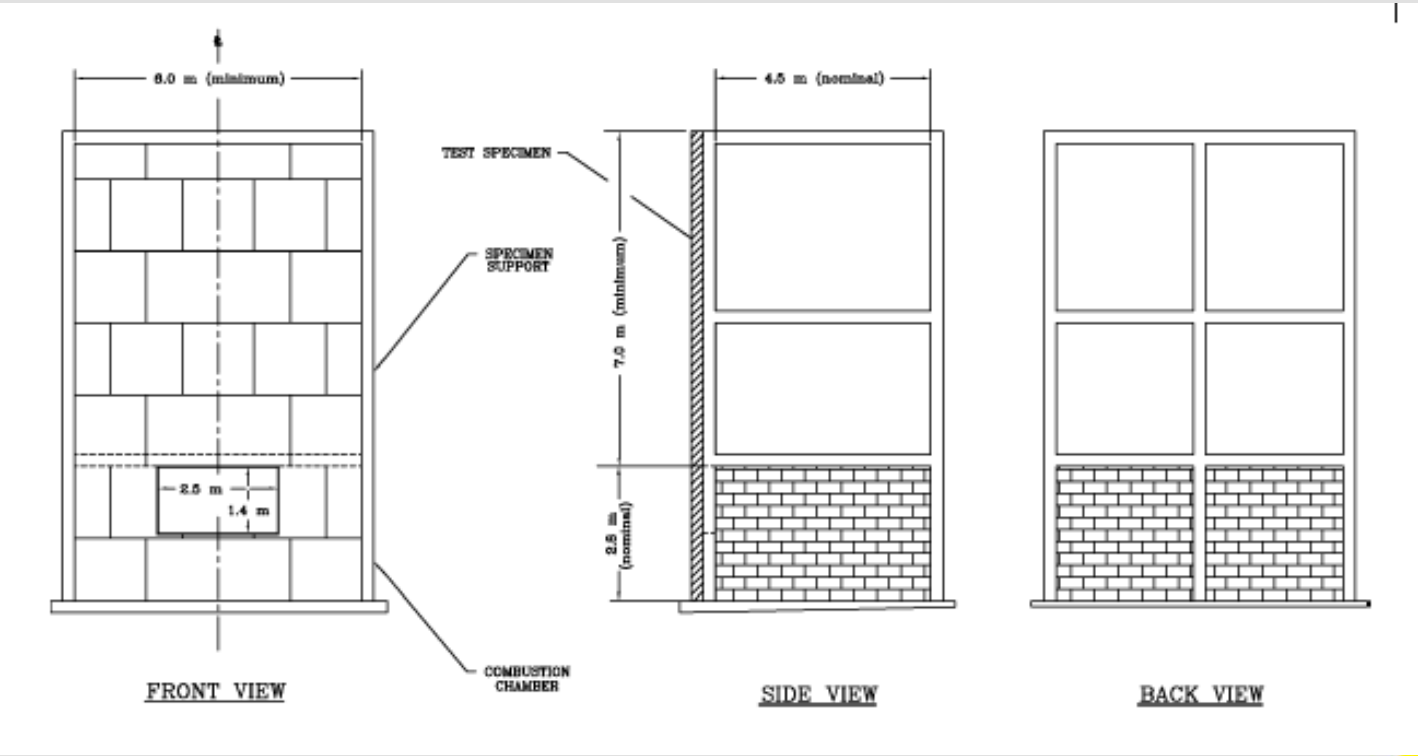
Use of FRTW in Building Code

Noncombustible construction:

- **3.1.5.21 Decorative wood cladding (moved from 3.1.5.5.(5))**
- **3.1.5.5.(4) Combustible components for exterior walls**

Combustible Components for Exterior Walls (3.1.5.5)

CAN/ULC-S134 – typical facility:



Combustible Components for Exterior Walls (3.1.5.5)

CAN/ULC-S134 – facility:

Combustible Components for Exterior Walls (3.1.5.5)

CAN/ULC-S134:

- Proprietary listings
- Currently no way to list generic assemblies

Combustible Components for Exterior Walls (3.1.5.5)

Generic CAN/ULC-S134 assemblies proposed:[1]

	Cladding	Sheathing	Wall Studs	Insulation
1a	FRTW plywood siding ≥12.7 mm thick	None	Untreated wood ≥406 mm o.c.	Thermosetting foam plastic, FSR ≤ 25
1b				Rock or slag fibre
2a	Aluminum sheet cladding ≥0.75 mm thick	None	FRTW wood ≥406 mm o.c.	Thermosetting foam plastic, FSR ≤ 25
2b				Rock or slag fibre

1. "Committee Paper #2 on Combustible Cladding", 1988 (summary of full-scale fire test results using CAN/ULC-S134 test apparatus)

Combustible Components for Exterior Walls (3.1.5.5)

Generic assemblies proposed:[1]

	Cladding	Sheathing	Wall Studs	Insulation
3	Vinyl cladding	Gypsum sheathing	Untreated wood ≥406 mm o.c.	Glass, rock or slag fibre
4a	Masonry veneer	FRT plywood sheathing ≥12.7 mm thick	Untreated wood ≥406 mm o.c.	Thermosetting foam plastic insulation FSR ≤ 25
4b				Glass, rock or slag fibre
4c		Gypsum sheathing		Thermosetting foam plastic insulation FSR ≤ 25
4d				Glass, rock or slag fibre

1. "Committee Paper #2 on Combustible Cladding", 1988 (summary of full-scale fire test results using CAN/ULC-S134 test apparatus)

Use of Fire-Retardant-Coated Wood (FRCW)

- **Can reduce FSR of uncoated wood (e.g. to 75 or 25)**
- **Interior finishes in combustible buildings**
- **Interior finishes in noncombustible buildings, except where FSR limits apply also to surfaces that may be exposed by cutting through product**

Use of FRTW in Building Code Roof Assemblies

- **(3.2.2) Permitted to be alternative to:**
  - **Noncombustible roof assembly**
  - **Ordinary wood roof assembly required to have 45-min fire-resistance rating**
- **In buildings not more than 1 storey in building height**
- **In Groups A-2, A-3, D, & F-3, with half allowable building area**
- **In Groups E and F-2, with no change to allowable building area**

Use of FRTW and FRCW in Building Code

3.1.11.5 Fire Blocks in Horizontal Concealed Spaces

- Floor or roof assemblies
- Combustible construction
- Unsprinklered
- Materials in space with FSR >25, max. 300 m^2 area, no dimension > 20 m
- Materials in space with FSR ≤ 25, max. 600 m^2 area, no dimension > 60 m

Use of FRTW and FRCW in Building Code

3.1.11.5 Fire Blocks in Horizontal Concealed Spaces

Example:

- **Attic of a church**
- **Wood trusses coated with fire-retardant paint**
- **Rest is noncombustible**

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