

Applications and Uses of
Fire Retardant Treated Wood
(FRTW) in the
National Building Code of Canada
(NBCC)

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Prepared by Arch Wood Protection Inc., manufacture of Dricon® Indoor fire retardant treated wood.



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CRITERIA

Fire Retardant Treated Wood

- 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 impregnation with fire-retardant chemicals. {NBCC 1.1.3.2}
- The treatment process performed in a factory using proprietary chemicals impregnated into the lumber or plywood in a pressure vessel per CSA 080. {NBCC 3.1.4.4}
- In addition, when testing **fire-retardant treated wood** products in the Steiner tunnel, the test is run for 30 minutes instead of the normal 10-minute test and the treated product must show no evidence of continued progressive combustion during the extended test period. {CAN/ULC S102}

Flame-Spread Ratings

- Must meet CAN/ULC S102, “*Standard Method of Test for Surface Burning Characteristics of Building Materials,*” which establishes the fire resistance rating of a single material or an assembly of materials. {NBCC 9.10.3.2 (1)}
- Applies to any exposed surface or any surface exposed by cutting through the material in any direction. {NBCC 3.1.13.8}
- Flame-spread rating for interior finishes is 150 except for doors, bathrooms is 200 and 25, 75 or 125 in ceilings. {NBCC 9.10.16.1}

Labeling requirements

- FRT wood products must be properly labeled by an accredited testing agency, such as Underwriters' Laboratories of Canada (ULC). Similar product labeling and certification requirements apply in the US. Combination UL/ULC labels indicate the FRTW product complies with both applicable standards and should be used on imports and exports.
- To be ULC listed as fire-retardant treated lumber or plywood, the treating process must show that it can reduce the flame-spread rating of the wood species by at least 30% and the treated lumber or plywood must have a flame-spread rating less than 70.

Combustible versus Noncombustible Construction

Combustible means that a material fails to meet CAN4-S114-M, “*Test for Determination of Non-Combustibility in Building Materials.*”

Noncombustible means a material meets the acceptance criteria of CAN4-S114.

Combustible construction means that type of construction that does not meet the requirements for *noncombustible construction*. {NBCC 1.1.3.2}

Fire Resistance Ratings

- Must meet CAN/ULC S101, “*Standard Method of Fire Endurance Tests of Building Construction Material.*” {NBCC 3.1.5.11(3)}
- Alternatively, the NBCC permits the authority having jurisdiction (AHJ) to accept results of test performed according to other standards.

USES

Noncombustible construction

- Wood may be used as furring strips or fascia and canopies, cant strips, roof curbs, fire stopping, roof sheathing and coverings, millwork, cabinets, counters, window sashes, doors, flooring, studs and even as wall finishes. FRTW may be substituted for any untreated wood application.
- Combustible materials use in high-rise or tall buildings is limited in areas, such as exits, corridors and lobbies, but FRTW can be used to meet these requirements.

Combustible materials in noncombustible construction

- Limited to those materials that have a flame-spread rating of not more than 25 when tested in conformance with CAN/ULC S102, “*Standard Method of Test for Building Materials and Assemblies.*” Combustible materials, which can be used in buildings of noncombustible construction. {NBCC 3.1.5}
- Combustible wall cladding and fascias are permitted in noncombustible construction. Each wall assembly must be tested in accordance with CAN/ULC-S134, “*Standard Method of Fire Test of Exterior Wall Assemblies.*” and must confirm with fire spread and heat flux limitations specified. {NBCC 3.1.5.5(1)}

- Combustible cladding assemblies that meet the requirements of the CAN/ULC-S134 test are permitted to be used in noncombustible construction where the spatial separation requirements of Subsection 3.2.3 permit noncombustible cladding and more than 10% of unprotected opening is allowed. {NBCC 3.1.5.5(1) and 3.2.3.7(9)}

Interior Uses

- Where the flame-spread requirements are most restrictive such as, millwork and paneling.
- Roof assemblies including roof decking and trusses. {NBCC 3.1.14.1}
- Interior load bearing and non load bearing partitions, etc. {NBCC 3.1.5.10}
- When FRTW is specified for interior use in the *NBCC*, it must have a flame-spread rating of not more than 25 when tested in conformance with CAN/ULC S102. Therefore, it qualifies as an interior finish for any application since the most restrictive flame-spread rating is 25. {NBCC 3.1.3.3}
- In noncombustible type buildings, any wood products up to 25mm (1") in thickness can be used as an interior wall finish if their flame-spread rating does not exceed 150 and as a ceiling finish if their flame-spread rating does not exceed 25, or are of "**fire-retardant treated wood.**" {NBCC 3.1.5.10}
- Other subsections of the code regulate the use of interior finishes such as wood products, based on their flame-spread ratings, depending upon their intended area of application and whether the building is sprinklered or not. {NBCC 3.1.13}

Exterior Uses

- FRT roof coverings must have a flame-spread rating of 25 and meet ASTM D2898 *accelerated weathering test* requirements, i.e. cedar shakes and shingles. {NBCC 3.1.15.(2)}
- FRT plywood siding over wood studs in exterior walls and FRT wood decorative cladding on exterior marquee fascias are permitted in noncombustible buildings. {NBCC 3.1.5.5(4) and (5)}

APPLICATIONS

Interior Millwork and Trim

- Wood millwork, such as, interior trim, doors and door frames, show windows and frames, aprons and backing, handrails, shelves, cabinets and counters are permitted in noncombustible construction. {NBCC 3.1.5.7(1)}
- **Fire-retardant treated wood** meeting the most restrictive limit of the flame-spread requirement, Flame Spread Rating (FSR) 25, is permitted extensively throughout noncombustible buildings but the material cannot exceed 25mm in thickness when used as a finish, except no maximum thickness applies for wood battens used on a ceiling. {NBCC (3.1.4.4)}
- No fire-retardant coating applied to wood and other combustible materials is known to meet the 25 flame-spread ratings limits required for wall or ceiling in noncombustible buildings, including combustible substrates such as plywood. {NBCC (3.1.4.10)}
- The flame-spread ratings for interior finishes in noncombustible buildings apply to any surface of material exposed by cutting through it. FRTW *is exempt* from this because fire-retardant chemical is applied through pressure impregnation. Fire retardant coatings *are not exempt* because they are surface applied only. {NBCC (3.1.5.10 (2) and 3.1.4.10 (3)}

Interior Finishes -Low Rise Buildings

- Buildings of noncombustible construction. {NBCC 3.1.5.4 and 3.1.5.10}
 - Ceilings: 25 FSR and not more than 25mm in thickness except for FRTW battens.
- Public corridors, corridors used by the public in Group A and B occupancies and corridors serving classrooms and patient sleeping rooms:
- Walls: Not more than 75 FSR or upper half, 25 FSR and lower half, 150 FSR.
- Ceiling: Not more than 25 FSR. {NBCC 3.1.13.2(4) and 3.1.13.6}
- Exits including exterior passageways per 3.3.14.10 providing the only means of egress:
 - 25 FSR: In noncombustible buildings the FSR must be homogeneous throughout the material except for doors, FRTW and heavy timber construction in sprinklered buildings. {NBCC 3.1.13.2 and 3.1.13.8(1)}

- Lobby used for exiting per 3.4.4.2(2):
 - 25 FSR: Up to 25% of the total wall area, not including combustible doors, is permitted to have 150 FSR. {NBCC 3.1.13.2(1) and 3.1.13.8(1)}
- Covered vehicular passageways except for heavy timber roof assemblies: 25 FSR. {NBCC 3.1.13.2(1)}

Interior Finishes - High Rise Buildings (Unsprinklered only*)

- Exit stairways, vestibules to exit stairs, and exit lobbies described in 3.4.4.2(2)
 - Walls, ceilings and floors not more than 25 FSR and 50 SDC (Smoke Development Classification).
- Elevator cars and vestibules
 - Walls and ceiling not more than 25 FSR and 100 SDC.
 - Floors not more than 300 FSR and 300 SDC.
- Service spaces and service rooms
 - Walls, ceilings and floors not more than 25 FSR and 50 SDC.

Note: Buildings of Group B major occupancy and elevator cars are not included and may not exceed 10% of wall or ceiling finishes including trim and millwork (150 FSR and 300 SDC) or doors (200 FSR and 300 SDC).

*See Table 6.3 of NBCC for sprinklered buildings.

Balconies and Similar Appendages

- Exterior balconies, porches, decks and supplemental exterior stairways typically must be constructed in accordance with the applicable occupancy classification of the building as required by the NBCC. When the balcony forms part of the means of egress, then they are required to have fire-resistance rating equal to that of mezzanines {Ref. 3.2.2.20-23}.
- Except for a building containing 1 or 2 dwelling units only, combustible projections on the exterior of a wall that could expose an adjacent building to fire spread and are more than 1m above ground level, including balconies, platforms, canopies, eave projections and stairs, shall not be permitted within a) 1.2m of a property line or the centerline of a public way, or b) 2.4m of a combustible projection on another building on the same property. {NBCC 3.1.10.4}.

Roof Assemblies

- Roof can be constructed solely of FRTW, or any combination of different structural supports such as noncombustible framework or a heavy timber support.
- By using solely FRTW or any combination, the designer waives the mandatory 45 minute fire-resistance rating required for a roof system in a building of combustible construction. Thus, the designer is afforded a high degree of flexibility in both design and material specifications.
- Types of applications include group assembly, mercantile, small business and light industrial buildings.
 - Residential roof applications, such as, government funded senior citizens apartments where long-life economical pitched roof designs are desired.
 - Wall sheathing in installations where standard drywall is subject to damage through day-to-day activities (i.e. warehousing facilities).
 - Raised flooring in mercantile buildings (restaurants) and stage flooring in performing arts centers.
- In certain unsprinklered one storey buildings of noncombustible type construction, fire-resistance rating of the roof assembly when deck is constructed of FRTW and the assembly passes the requirements of CAN/ULC S126, “Standard Method of Test for Fire Spread Under Roof-Deck Assemblies.” {NBCC 3.1.14.1}.
- A roof deck system of FRTW may be supported by metal and reinforced concrete beams or joists, heavy timber supports and FRTW joists or trusses. Unless the wood members are of heavy timber or wood-framed construction with a 45 minute fire-resistance rating (FRR), then, they must be **fire-retardant treated wood**.
- Plywood decking, if not tongue and groove, must also have unsupported joints solidly backed with FRTW or plywood.
- FRTW or noncombustible ceilings may be attached to the underside of the system, with the resulting concealed spaces appropriately fire stopped.
- FRTW roof assemblies are permitted as an alternative to roof assemblies of noncombustible construction or ordinary wood-frame roof assemblies having a fire resistance rating of 45 minutes except that when FRTW is used, the building size must be reduced by 50% of the total area allowed for the other two types of roof assembly.

The requirements for roof assemblies in the NBCC are based on the individual occupancy use but are also limited by the overall storey height and the total building area. Table 1 summarizes the permitted uses of FRTW in roof assemblies {NBCC 3.2.2.20 to 3.2.2.84}.

Table 1: NBCC Design Requirements for Roof Assemblies

	Height and Area Limitations (Maximum)			FRTW Permitted uses	Requirements:
	Stories Height	Unsprinklered Area	Sprinklered Area		
Group A, Div 2	1-Storey	Facing 1 streets: 1600m ² Facing 2 streets: 2000m ² Facing 3 streets: 2400m ² {NBCC 3.2.2.25}	4800m ² {NBCC 3.2.2.26}	Roof Assemblies	45 minute fire resistance rating if of combustible construction, waived for a 1 storey building with FRTW roof systems if building area is not more than ½ values otherwise permitted; or unrated noncombustible construction. No rating requirements if sprinklered. * See Note 7.
Group A, Div 3	1-Storey	Facing 1 streets: 2400m ² Facing 2 streets: 3000m ² Facing 3 streets: 3600m ² {NBCC 3.2.2.32}	N/A	Roof Assemblies	45 min if fire-resistance rating if combustible, waived if building area is not more than ½ value otherwise permitted and FRTW – roof system used or unrated noncombustible construction. * See Note 7.
Group D	1-Storey	Facing 1 streets: 4800m ² Facing 2 streets: 6000m ² Facing 3 streets: 7200m ² {NBCC 3.2.2.53}	14400m ² {NBCC 3.2.2.54}	Roof Assemblies	45 minute fire resistance rating if of combustible construction, waived for sprinklered buildings and 1-storey buildings with FRTW roof systems if building area is not more than ½ values otherwise permitted, or unrated noncombustible.
Group E	1-Storey	2400m ² : Facing 1 streets 3000m ² : Facing 2 streets 3600m ² : Facing 3 streets {NBCC 3.2.2.59}	7200m ² {NBCC 3.2.2.60}	Roof Assemblies	45 minute fire resistance rating, waived for 1 storey buildings with unrated noncombustible roof systems, for 1-storey buildings with FRTW roof systems and for sprinklered buildings.
Group F, Div 2	1-Storey	1500m ² : Facing 1 streets 1500m ² : Facing 2 streets 1500m ² : Facing 3 streets {NBCC 3.2.2.69}	9600m ² {NBCC 3.2.2.70}	Roof Assemblies	45 minute fire resistance rating if of combustible construction, waived for 1 storey buildings with FTWW roof systems or if building is sprinklered or unrated noncombustible.
Group F, Div 3	1-Storey	4800m ² : Facing 1 streets 6000m ² : Facing 2 streets 7200m ² : Facing 3 streets {NBCC 3.2.2.76}	14400m ² {NBCC 3.2.2.77}	Roof Assemblies	45 minute fire resistance rating if of combustible construction, waived for 1 storey buildings with FTWW roof systems or if building is sprinklered or unrated noncombustible

*Note 7: Fire resistance rating waved for roof assembly having at least 6 m clearance above main floor in gymnasiums and Group A, Division 3 occupancies.

Roof Trusses

- Plywood decking, if not tongue and groove, must also have unsupported joints solidly backed with FRT wood.
- FRTW or non-combustible ceilings may be attached to the underside of roof truss if the resulting concealed spaces are fire stopped.
- FRTW roof assemblies are permitted as an alternative to assemblies of noncombustible construction or ordinary wood frame roof assemblies having a fire-resistance rating of 45 minutes. Note: The NBCC imposes area limits because FRTW roof systems are generally open, subject to direct exposure from a fire, and consequently are less structurally stable during a fire. {NBCC 3.1.14.1}

Roof Coverings

- Roof coverings must have an A, B or C rating when tested in accordance with CAN/ULC S107, “Standard Methods of Fire Test of Roof Coverings”.
- Fire-retardant coatings typically cannot meet all the requirements of a Class C rating due to the accelerated weathering tests to ensure that the effects of fire-retardant treatment will not be reduced by continuous exposure to weather {NBCC 3.5.2.}.

- The *NBCC* permits roof coverings that meet a Class C rating to be used for any building, including noncombustible construction regardless of height or area. This C rating can be easily met using FRTW shakes or shingles.
- Small assembly buildings not more than 2 stories in building height and less than 1000m in building area do not require a classification for the roof covering {NBCC 3.1.14.2(2)}.

Miscellaneous Roof Structures

- Roof top enclosures, such as, elevator machinery rooms, due to their low occupant load, may be omitted from the storey count when calculating the building height. Roof top enclosures on wood buildings not more than four stories in total height may be of wood frame construction. {NBCC 3.2.1(1)}
- Wood frame enclosures for service rooms containing heating and cooling equipment are restricted to buildings permitted to be of combustible construction. Other wood components besides the structural members may be used in service rooms. {NBCC 3.2.2.14}

Cooling Towers

- The *NBCC* requires evaporative cooling sections or towers whose main structure exceeds a volume of 55m² shall comply with the requirements of NFPA 214, “*Water-Cooling Towers*” {NBCC 6.2.3.15 (4)}.

Canopies and Awnings

- FRTW decorative cladding is permitted by the *NBCC* on first floor canopy fascias only. In this case, the FRTW must undergo accelerated weather before testing to establish the required flame-spread rating of 25 or less {NBCC 3.1.4.4(5)}.

Concealed Spaces

- Certain combustible materials are permitted to be used in the concealed spaces of buildings that are required to be of noncombustible construction. The *NBCC* places limits on the flame-spread potential of these materials and it also limits the amount of smoke generated (Smoke Developed Classification) from certain building materials.
- If the concealed space is used as a plenum for heating, ventilating and air conditioning systems, the *NBCC* imposes restrictions on the types of materials which may be used within that space to reduce the possibility of the spread of fire and smoke through these service areas to the rest of the building {NBCC 3.6.5.4}.
- The interior wall surface of service shafts is limited to a flame-spread rating of 25. Refuse and linen chutes and the room into which they discharge, must be sprinklered and additional fire-safety requirements are also imposed {NBCC 3.1.13.2 and 3.6.3.3}.

Fire stopping and Draft stopping

- Fire-stops can be made of any material, which remains in place and restricts the passage of flames when subject to the standard exposure of CAN/ULC-S101-M, “*Standard Method of Fire Endurance Test of Building Construction*”. The *NBCC* specifies type, thickness and location of fire-stop materials {NBCC 3.1.11.7}.
- Fire-stops are not required in wall assemblies when the exposed construction materials and any insulation within the wall space have a flame-spread rating not more than 25 on any exposed surface, or on any surface exposed by cutting through the material in any direction when the vertical distance is not more than 10m {NBCC 3.1.1.2 (2)(c)}.
- Restrictions on the size of fire-stopped compartments in the *NBCC* are eased when exposed material within have flame-spread rating of not more than 25. For example, in roof spaces or attics of combustible construction, fire stopping is required to separate the concealed space into compartments not more than: a) 600m² in area with no dimension more than 60m if exposed construction materials have a flame-spread rating not more than 25, and b) 300m² in area with no dimension more than 20m if the exposed construction materials have a flame-spread rating more than 25 {NBCC 3.1.11.5}.
- Concealed spaces in mansard or gambrel style roofs, exterior cornices, balconies and canopies of combustible construction in which the exposed construction materials within the space have a surface flame-spread rating exceeding 25 shall have vertical fire-stops at intervals of not more than 20m and at points where such concealed spaces extend across the ends of required vertical fire separations {NBCC 9.10.15.1}.
- *NBCC* requires fire stops in roof spaces and ceilings in sections of not more than 300m² in area and not more than 60m in dimension. This effectively exempts most residential roofs or floors {NBCC 9.10.15}.

Kiosks in Covered Malls

Kiosks and similar structures must take into consideration all the requirements which apply to the remainder of the building, including structural fire protection, construction type, finish materials, egress widths and sprinkler installations {NBCC A-3.3.1.4.(1)}.

OTHER CONSIDERATIONS:

Fasteners and Connectors

- Nails shall be common steel wire nails or common spiral nails, conforming to CSA B111, “*Wire Nails, Spikes and Staples.*” Wood screws shall conform to ANSI B18.6.1, “*Slotted and Recessed Wood Screws (Inch Series)*” {NBCC 9.23.3.1}.

Fire-Retardant Coatings

- May be used for new construction and rehabilitation projects.
- Can be used in areas where untreated wood products cannot be used.
- Not suitable for use in high humidity or exterior applications.
- Must meet the ASTM E84 extended 30-minute test {NBCC 3.1.5.10}.

Component Additive Method (CAM)

- The fire-resistance rating of a material, assembly of materials or a structural member shall be determined on the basis of the results of tests conducted in conformance with CAN/ULC-S101-M, “*Fire Endurance Tests of Building Construction and Materials.*” However, material, an assembly of materials or a structural member is permitted to be assigned a fire-resistance rating on the basis of Appendix D “*Fire Performance Ratings*” {NBCC 3.1.7.1(2)}.
- The maximum fire-resistance rating of walls constructed of wood studs or light gauge steel studs, floors constructed of wood joists or open web steel joists, and roofs constructed of wood joists, pre-manufactured wood trusses or open web steel joists, can be determined for ratings up to 90 minutes {Appendix D-2.3.}
- CAM can be used for wood frame floors and roof assemblies with wood joists and metal plate connected wood trusses (both pitched and parallel cord design). Wood joists and members of trusses must not be less than 38mm x 89mm. CAM cannot be used to assign fire-resistance ratings to wood I-joists and steel stud wall assemblies.

APPENDIX A

REFERENCE SECTIONS IN THE NATIONAL BUILDING CODE OF CANADA (NBCC)

1.1.3.2 Definitions

Fire-retardant treated wood (FRTW) 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 impregnation of the wood with a fire-retardant chemical.

3.1.4.4. Fire-Retardant Treated Wood

If *fire-retardant treated wood* is specified in this Part, the wood shall a) be pressure impregnated with a fire-retardant chemical, in a licensed treating facility, and produced in conformance with CSA O80 “*Standard for Wood Preservation*,” and b) have a flame-spread rating not more than 25.

3.1.5.5. Combustible Components for Exterior Walls

- 1) Except for an exposing building face required to conform to Sentence 3.2.3.7.(1) or Sentence 3.2.3.7.(4), an exterior non-load bearing wall assembly that includes combustible components is permitted to be used in a building required to be of noncombustible construction provided:
 - a) the building is:
 - i) not more than 3 stories in building height, or
 - ii) sprinklered throughout
 - b) the interior surfaces of the wall assembly are protected by a thermal barrier conforming to Sentence 3.1.5.11.(3), and
 - c) the wall assembly satisfies the criteria of Sentences (2) and (3) when subjected to testing in conformance with CAN/ULC-S134, “*Fire Test of Exterior Wall Assemblies*.” (See Appendix A.)
- 2) Flaming on or in the wall assembly shall not spread more than 5m above the opening during or following the test procedure referenced in Sentence (1). (See Appendix A.)
- 3) The heat flux during the flame exposure on a wall assembly shall be not more than 35 kW/m² measured 3.5m above the opening during the test procedure referenced in Sentence (1). (See Appendix A.)
- 4) A wall assembly permitted by Sentence (1) that includes combustible cladding of FRTW shall be tested for fire exposure after the cladding has been subjected to an accelerated weathering test as specified in ASTM D 2898, “*Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing*.”
- 5) Wood decorative cladding is permitted to be used on exterior marquee fascias, of a storey having direct access to a street or access route, of a building required to be of noncombustible construction provided the cladding is FRTW that has been, before testing, conditioned in conformance with ASTM D 2898, “*Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing*.”

3.1.5.10. Combustible Interior Finish

Combustible interior ceiling finishes, other than foamed plastics, are permitted in a building required to be of noncombustible construction provided they:

- a) are not more than 25mm thick, except for exposed **fire-retardant treated wood** battens, and
- b) have a flame-spread rating not more than 25 on any exposed surface, or on any surface that would be exposed by cutting through the material in any direction, or are of **fire-retardant treated wood**, except that not more than 10% of the ceiling area within each fire compartment is permitted to have a flame-spread rating not more than 150.

3.1.7. Fire-Resistance Ratings

3.1.7.1. Determination of Ratings

- 1) Except as permitted by Sentence (2) and Article 3.1.7.2., the rating of a material, assembly of materials or a structural member that is required to have a *fire-resistance rating*, shall be determined on the basis of the results of tests conducted in conformance with CAN/ULC-S101-M, “*Fire Endurance Tests of Building Construction and Materials*.”
- 2) A material, assembly of materials or a structural member is permitted to be assigned a *fire-resistance rating* on the basis of Appendix D.

3.1.10.3. Continuity of Firewalls

- 1) A firewall shall extend from the ground continuously through, or adjacent to, all stories of a building or buildings so separated, except that a firewall located above a basement storage garage conforming to Article 3.2.1.2 is permitted to commence at the floor assembly immediately above the storage garage. (See also Sentence 3.1.10.1 (3).)
- 2) A firewall is permitted to terminate on the underside of a reinforced concrete roof slab provided:
 - a) the roof slab on both sides of the firewall has a fire-resistance rating not less than:
 - i) 1 hour if the firewall is required to have a fire-resistance rating not less than 2 hours, or
 - ii) 2 hours if the firewall is required to have a fire-resistance rating not less than 4 hours, and
 - b) there are no concealed spaces within the roof slab in that portion immediately above the firewall.

3.1.10.4. Parapets

There are no provisions in the NBCC that allow the roof deck to be constructed of FRT plywood at least 4 feet wide continuously on each side of the fire wall in lieu of installing a parapet as is currently permitted by the International Building Code (IBC).

3.1.11.2. Fire Stopping in Wall Assemblies

Fire stops conforming to Sentence (1) are not required provided:

- a) the wall space is filled with insulation,
- b) the exposed construction materials and any insulation within the wall space are noncombustible,
- c) *the exposed construction materials and any insulation within the wall space have a flame-spread rating not more than 25 on any exposed surface, or on any surface that would be exposed by cutting through the material in any direction, and fire stops are installed so that the vertical distance between them is not more than 10m, or*
- d) the insulated wall assembly contains not more than one concealed air space, and the horizontal thickness of that air space is not more than 25mm.

3.1.11.5. Fire Stopping of Roof Spaces, Balconies and Canopies

- 1) A concealed space within a ceiling or roof assembly of *combustible construction*, including an *attic or roof space*, in which sprinklers are not installed, shall be separated by construction conforming to Article 3.1.11.7. into compartments not more than:
 - a) 600m² in area with no dimension more than 60m if the exposed construction materials within the space have a *flame-spread rating not more than 25*, and
 - b) 300m² in area with no dimension more than 20m if the exposed construction materials within the space have a *flame-spread rating more than 25*. (See Appendix A.)
- 2) A concealed space in an exterior cornice, a mansard style roof, a balcony or a canopy in which exposed construction materials within the space have a *flame-spread rating more than 25*, shall be separated by construction conforming to Article 3.1.11.7.:
 - a) at locations where the concealed space extends across the ends of required vertical *fire separations*, and
 - b) so that the maximum dimension in the concealed space is not more than 20 m.

3.1.13.8. Noncombustible Construction

In a building required to be of noncombustible construction:

- a) the flame-spread ratings required by Subsection 3.1.5. shall apply in addition to the requirements in this Subsection, and
- b) the flame-spread ratings for exits in this Subsection shall also apply to any surface in the exit that would be exposed by cutting through the material in any direction, except that this requirement does not apply to doors, heavy timber construction in a sprinklered building and FRTW.

3.1.14. Roof Assemblies

3.1.14.1. Fire-Retardant Treated Wood Roof Systems

- 1) If a **fire-retardant treated wood** roof system is used to comply with the requirements of Subsection 3.2.2., the roof deck assembly shall meet the conditions of acceptance of CAN/ULC-S126-M, "*Test for Fire Spread Under Roof-Deck Assemblies.*"
- 2) Supports for the roof deck assembly referred to in Sentence (1) shall consist of:
 - a) **fire-retardant treated wood**,
 - b) heavy timber construction,
 - c) noncombustible construction, or
 - d) a combination thereof.

3.2.2.11. Exterior Balconies

An exterior balcony shall be constructed in accordance with the type of construction required by Articles 3.2.2.20. to 3.2.2.83., as applicable to the *occupancy* classification of the *building*.

3.2.2.14. Roof-Top Enclosures

- 1) A roof-top enclosure for elevator machinery or for a *service room* shall be constructed in accordance with the type of construction required by Articles 3.2.2.20. to 3.2.2.83.
- 2) A roof-top enclosure for elevator machinery or for a *service room*, not more than one *storey* high, is not required to have a *fire-resistance rating*.
- 3) A roof-top enclosure for a stairway shall be constructed in accordance with the type of construction required by Articles 3.2.2.20. to 3.2.2.83.
- 4) A roof-top enclosure for a stairway need not have a *fire-resistance rating* nor be constructed as a *fire separation*.

3.2.2.25. Group A, Division 2, up to 2 Stories

A building classified as Group A, Division 2 is permitted to conform to Sentence (2) provided:

- a) it is not more than 2 stories in building height, and
- b) it has a building area not more than the value in Table 3.2.2.25.

3.2.2.32. Group A, Division 3, One Storey, Increased Area

- 1) A building classified as Group A, Division 3 is permitted to conform to Sentence (2) provided:
 - a) it is not more than 1-storey in building height, and
 - b) it has a building area not more than:
 - i) 2,400m² if facing one street,
 - ii) 3,000m² if facing 2 streets, or
 - iii) 3,600m² if facing 3 streets.
- 2) The building referred to in Sentence (1) is permitted to be of combustible construction or noncombustible construction used singly or in combination, and:
 - a) mezzanines shall have, if of combustible construction, a fire-resistance rating not less than 45 min,
 - b) roof assemblies shall have, if of combustible construction, a fire-resistance rating not less than 45 min, except that the fire-resistance rating is permitted to be waived provided the roof assembly is constructed as a **fire-retardant treated wood** roof system conforming to Article 3.1.14 .1., and the building area is not more than:
 - i) 1,200m² if facing one street,
 - ii) 1,500m² if facing 2 streets, or
 - iii) 1,800m² if facing 3 streets, and
 - c) load bearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall:
 - i) have a fire-resistance rating not less than 45 min, or
 - ii) be of noncombustible construction.

3.2.2.18. Automatic Sprinkler System Required

- 1) Except as permitted by Sentence (2), an automatic sprinkler system conforming to the requirements of Articles 3.2.4.7., 3.2.4.8., 3.2.4.9. and 3.2.5.13. shall be installed throughout a building regulated by one or more of Articles 3.2.2.20., 3.2.2.21., 3.2.2.22., 3.2.2.23., 3.2.2.24., 3.2.2.26., 3.2.2.27., 3.2.2.29., 3.2.2.31., 3.2.2.33., 3.2.2.36., 3.2.2.37., 3.2.2.38., 3.2.2.39., 3.2.2.40., 3.2.2.41., 3.2.2.42., 3.2.2.43., 3.2.2.45., 3.2.2.48., 3.2.2.49., 3.2.2.51., 3.2.2.52., 3.2.2.54., 3.2.2.56., 3.2.2.57., 3.2.2.58., 3.2.2.60., 3.2.2.62., 3.2.2.63., 3.2.2.64., 3.2.2.65., 3.2.2.67., 3.2.2.68., 3.2.2.70., 3.2.2.72., 3.2.2.73., 3.2.2.75., 3.2.2.77., 3.2.2.79. and 3.2.2.81.
- 2) If a storey in a building or a floor area is required to have an automatic sprinkler system installed throughout in accordance with one or more of Articles 3.2.2.20. to 3.2.2.83. or Section 3.3., the automatic sprinkler system shall also be installed throughout all lower stories in the building not withstanding permission in Articles 3.2.2.20. to 3.2.2.83. to construct one or more of those stories without installing automatic sprinkler protection. (See Appendix A.)

3.2.2.19. Buildings Containing Impeded Egress Zones

A building containing an impeded egress zone and conforming to the appropriate requirements of Articles 3.2.2.20. to 3.2.2.83. is not required to conform to the requirements of Articles 3.2.2.36. and 3.2.2.37. for a Group B, Division 1 major occupancy provided:

- a) the building is sprinklered throughout,
- b) it is not more than 1 storey in building height,
- c) it does not include:
 - i) a contained use area,
 - ii) sleeping accommodation,
 - iii) a high hazard industrial occupancy, or
 - iv) a mercantile occupancy.
- d) the building area is not more than 6,400m² if the building includes a medium hazard industrial occupancy,
- e) the impeded egress zone does not extend beyond the boundaries of the fire compartment in which it is located, and
- f) the occupant load of the impeded egress zone is not more than 100.

3.2.2.53. Group D, up to 3 Stories

- 1) A building classified as Group D is permitted to conform to Sentence (2) provided:
 - a) it is not more than 3 stories in building height, and
 - b) it has a building area not more than the value in Table 3.2.2.53.
- 2) The building referred to in Sentence (1) is permitted to be of combustible construction or noncombustible construction used singly or in combination, and
 - a) floor assemblies shall be fire separations and, if of combustible construction, shall have a fire-resistance rating not less than 45 min,
 - b) mezzanines shall have, if of combustible construction, a fire-resistance rating not less than 45 min,
 - c) roof assemblies shall have, if of combustible construction, a fire-resistance rating not less than 45 min, except that in a building not more than 1 storey in building height, the fire-resistance rating is permitted to be waived provided the roof assembly is constructed as a **fire-retardant treated wood** roof system conforming to Article 3.1.14.1. and the building area is not more than
 - i) 2,400m² if facing one street,
 - ii) 3,000m² if facing 2 streets, or
 - iii) 3,600m² if facing 3 streets, and
 - d) Load bearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall:
 - i) have a fire-resistance rating not less than 45 min, or
 - ii) be of noncombustible construction.

3.2.2.59. Group E, up to 3 Stories

- 1) A building classified as Group E is permitted to conform to Sentence (2) provided:
 - a) it is not more than 3 stories in building height, and
 - b) it has a building area not more than the value in Table 3.2.2.59.
- 2) The building referred to in Sentence (1) is permitted to be of combustible construction or noncombustible construction used singly or in combination, and:
 - a) floor assemblies shall be fire separations with a fire-resistance rating not less than 45 min,
 - b) mezzanines shall have, if of combustible construction, a fire-resistance rating not less than 45 min,
 - c) roof assemblies shall have a fire-resistance rating not less than 45 min, except that in a building not more than 1-storey in building height, the fire-resistance rating is permitted to be waived provided the roof assembly is of noncombustible construction or is constructed as a **fire-retardant treated wood** roof system conforming to Article 3.1.14.1.,
 - d) load bearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall:
 - i) have a fire-resistance rating not less than 45 min, or
 - ii) be of noncombustible construction, and
 - iii) load bearing walls, columns and arches supporting a fire separation shall have a fire-resistance rating not less than that required for the fire separation.

3.2.2.69. Group F, Division 2, up to 3 Stories

A building classified as Group F, Division 2 is permitted to conform to Sentence (2) provided:

- a) it is not more than 3 stories in building height, and
- b) it has a building area not more than the value in Table 3.2.2.69.

3.2.3.6. Combustible Projections

Except for a *building* containing one or 2 *dwelling units* only, *combustible* projections on the exterior of a wall that could expose an adjacent *building* to fire spread and are more than 1 m above ground level, including balconies, platforms, canopies, eave projections and stairs, shall not be permitted within:

- a) 1.2 m of a property line or the centerline of a *public way*, or
- b) 2.4 m of a *combustible* projection on another *building* on the same property.

6.2.4.2. Duct Design

The design of ducts and fittings shall conform to SMACNA, “*HVAC Duct Construction Standards – Metal and Flexible*.”

6.2.4.3. Construction and Installation of Ducts and Plenums

- 1) Rectangular panels in plenums and ducts more than 300mm wide shall be shaped to provide sufficient stiffness.
- 2) Where the installation of heating supply ducts in walls and floors creates a space between the duct and construction material, the space shall be fire stopped with *noncombustible* material at each end.
- 3) Ducts shall be securely supported by metal hangers, straps, lugs or brackets, except that, where zero clearance is permitted, wooden brackets may be used.

9.23.3. Fasteners

9.23.3.1. Standards for Nails and Screws

- 1) Unless otherwise indicated, nails specified in this Section shall be common steel wire nails or common spiral nails, conforming to CSA B111, “*Wire Nails, Spikes and Staples*.”
- 2) Wood screws specified in this Section shall conform to ANSI B18.6.1, “*Slotted and Recessed Wood Screws (Inch Series)*.” (See Appendix A.)

9.10.14.13. Combustible Projections

Except for *buildings* containing 1 or 2 *dwelling units* only, *combustible* projections on the exterior of a wall that are more than 1 m above ground level, such as balconies, platforms, canopies, eave projections and stairs, and that could expose an adjacent *building* to fire spread, shall not be permitted within:

- a) 1.2m of a property line or the centerline of a *public way*, or
- b) 2.4m of a *combustible* projection on another *building* on the same property.

9.10.15.1. Required Fire Stops in Concealed Spaces

Concealed spaces in mansard or gambrel style roofs, exterior cornices, balconies and canopies of combustible construction in which the exposed construction materials within the space have a surface flame-spread rating exceeding 25 shall have vertical fire stops at intervals of not more than 20m and at points where such concealed spaces extend across the ends of required vertical fire separations.

D-3.1.5. Proprietary Materials

- 1) Information on flame-spread rating of proprietary materials and fire-retardant treatments that cannot be described in sufficient detail to ensure reproducibility is available through the listing and labeling services of Underwriters’ Laboratories of Canada, Timber Inspection, Intertek Testing Services NA Ltd. (3210 American Drive, Mississauga, Ontario L4V 1B3), or other recognized testing laboratory.
- 2) A summary of flame-spread test results published prior to 1965 has been prepared by the Institute for Research in Construction of the National Research Council of Canada (see Item (1) in D-6.1., Fire Test Reports).

D-4.2.3. Effect of Chemical Additives

The addition of a fire-retardant chemical is not sufficient to change a combustible product to a noncombustible product.