FIREHARD

MODULE 6
EXTERIOR WALLS & CLADDING

Wall Assemblies, Cladding Materials, Sheathing, Insulation, and the Neighbouring Structure Exposure Problem

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This guide is free. It always will be.

See also: Module 1 (Openings), Module 2 (Roof & Eaves), Module 3 (Vents & Penetrations), Module 4 (Decks & Attachments), Module 5 (Fencing, Landscaping & Site).

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1. Why Walls Matter

Exterior walls are the largest surface area of any residential building. They are the primary interface between the inside of your home and every external fire exposure: radiant heat, direct flame contact, embers, and burning debris. While roofs, vents, and windows receive most of the attention in wildfire hardening literature, the exterior wall assembly determines whether fire can penetrate to the structural framing of the building.

In a typical Canadian home, the exterior wall assembly consists of vinyl or wood siding over housewrap over OSB or plywood sheathing over 2×4 or 2×6 wood framing with fibreglass batt insulation and interior drywall. Every layer in this assembly except the drywall is combustible. The siding is the first line of defence, but it is only one component. A wall's fire performance depends on the complete assembly — from the outer cladding through to the interior lining.

1.1 The Research

IBHS testing has demonstrated that non-combustible cladding dramatically outperforms combustible cladding when exposed to radiant heat and flame. In side-by-side demonstrations, combustible siding ignited and fuelled fire growth, while non-combustible siding (fibre cement) did not ignite under the same exposure.

The University of California Fire Research Laboratory found that the siding joint is the most vulnerable point in a combustible wall assembly. Flame penetration through the siding occurs most readily at lap joints — the horizontal overlaps where one board meets another. Ship-lap and tongue-and-groove joints provide significantly better flame resistance than plain bevel joints.

FEMA P-737 (Home Builder's Guide to Construction in Wildfire Zones) recommends that the entire wall assembly, not just the cladding, achieve a fire-resistance rating tested to ASTM E119. A minimum one-hour rating is recommended. This ensures that even if the cladding fails, the underlying structure resists fire penetration long enough for the exposure to subside.

The most significant recent research comes from the UL Fire Safety Research Institute (FSRI). Gorham, Willi, and Horn (2025) conducted full-scale building-to-building fire spread experiments, exposing three wall assemblies — exterior plywood (T1-11), EIFS (exterior insulation finishing system), and fibre cement — to a post-flashover compartment fire at separation distances of 1.8, 3.0, and 4.3 metres. These distances are common in Canadian subdivisions.

1.2 Key Findings from Gorham et al. (2025)

Combustible siding ignited at 3.0 and 4.3 metres. Both the plywood (T1-11) and EIFS wall assemblies ignited at the 3.0-metre and 4.3-metre separation distances from a burning structure. This is within the range of typical Canadian subdivision setbacks.

Non-combustible siding required closer proximity. The fibre cement wall assembly resisted ignition at 3.0 and 4.3 metres but the combustible sheathing behind it ignited at 1.8 metres. The cladding itself did not ignite, but heat transferred through it to the OSB sheathing underneath. This demonstrates that non-combustible cladding alone is not sufficient — the entire assembly matters.

EIFS is particularly dangerous. When the EIFS stucco lamina detached from the EPS foam insulation, the exposed foam burned intensely, producing peak heat fluxes exceeding 175

kW/m² — far higher than the 109 kW/m² at the time of ignition. The burning EPS created a pool fire at the base of the wall that threatened the entire structure. EIFS should be considered a high-risk cladding in wildfire-prone areas.

Wall failure can occur before or after window failure. Comparing their results with companion window studies, the researchers found that exterior wall failure could happen before or after window failure, depending on the construction. This means both walls and windows are important — hardening one without the other leaves a critical vulnerability.

12 of 14 experiments resulted in target ignition. Across all separation distances tested, the target wall ignited in 12 of 14 experiments. This underscores the risk of building-to-building fire spread at the separation distances common in Canadian residential construction.

THE CRITICAL INSIGHT

Non-combustible cladding is necessary but not sufficient. The complete wall assembly — cladding, sheathing, insulation, and gaps — determines fire resistance. A fibre cement clad wall with combustible OSB sheathing and fibreglass insulation is significantly better than a vinyl-clad wall, but it can still fail under sustained exposure. Adding Type X gypsum sheathing behind the cladding dramatically improves the assembly's fire resistance.

2. The Neighbouring Structure Problem

This section addresses the most significant and most commonly ignored source of fire exposure for Canadian residential buildings: the neighbouring structure.

2.1 The Exposure

During a wildland-urban interface fire, structures that ignite become fuel sources. A burning Canadian wood-frame house produces sustained radiant heat for 30 to 90 minutes as it progresses from ignition through structural collapse. During this period, it generates:

Radiant heat: A fully involved residential structure produces heat flux of 80–175 kW/m² at its surface. At 3 metres, the incident heat flux on an adjacent wall can exceed 40 kW/m² — well above the ignition threshold for combustible siding and the cracking threshold for annealed glass. At 6 metres, the heat flux may still exceed 20 kW/m², sufficient to ignite combustible debris and soften vinyl siding.

Embers: A burning structure generates embers continuously for the duration of the fire. Unlike a passing vegetation fire front (which typically produces peak ember exposure for 5–15 minutes), a burning structure produces embers for 30–90 minutes. This sustained exposure tests every gap, vent, and opening on the exposed face.

Direct flame contact: At separation distances below 3 metres, flames from a fully involved structure can directly contact the adjacent wall. Flame lengths of 3–5 metres are common during peak burning of a residential structure.

2.2 Why the Building Code Doesn’t Solve This

The Canadian Building Code addresses structure-to-structure fire exposure through spatial separation provisions (NBC Part 3, Subsection 3.2.3, and Part 9, Section 9.10.14). These provisions limit unprotected wall area based on the distance from the building to the property line (the “limiting distance”). The underlying assumption is that a fire department will respond to a single-structure fire within minutes and contain it before it threatens adjacent buildings.

During a wildland-urban interface event, this assumption fails. When dozens or hundreds of structures ignite simultaneously, fire departments cannot respond to each one. The spatial separation provisions were designed for isolated single-structure fires in an urban context, not for community-scale wildfire events where the fire service is overwhelmed.

The result: Canadian homes built to code, with code-compliant setbacks, are routinely destroyed by fire from adjacent structures during WUI events. The code is not wrong — it was designed for a different scenario.

2.3 The Scale of the Problem

In Canadian subdivisions built over the past 35 years, typical lot widths of 10–15 metres and minimum side-yard setbacks of 1.2–1.5 metres result in building separation distances of 2.4–6 metres. In townhouse developments, the separation is zero (shared party wall) or 1.5–3 metres (between blocks). In semi-detached and duplex construction, separation is zero on one side.

This means the Gorham et al. (2025) experimental conditions — 1.8, 3.0, and 4.3 metres — are directly representative of the vast majority of Canadian residential construction. The finding that

12 of 14 experiments resulted in ignition of the target wall is directly relevant to every home in a typical Canadian subdivision.

THE HONEST TRUTH

Most Canadian homes are within ignition distance of at least one neighbouring structure. During a wildland-urban interface fire, if your neighbour's home catches fire, your home is at serious risk regardless of your vegetation exposure. This is not a reason to give up on hardening — it is the reason hardening matters. A hardened home buys 30–60 minutes of resistance. A burning neighbour's fuel is consumed within that window. Hardening works because the exposure is temporary. But hardening your home alone is less effective than hardening your home and convincing your neighbours to do the same.

3. Wall Assembly Components

Fire resistance is a property of the complete wall assembly, not any single layer. Each component contributes to the overall performance.

3.1 Exterior Cladding

The cladding is the outermost layer and the first surface exposed to fire. Its role is to resist ignition, prevent flame spread, and shield the layers behind it from radiant heat.

Non-combustible cladding (recommended WER-2+, required WER-3+)

Fibre cement board (e.g., James Hardie HardiePlank, HardiePanel): Non-combustible, Class A flame spread rating, does not melt or drip. Available in lap siding, panel, and trim profiles. The most widely available non-combustible residential cladding in Canada. Does not ignite under direct flame exposure. Note: fibre cement transfers heat — the sheathing behind it must also resist fire (see Section 3.2).

Metal cladding (steel or aluminium panel): Non-combustible. Resists ignition and flame spread. Aluminium has a lower melting point (660°C) than steel (1,400°C) but both significantly outperform combustible cladding. Steel panel (Vicwest, Gentek) and aluminium profile options available across Canada.

Stucco (cement plaster): Non-combustible. Traditional three-coat stucco over metal lath provides excellent fire resistance. One-coat synthetic stucco (EIFS) is not recommended — the EPS foam insulation layer is combustible and burns intensely if the lamina fails (Gorham et al., 2025).

Masonry (brick, stone, concrete block): Non-combustible. Provides the highest fire resistance of any cladding. Minimum 90mm thickness per AS 3959. Mass acts as thermal barrier. Common in eastern Canada; less common in western Canada residential construction.

Combustible cladding (acceptable WER-1, not recommended WER-2+)

Vinyl siding: The most common residential cladding in Canada. Melts and deforms at approximately 170–200°C, well below the temperatures produced by a nearby burning structure. Does not sustain combustion on its own (self-extinguishes when the external heat source is removed), but melts away and exposes the layers behind it to direct fire exposure. Not recommended for any face with vegetation within 30 metres or a neighbouring structure within 10 metres.

Wood siding (cedar, spruce, pine): Combustible. Ignites at approximately 250–300°C depending on species, moisture content, and thickness. Once ignited, sustains combustion and fuels fire growth. Fire-retardant-treated (FRT) wood performs significantly better but is still combustible and loses effectiveness over time with weathering.

Engineered wood (LP SmartSide, T1-11 plywood): Combustible. Similar fire performance to solid wood. LP SmartSide with zinc borate treatment provides improved resistance to ignition but is still combustible.

3.2 Sheathing

The sheathing sits between the cladding and the framing. In a standard Canadian wall, the sheathing is OSB (oriented strand board) or plywood — both combustible. This is the layer that

the Gorham et al. (2025) research identified as the point of failure even behind non-combustible fibre cement cladding.

Type X fire-rated gypsum board (15.9mm / 5/8"): The most practical upgrade. Type X gypsum contains glass fibres that hold the gypsum core together as it calcines (releases moisture) under heat exposure. A single layer of 15.9mm Type X gypsum provides approximately 45 minutes of fire resistance before heat penetrates to the framing behind it. Available from all major manufacturers (CGC, Georgia-Pacific, National Gypsum, Gold Bond). For exterior use, specify glass-mat faced exterior gypsum sheathing (such as Gold Bond eXP Fire-Shield or DensGlass) which resists moisture while providing fire resistance.

Standard OSB or plywood: Combustible. Provides structural bracing and acts as the nailing surface for cladding, but offers minimal fire resistance. Once the cladding fails (or heat transfers through non-combustible cladding), OSB ignites within minutes.

Fire-retardant-treated plywood: Improved fire resistance over standard plywood but inferior to Type X gypsum. More expensive than gypsum and loses effectiveness over time. Not recommended when Type X gypsum is available.

THE KEY UPGRADE

Installing 15.9mm Type X gypsum sheathing behind non-combustible cladding is the single most impactful wall assembly upgrade. It transforms the wall from a single-barrier system (cladding only) to a two-barrier system (cladding + gypsum). If the cladding transfers heat (fibre cement) or is damaged (debris impact), the gypsum provides a second layer of fire resistance. Combined cost at construction time: $500–$1,500 for a typical home. As retrofit: $2,000–$5,000.

3.3 Insulation

The insulation sits within the wall cavity between the studs. Its fire performance varies dramatically by type.

Mineral wool (Rockwool/Roxul): Non-combustible. Made from basite rock and recycite slag. Melting point exceeds 1,000°C. Provides fire resistance within the wall cavity — even if the sheathing and cladding fail, mineral wool does not ignite and acts as a thermal barrier protecting the interior drywall and the spaces beyond. Also provides excellent thermal and acoustic performance. R-15 for 2×4 walls, R-23 for 2×6 walls.

Fibreglass batt: The glass fibres are non-combustible, but the paper or foil facer and the binder resins are combustible. In a wall fire, fibreglass batts do not sustain combustion but they do melt and shrink at approximately 540°C, losing their insulating value and exposing the cavity to convective heat transfer. Adequate for WER-1 and WER-2; mineral wool preferred for WER-3+.

Spray foam (open-cell and closed-cell): Combustible. Both open-cell and closed-cell spray foam are combustible and can produce toxic smoke when they burn. In a wall fire, spray foam can accelerate fire spread within the cavity. The International Building Code requires a thermal barrier (typically 12.7mm drywall) over spray foam on the interior side, but the exterior side of the cavity is typically unprotected. Not recommended for exposed faces at WER-3+.

Rigid foam (EPS, XPS, polyiso): Combustible. Used as continuous exterior insulation. EPS is the most combustible; polyiso is the least. If used, must be protected by non-combustible cladding with minimal or no air gap behind the cladding. The Gorham et al. (2025) EIFS experiments demonstrated the danger of EPS under fire exposure.

3.4 Interior Lining

Standard 12.7mm (1/2") drywall: Provides approximately 20–30 minutes of fire resistance. This is the interior side of the thermal barrier and is not typically the focus of wildfire hardening, which addresses the exterior side. However, for WER-4 and CNEL system applications, the interior drywall contributes to the overall assembly fire resistance.

15.9mm (5/8") Type X drywall: Provides approximately 45 minutes of fire resistance on the interior side. Combined with Type X gypsum sheathing on the exterior side, this creates a wall assembly with fire resistance on both sides of the framing — significantly exceeding the 30–60 minutes needed to survive a neighbouring structure fire.

4. Gaps, Joints, and Junctions

The performance of a wall assembly can be undermined by gaps at joints and junctions. Fire can penetrate through gaps as small as 3mm, and embers can enter through any opening that allows airflow.

4.1 Siding Joints

Every horizontal and vertical joint in the cladding is a potential failure point. UC Fire Research Laboratory testing found that plain bevel lap joints are the most vulnerable to flame penetration. Ship-lap and tongue-and-groove joints provide significantly better protection.

WER-1: Standard installation per manufacturer specifications.

WER-2: Seal all visible gaps at joints with non-combustible caulk. Ensure joints are tight and overlaps are at least 30mm.

WER-3+: Seal all joints. Use ship-lap or tongue-and-groove profiles where available. Back-flash all butt joints with metal or fibre cement strips behind the joint.

4.2 Wall-to-Roof Junction

The junction where the wall meets the roof/eave is one of the most critical fire pathways. Heat and embers rise along the wall surface and concentrate at the eave. If the soffit is open (exposed rafter tails), fire enters the roof cavity directly. If the soffit is enclosed but the wall-to-soffit junction is not sealed, embers enter through the gap.

WER-1: Ensure no visible gaps at wall-to-soffit junction.

WER-2+: Seal the wall-to-soffit junction with non-combustible caulk or metal flashing. Soffit must be enclosed with non-combustible material (see Module 2).

4.3 Wall-to-Foundation Junction

The base of the wall is vulnerable to radiant heat from burning ground cover, ember accumulation at the base, and fire from adjacent combustible materials (decks, fences, stored items). The first 400mm of wall above grade is the most critical zone.

WER-1: Clear combustible materials from within 1.5 metres of the wall base.

WER-2: Non-combustible cladding within 400mm of grade. Seal gaps at the wall-to-foundation junction. Metal flashing at the junction.

WER-3+: Non-combustible cladding full height. Seal all gaps ≤3mm with non-combustible caulk or flashing. Metal mesh (≤2mm) over weep holes and any openings in the first 400mm.

4.4 Wall-to-Deck Junction

Where a deck attaches to the wall, the junction concentrates heat, embers, and flame exposure. IBHS research found that deck fires frequently spread to the building at this junction. See Module 4 for detailed deck-to-wall specifications.

All WER levels: Metal flashing at the deck-to-wall junction. No combustible cladding within 300mm of the deck surface at WER-3+.

4.5 Corners and Trim

Internal corners (where two walls meet at an angle less than 180°) accumulate windblown debris and embers. Trim boards, corner boards, and decorative elements create gaps and combustible surfaces.

WER-1: Clear debris from corners regularly.

WER-2: Non-combustible or aluminium-wrapped corner trim. Seal gaps behind trim with non-combustible caulk.

WER-3+: All trim and mouldings non-combustible. No combustible trim within 400mm of any junction (wall-to-roof, wall-to-deck, wall-to-foundation).

5. Rain Screen and Ventilated Cavities

Modern wall assemblies frequently include a ventilated rain screen cavity between the cladding and the sheathing. This cavity (typically 19–25mm) is essential for moisture management but creates a potential fire pathway.

5.1 The Fire Risk

A ventilated cavity acts as a chimney during a fire. Hot gases and flames that enter at the base of the wall travel upward through the cavity, preheating and igniting the sheathing or insulation. The wider the cavity and the taller the wall, the more effective the chimney effect.

The Building America Solution Center recommends that in wildfire-prone areas, drainage gaps of 25mm or greater should be limited to assemblies where both the cladding and the continuous insulation are non-combustible, or where combustible insulation is protected by a non-combustible layer.

5.2 Specifications by WER Level

WER-1: Standard rain screen cavity per building code. No additional fire requirements.

WER-2: Screen the bottom of the rain screen cavity with non-combustible mesh (≤3mm aperture) to limit ember entry. Cap the top of the cavity to prevent direct airflow into the soffit space.

WER-3+: Screen bottom with ≤2mm non-combustible mesh. Install horizontal fire stops (non-combustible cavity barriers) at each storey and at the eave. Use non-combustible furring strips (metal hat channel) instead of wood strapping. If combustible continuous insulation is used behind the cavity, protect it with a non-combustible layer (mineral wool board or non-paper-faced gypsum).

RAIN SCREEN FIRE STOPS

Horizontal cavity barriers at each storey and at the eave are standard practice in many European countries for fire safety in ventilated facades. In Canada, they are not typically required for low-rise residential construction. In wildfire-prone areas, they should be considered standard practice at WER-3+ and are recommended at WER-2. Metal cavity barriers (such as Siderise or Lamatherm products, or site-fabricated from sheet metal) cost $2–$5 per linear foot and take minutes to install during construction.

6. Specifications by WER Level

6.1 Summary Table

Component	WER-1	WER-2	WER-3	WER-4
Cladding	Code compliant	NC preferred on exposed faces	NC required all faces	NC required, tested to NFPA 268 or AS 1530.1
Sheathing	Code minimum (OSB/plywood)	Code minimum; Type X on Close Neighbour faces	Type X gypsum sheathing on exposed faces	Type X gypsum sheathing all faces
Insulation	Code minimum	Code minimum; mineral wool on CN faces	Mineral wool preferred all faces	Mineral wool required all exposed faces
Gaps and joints	Seal visible gaps	Seal all gaps ≤3mm, NC caulk	Seal all gaps ≤3mm, back-flash butt joints	Seal all gaps ≤2mm, engineer joints
Wall-roof junction	No visible gaps	Sealed, NC caulk	Sealed, metal flashing, NC soffit	Sealed, metal flashing, fire-stopped
Wall-foundation	Clear combustibles	NC cladding (or equivalent) within 400mm, sealed	NC cladding (or equivalent), sealed, ≤2mm mesh at weeps	NC, sealed, ≤2mm mesh, metal flashing
Rain screen	Standard	Screen bottom ≤3mm mesh	Fire stops each storey, ≤2mm mesh, metal furring	Fire stops, ≤2mm mesh, NC furring, NC insulation
Corner trim	Maintain	NC or aluminium-wrapped	NC only	NC only, sealed

6.2 Close Neighbour Exposure Level (CNEL): Wall Specifications

When a neighbouring structure is within 10 metres of any wall (see FireHard Self-Assessment Guide, Section 8), apply the following specifications to that wall face, in addition to the WER level specifications:

Component	Close Neighbour Specification
Cladding	Non-combustible (fibre cement, metal, stucco, or masonry). No vinyl, no wood, no EIFS.
Sheathing	15.9mm (5/8") Type X glass-mat faced exterior gypsum (Gold Bond eXP Fire-Shield, DensGlass, or equivalent).
Insulation	Mineral wool (Rockwool ComfortBatt or SafenSound). Provides fire resistance within the cavity.
Rain screen cavity	Metal furring strips (hat channel). Screen bottom ≤2mm NC mesh. Horizontal cavity barrier at each storey.
All gaps and joints	Sealed ≤3mm with NC caulk or metal flashing.
Soffit/fascia on this face	Non-combustible (fibre cement or aluminium). Enclosed. No open eaves.

Component	Close Neighbour Specification
Windows on this face	5mm tempered glass both panes. Wildfire shutters recommended. Minimise glazing area.
Ground cover between buildings	Non-combustible throughout (gravel, concrete, stone). No fencing, no vegetation, no storage.

These specifications create a wall assembly that provides approximately 60–90 minutes of fire resistance against a neighbouring structure fire at typical Canadian subdivision separation distances. This exceeds the 30–90 minute burn duration of a typical residential structure. The assembly is not formally fire-rated — it has not been tested as a complete system to ASTM E119 — but each component is selected based on research and the performance is expected to be adequate for the exposure scenario.

7. AS 3959 Wall Requirements and Canadian Adaptation

AS 3959 specifies exterior wall construction by BAL level. These requirements inform the FireHard specifications.

7.1 AS 3959 Requirements by BAL

BAL-12.5 (maps to WER-1/2): No requirements for wall cladding above 400mm from the ground, decks, or carport roofs. Walls within 400mm of ground or deck surfaces must be non-combustible, fibre cement (≥6mm), bushfire-resisting timber (≥650 kg/m³), or steel sheeting. Gaps >2mm to be screened with 2mm non-combustible mesh.

BAL-19 (maps to WER-2): Same as BAL-12.5 for walls. Walls must be sarked (fire-protective membrane behind the cladding). Sarking can be foil-laminate or equivalent fire-resistant material.

BAL-29 (maps to WER-3): Walls must be non-combustible (brick, concrete ≥90mm, rammed earth), bushfire-resisting timber, or cladding on sarked walls that is non-combustible, fibre cement ≥6mm, timber ≥750 kg/m³, or steel sheeting. Gaps >2mm screened with 2mm mesh.

BAL-40 and BAL-FZ (maps to WER-4): Walls must be non-combustible (masonry ≥90mm) or systems tested to AS 1530.8.1. Heavy masonry, concrete, or engineered systems only. No combustible cladding of any kind.

7.2 Canadian Adaptation

The AS 3959 wall requirements translate well to Canadian practice with the following adjustments:

Sarking: AS 3959 requires sarking (a fire-protective membrane) behind the cladding from BAL-19. The Canadian equivalent is self-adhering modified bitumen membrane (such as Grace Perm-A-Barrier or Blueskin VP160) or foil-faced membrane. For WER-3+, the more effective approach is Type X gypsum sheathing, which provides both the fire barrier function of sarking and structural sheathing in one layer.

Timber density requirements: AS 3959 permits high-density hardwood cladding (≥650–750 kg/m³ depending on BAL). Canadian hardwood species that meet this threshold include red oak (≈630–700), yellow birch (≈670), and sugar maple (≈685). However, these species are not commonly used as exterior cladding in Canada. Fibre cement is a more practical and consistently available non-combustible alternative.

The 400mm zone: AS 3959 requires non-combustible cladding within 400mm of the ground, decks, and other horizontal surfaces at all BAL levels above BAL-LOW. This recognises that the base of the wall is most vulnerable to radiant heat from ground fires and debris accumulation. The WER system adopts this as a requirement at WER-2+.

Climate considerations: Canadian wall assemblies must address cold-climate performance (thermal bridging, moisture management, vapour drive) in addition to fire resistance. Metal furring strips and exterior mineral wool insulation can create thermal bridges that reduce energy performance. Thermal-break furring or intermittent fastening patterns should be considered. A wall designed for both fire and cold must balance these requirements.

EIFS IN CANADA

EIFS (Exterior Insulation and Finish Systems) is widely used in Canada for energy efficiency. However, the Gorham et al. (2025) research demonstrated that EIFS with EPS insulation is a high fire risk. If EIFS is used on a home in a wildfire-prone area, consider replacing it with a mineral wool insulated rain screen system on exposed faces. Mineral wool provides comparable thermal performance with dramatically better fire performance. On faces with close neighbour exposure, EIFS replacement should be a priority.

8. Construction Sequences

8.1 New Construction (WER-2+)

When building a new wall assembly to WER-2 or higher:

1. Frame the wall per code (2×4 or 2×6 at 400mm or 600mm centres).

2. Install mineral wool batt insulation within the cavity (WER-3+; fibreglass acceptable at WER-2).

3. Install 15.9mm Type X glass-mat faced gypsum sheathing (WER-3+; OSB acceptable at WER-2 on non-exposed faces). Tape and seal joints with manufacturer-specified tape.

4. Install weather-resistive barrier (WRB) per code over the sheathing.

5. Install metal furring strips (hat channel) for rain screen cavity (WER-3+; wood strapping acceptable at WER-2).

6. Install horizontal cavity barriers at each storey (WER-3+). Screen bottom of cavity with ≤2mm non-combustible mesh.

7. Install non-combustible cladding (fibre cement, metal, stucco, or masonry).

8. Seal all joints, junctions, and gaps ≤3mm with non-combustible caulk or metal flashing.

9. Install non-combustible corner trim, drip edge, and flashings.

8.2 Retrofit: Prioritised Upgrade Sequence

For existing homes, wall upgrades are among the most expensive retrofits. Prioritise by cost-effectiveness:

Priority 1: Seal all gaps (≤3mm). Walk the entire perimeter. Seal every gap at siding joints, wall-roof, wall-foundation, around pipes and ducts, at corners and trim, and at the wall-deck junction. Non-combustible caulk (high-temperature silicone or intumescent sealant). Cost: $50–$200 in materials. This alone significantly reduces ember entry. Do this regardless of WER level.

Priority 2: Non-combustible cladding within 400mm of grade. If you have vinyl or wood siding, replace the lowest 400mm (about 16 inches) with fibre cement or metal. This protects the most vulnerable zone — the base of the wall where radiant heat from ground fires and debris accumulation is highest. $300–$1,000.

Priority 3: Non-combustible cladding on the most exposed face. Replace the entire cladding on the face with the highest vegetation or neighbour exposure. $3,000–$8,000 per face. If doing a single face, choose the face facing the closest vegetation or the closest unhardened neighbour.

Priority 4: Type X gypsum sheathing on Close Neighbour faces. If recladding an exposed face, remove the old siding and install Type X gypsum sheathing over the existing OSB before installing new non-combustible cladding. This adds the second fire barrier. $500–$1,500 per face (labour is the majority, since you are already recladding).

Priority 5: Full re-cladding with upgraded assembly. Replace all cladding with non-combustible material. Install Type X gypsum sheathing, mineral wool insulation (if accessible from exterior), metal furring, and cavity barriers. $12,000–$30,000 for a typical home. Often best combined with a major renovation or re-siding project.

THE REALISTIC APPROACH

Full wall assembly upgrade is one of the most expensive retrofits. For most homeowners, Priorities 1 and 2 (sealing gaps and non-combustible cladding at the base) provide significant improvement for under $1,000. Priority 3 (recladding one face) is a good investment when the siding is due for replacement anyway. Combine wildfire hardening with planned maintenance to spread costs.

9. Product Research: Canadian Market

9.1 Non-Combustible Cladding

James Hardie (fibre cement): HardiePlank (lap siding), HardiePanel (panel siding), HardieTrim (trim boards), HardieSoffit (soffit panels). Class A flame spread. Widely available through building supply across Canada. hardiebuildingproducts.com

Allura (fibre cement): Lap siding, vertical panels, and shingle panels. Distributed in Canada. allurausa.com

Gentek (aluminium siding): Aluminium lap siding and soffit. Non-combustible. Canadian manufacturer. gentek.ca

Kaycan (aluminium and steel): Aluminium siding and soffit. Canadian manufacturer. kaycan.com

Vicwest (steel panel): Steel wall cladding in profile and flat panel. Canadian manufacturer (Cambridge, ON). vicwest.com

Longboard (aluminium panel): Architectural aluminium wall cladding. Canadian manufacturer (Abbotsford, BC). longboardproducts.com

9.2 Fire-Resistant Sheathing

Gold Bond eXP Fire-Shield: 15.9mm glass-mat faced Type X exterior gypsum sheathing. Meets ASTM C1177. Fire-resistant and moisture-resistant. National Gypsum Company.

Georgia-Pacific DensGlass: Glass-mat faced gypsum sheathing. Available in 12.7mm and 15.9mm. Fiberglass mat face resists moisture. gp.com

CGC Sheetrock: Type X gypsum panels. Interior use primarily, but Type X core provides fire resistance when installed as sheathing with appropriate weather protection. cgcinc.com

9.3 Mineral Wool Insulation

Rockwool ComfortBatt: Stone wool batt insulation. R-15 (3.5"), R-23 (5.5"). Non-combustible. Melting point >1,000°C. Available at all major Canadian building supply retailers. rockwool.com

Rockwool ComfortBoard: Rigid mineral wool board for continuous exterior insulation. R-6 per 38mm. Non-combustible. Can replace EPS/XPS in rain screen assemblies.

Rockwool Safe’n’Sound: Acoustic mineral wool batt. Same fire resistance as ComfortBatt. Lower thermal performance but provides fire barrier in wall cavities.

9.4 Non-Combustible Caulk and Sealant

3M Fire Barrier Sealant CP 25WB+: Water-based intumescent sealant. Expands in fire to seal gaps. UL listed.

Hilti CP 601s: Firestop sealant. Intumescent. Tested to ASTM E814. hilti.ca

DAP Fire Stop: Intumescent fire-rated sealant. Available at retail. Suitable for gaps up to 25mm.

High-temperature silicone (Permatex, Rutland): Rated to 260–315°C. Not intumescent. Suitable for smaller gaps where intumescent expansion is not needed.

10. Maintenance Protocol

Wall assemblies require annual inspection and maintenance to maintain fire resistance.

1. Inspect all caulk joints for cracking, separation, or deterioration. Re-caulk as needed with non-combustible sealant.

2. Inspect cladding for damage, gaps, missing sections, or deterioration. Repair or replace immediately. Any gap in the cladding exposes the layers behind it to direct fire exposure.

3. Clear debris from wall-foundation junctions, internal corners, and any ledges or surfaces where organic material accumulates. Ember ignition of accumulated debris at the base of the wall is a common ignition pathway.

4. Inspect and clear the rain screen cavity bottom (if accessible). Verify mesh screening is intact and not blocked by debris.

5. Verify no combustible materials have been stored within 1.5 metres of any wall (firewood, lumber, propane tanks, recycling bins, furniture cushions).

6. Inspect trim, corner boards, and flashings for damage or separation. Reseal as needed.

7. Verify ground cover within 1.5 metres remains non-combustible (gravel, concrete, stone). Replace any mulch or vegetation that has encroached. Refer to FireSmart Canada for vegetation management guidance.

8. Check wall-to-deck junction flashing for integrity. Re-flash if damaged.

9. For homes with EIFS or stucco, inspect for cracking that could allow fire entry to the insulation layer. Repair cracks immediately with compatible non-combustible patching material.

10. Document condition and repairs. Photograph each face annually for insurance and maintenance records.

11. References

11.1 Standards and Codes

AS 3959:2018. Australian Standard — Construction of Buildings in Bushfire-Prone Areas. Standards Australia.

NBC 2020. National Building Code of Canada. Part 3 (Fire Protection, Occupant Safety and Accessibility) and Part 9 (Housing and Small Buildings). NRC: Ottawa.

California Building Code Chapter 7A. Materials and Construction Methods for Exterior Wildfire Exposure. California Building Standards Commission.

IWUIC 2021. International Wildland-Urban Interface Code. International Code Council.

ASTM E119. Standard Test Methods for Fire Tests of Building Construction and Materials.

ASTM E84. Standard Test Method for Surface Burning Characteristics of Building Materials.

ASTM C1177. Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

NFPA 268. Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source.

NFPA 285. Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies.

AS 1530.1. Methods for Fire Tests on Building Materials, Components and Structures — Combustibility Test for Materials.

AS 1530.8.1. Methods for Fire Tests on Building Materials — Tests on Elements of Construction for Buildings Exposed to Simulated Bushfire Attack.

11.2 Research

Gorham, D.J., Willi, J.M., and Horn, G. (2025). "Residential Exterior Wall Reaction to Post-Flashover Compartment Fires." Fire and Materials, 2025. UL Fire Safety Research Institute. Full-scale building-to-building fire spread experiments at 1.8, 3.0, and 4.3m separation distances.

IBHS (2019). Wildfire Research: Vulnerabilities of Buildings to Wildfire Exposures. Insurance Institute for Business & Home Safety. ibhs.org

UC Fire Research Laboratory. Siding joint vulnerability testing. University of California.

FEMA P-737 (2008). Home Builder’s Guide to Construction in Wildfire Zones. Federal Emergency Management Agency. Fact Sheet 7: Exterior Walls.

NRC (2021). Bénichou, N., et al. National Guide for Wildland-Urban Interface Fires. National Research Council of Canada: Ottawa. 192 pp.

Maranghides, A., et al. NIST Post-Fire Investigations: Marshall Fire (2021) and Camp Fire (2018). Structure-to-structure fire spread documentation.

11.3 Product Manufacturers

James Hardie: hardiebuildingproducts.com — Fibre cement cladding, trim, soffit

Allura: allurausa.com — Fibre cement siding and panels

Gentek: gentek.ca — Aluminium siding, soffit, and accessories

Kaycan: kaycan.com — Aluminium siding and soffit

Vicwest: vicwest.com — Steel wall and roof cladding

Longboard: longboardproducts.com — Architectural aluminium cladding

National Gypsum (Gold Bond): nationalgypsum.com — eXP Fire-Shield gypsum sheathing

Georgia-Pacific: gp.com — DensGlass gypsum sheathing

CGC (Saint-Gobain): cgcinc.com — Type X gypsum products

Rockwool: rockwool.com — Mineral wool insulation (ComfortBatt, ComfortBoard, Safe'n'Sound)

3M: 3m.ca — Fire Barrier Sealant CP 25WB+

Hilti: hilti.ca — CP 601s firestop sealant

DAP: dap.com — Fire Stop sealant

DISCLAIMER

This guide is published by FireHard Canada for general educational and informational purposes. It provides technical guidance on wildfire-resistant construction practices based on current Canadian building science, standards, and research. This guide is subject to the following conditions:

Not professional advice: *This guide does not constitute professional engineering, architectural, or construction advice. It is not a substitute for the services of a licensed engineer, architect, or other qualified professional. Users should engage qualified professionals for design, specification, and construction of wildfire-resistant assemblies.*

Building code responsibility: *Building codes, standards, and regulations vary by province, territory, and municipality and are subject to change. This guide references specific code provisions for context but does not warrant that any specification contained herein satisfies the requirements of any specific jurisdiction. Compliance with applicable building codes is the responsibility of the property owner, their design professionals, their contractors, and local building authorities.*

Site-specific conditions: *The specifications and recommendations in this guide are general in nature. Actual wildfire resistance depends on site-specific conditions including but not limited to: topography, prevailing wind patterns, vegetation type and density, proximity to wildland fuels, local climate, neighbouring structures, and access to fire suppression services. A qualified professional familiar with local conditions should assess the applicability of any recommendation to a specific property.*

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No guarantee of wildfire survival: *Compliance with the recommendations in this guide does not guarantee that a property will survive a wildfire event. Wildfire outcomes depend on fire intensity, duration, wind conditions, ember density, suppression response, terrain, vegetation, neighbouring property conditions, and other factors beyond building construction. The WER system measures resistance to specific wildfire exposure mechanisms; it does not predict outcomes.*

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is an inherently unpredictable natural hazard and assume all risks associated with wildfire exposure to their property. Full terms at firehard.ca/terms.

DISCLAIMER

This guide provides general construction guidance. It is not professional engineering advice. The measures described reduce the probability of building ignition but do not guarantee survival in a wildfire event. No building is fireproof. For site-specific assessment, contact a qualified P.Eng. Wildernest Systems Inc. accepts no liability for losses arising from the use of this guide.

Verification Pathways

The WER system recognizes three pathways to meet each specification. This mirrors how building codes work — a prescriptive path for straightforward compliance, and alternative solution paths for flexibility.

Deemed-to-Satisfy

Materials and assemblies explicitly named in the FireHard specification. If the design guide lists it, it meets the standard. Example: fibre cement panel, metal cladding, stucco, or masonry all satisfy “noncombustible cladding (or engineered equivalent)” without further testing.

Tested Equivalent

Products tested to the referenced standard by a recognized testing laboratory. The manufacturer’s test report is the evidence of compliance. Example: an ember-resistant vent not listed in this guide but tested to ASTM E2886 by an accredited lab meets the WER-2 vent specification.

Engineered Alternative

A P.Eng. assessment demonstrating equivalent performance through analysis. The engineer’s sealed report is the evidence. Example: a heavy-timber fence post (140×140mm minimum) may satisfy the WER-2 fencing specification through charring rate analysis, even though it is not noncombustible.

Fire-Rated Timber

Where a specification says “NC or fire-rated,” fire-rated timber is an acceptable alternative when it meets minimum section dimensions. Large-section timber chars at a predictable rate (approximately 0.65mm/min for softwood per Eurocode 5) and can maintain structural integrity for defined periods. For fencing, outbuilding framing, and deck substructure, timber sized to resist ignition for the design fire exposure period is acceptable at WER-1 through WER-3. Minimum section dimensions are specified in the relevant design guides. At WER-4, all exterior materials must be noncombustible — no timber alternatives.

Close Neighbour Exposure Level (CNEL)

Most Canadian subdivision homes are built 1.5–6 metres apart. If any face of your home is within 10 metres of a neighbouring structure, the CNEL system applies to that face. Measures scale with WER level. See the CNEL section in each FireHard design guide and Construction Detail Guide 6 for full technical details.

About FireHard Canada

FireHard Canada (firehard.ca) is a trade name of Wildernest Systems Inc. The Wildfire Exposure Rating (WER) system was developed by engineers at Wildernest Systems Inc. and Bulkley Valley Engineering Services Ltd., with landscape architecture expertise from Lazzarin Svisdahl Landscape Architects.

FireHard Canada publishes free wildfire hardening resources for Canadian homes. Six Construction Detail Guides, FireHard Self-Assessment Guides, four FireHard Design Guides, a New Construction Design Guide, and the FireHard Technical Reference are all available free at firehard.ca.

We are building FireHard Canada non-profit organization for stakeholder engagement, peer review, and ongoing refinement of the WER system. We are actively seeking engineers, architects, building scientists, insurers, building officials, researchers, and community advocates to participate.

Get involved: firehard.ca/partners

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