F I R E H A R D . C A

C O N S T R U C T I O N D E T A I L G U I D E 3

Vents & Penetrations

Ember-Resistant Screening, Sealing & Retrofit Details for WUI Homes

Adapted for Canadian WUI conditions from:

- **AS 3959:2018** (Australian Standard — Construction of Buildings in Bushfire-Prone Areas)
- **California Building Code Chapter 7A** (Materials & Construction Methods for Exterior Wildfire Exposure)
- **NRC National Guide for WUI Fires** (National Research Council Canada, 2021)
- **FireSmart Canada** Construction Guidance & Best-Practice Checklist
- **IBHS Wildfire Prepared Home Standard** (Insurance Institute for Business & Home Safety)

Version 1.0 | February 2026 | Free Resource — No Paywall

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1. Why Vents Are Your Home's Biggest Wildfire Vulnerability

During a wildfire, the greatest threat to your home is not the wall of flame you see on the news. It is the storm of burning embers that precedes it, sometimes by kilometres. These embers — fragments of burning bark, pine needles, and structural debris — are carried by wind and deposited on and around buildings far ahead of the fire front.

THE CRITICAL STATISTIC

Up to 90% of homes lost during wildfires are ignited by wind-blown embers, not by direct flame contact. — IBHS, Insurance Institute for Business & Home Safety

Every home has openings designed to let air move through enclosed spaces: attic vents, soffit vents, foundation vents, gable vents, ridge vents, dryer exhausts, bathroom fans, and gaps around pipes, wires, and ducts. These openings are essential for moisture control and energy performance. But during an ember storm, every one of them becomes a potential ignition pathway.

When a burning ember enters an attic through an unprotected vent, it lands on dust, insulation, stored cardboard, or framing lumber. In the oxygen-rich, sheltered environment of an attic, a single ember can smoulder for minutes before producing a flame. By the time fire is visible from outside, the roof structure is already compromised. The home appears to burn from the inside out.

IBHS laboratory experiments (2011–2017) demonstrated that embers readily entered through standard gable vents, and that even 1/8" (3mm) mesh screening did not fully eliminate ember entry — though it significantly reduced both the number and size of embers penetrating the attic space.

The research also found that eave construction type makes a significant difference: vents installed in soffited-eave (boxed-in) construction were substantially less vulnerable to ember entry than vents in open-eave (exposed-rafter) construction. In open-eave construction, wind drives embers directly at the vent face between rafters. In soffited-eave construction, embers must travel horizontally under the soffit before finding the vent opening — a much more difficult path.

1.1 How Embers Enter: The Five Pathways

Understanding how embers find their way into your home is the foundation for stopping them. Research from CSIRO (Australia), IBHS (United States), and post-fire damage surveys consistently identify five primary entry pathways through vents and penetrations:

1. **Attic/Gable Vents:** Gable-end vents face directly into wind. Standard 6mm (1/4") screening allows embers to pass through easily. Even louvered gable vents provide minimal resistance because ember trajectories follow airflow patterns through louver gaps.
2. **Soffit/Eave Vents:** Continuous soffit strip vents and individual soffit vents connect directly to the attic space. In open-eave construction, vents between rafter blocking are

extremely vulnerable. Debris accumulation on horizontal soffit vent surfaces can ignite and burn through the screening.

3. **Ridge/Roof Vents:** Ridge vents run along the peak of the roof. While their position makes direct ember impingement less common, embers deposited on the roof can slide or roll into ridge vent openings. Debris accumulation in the vent channel is a secondary ignition risk.
4. **Foundation/Crawlspace Vents:** Foundation vents face wind directly, similar to gable vents. Embers that enter the crawlspace can ignite stored materials, insulation, or floor framing. Combustible debris that accumulates against foundation walls and around vent openings increases the risk.
5. **Service Penetrations:** Dryer vents, bathroom exhaust fans, range hood vents, HRV/ERV intakes and exhausts, electrical conduit entries, plumbing stack flashings, and gas line penetrations. Any gap around these elements is an ember pathway. Even small gaps of 2–3mm can admit embers capable of igniting fine fuels.

CRITICAL FINDING: THE FASCIA-SHEATHING GAP

IBHS research found that in soffited-eave construction, most ember entry occurred not through the soffit vents themselves, but through the gap between the fascia board and the roof sheathing above it. Installing a metal drip edge at the roof edge to cover this gap dramatically reduced ember accumulation in the attic. This detail is often overlooked even in homes with proper ember-resistant vents.

2. Vent Screening Specifications: What the Standards Require

There is no single global standard for wildfire vent screening. Requirements vary significantly between jurisdictions, and Canada currently has no mandatory WUI building code — which is precisely why this guide exists. The table below compares the major standards and identifies our recommended specification for Canadian WUI conditions.

Element	Australia AS 3959	California Ch. 7A	FireSmart Canada	FireHard Canada Recommended
Mesh size	Max 2mm aperture	1/16”–1/8” (1.6–3.2mm)	3mm non-combustible	**Max 2mm (1/16”) for new; 3mm (1/8”) min for retrofit**
Material	Corrosion-resistant steel, bronze, or aluminium	Corrosion-resistant, non-combustible	Non-combustible metal	**316 stainless steel or bronze; galvanized steel acceptable**
Test standard	AS 1530.8.1 / 8.2	ASTM E2886 (ember + flame)	None specified	**ASTM E2886 where available; 2mm mesh minimum otherwise**
Eave vents	Screened, no gaps >2mm	Prohibited unless ASTM E2886 listed	Screen with 3mm mesh	**Soffited-eave only; ASTM E2886 listed or baffled + 2mm mesh**
Gable vents	Screened 2mm	ASTM E2886 listed	Screen with 3mm mesh	**Replace with ASTM E2886 listed vent or seal permanently**
Foundation	Screened 2mm	ASTM E2886 listed	Screen with 3mm mesh	**ASTM E2886 listed vent preferred; 2mm mesh + baffle minimum**
Max vent area	Per AS 3959 BAL	144 sq in (929 cm²) per opening	Not specified	**144 sq in max per opening per California practice**

2.1 Why We Recommend 2mm (1/16”) Mesh for New Construction

FireSmart Canada specifies 3mm (1/8”) mesh. California allows 1/16” to 1/8”. Australia requires no larger than 2mm. Why do we recommend 2mm for new construction?

Laboratory testing by IBHS (Quarles, 2017) demonstrated that embers passing through 1/8” (3mm) screening can still retain enough thermal energy to ignite fine fuels like dust, lint, and cellulose insulation. Finer 1/16” (1.6mm) screening further reduces the size and energy of embers that pass through, providing measurably better protection.

The trade-off is airflow. Finer mesh reduces net free area (NFA) — the actual open space through which air moves. Standard 1/4” mesh provides approximately 81% NFA. At 1/8”, NFA drops to approximately 75%. At 1/16”, NFA is approximately 71%. For most homes with adequate ventilation area, this 4–6% reduction is insignificant and easily compensated by adding modest additional vent area.

The other trade-off is maintenance. Finer mesh collects debris faster — pine needles, dust, cobwebs, and insect material can clog 1/16” mesh within a season. This requires regular inspection and cleaning, which we cover in Section 7.

For new construction: Specify 2mm (1/16”) corrosion-resistant non-combustible mesh on all vent openings. Increase total vent area by 10–15% above code minimum (1/300 of insulated ceiling area per BCBC 9.19) to compensate for reduced NFA.

For retrofit: 3mm (1/8”) mesh is the practical minimum and a massive improvement over the 6mm (1/4”) rodent screen found on most existing BC homes. If replacing vents entirely, specify ASTM E2886-listed products.

3. Vent Types: Vulnerability Ranking & Recommended Actions

Not all vents are equally vulnerable. The following section ranks each vent type by risk and provides specific recommended actions for both new construction and retrofit.

3.1 Gable Vents — HIGHEST RISK

RISK LEVEL: CRITICAL

Gable vents face directly into prevailing winds. IBHS testing showed embers readily enter through standard gable vents even with 1/8” mesh. They are the single most vulnerable vent type on most homes.

How they work: Gable vents are installed in the triangular wall section at each end of a gable roof. They exhaust hot air from the attic by cross-ventilation. Standard gable vents use louvered frames with 1/4” rodent mesh behind them.

Why they fail: Wind-driven embers strike the louvers and are deflected inward through gaps. The 1/4” mesh behind the louvers offers minimal resistance. Even 1/8” mesh allows small embers through. The large opening area (typically 300–900 cm²) means many embers can enter simultaneously.

Recommended Actions

New construction (preferred): Eliminate gable vents entirely. Use a balanced soffit-to-ridge ventilation system with ember-resistant soffit vents and a baffled ridge vent. If gable vents are architecturally required, specify ASTM E2886-listed gable vents with intumescent technology.

New construction (minimum): ASTM E2886-listed gable vent with intumescent honeycomb matrix. Products available from BrandGuard, Vulcan Vents, FireStorm.

Retrofit (preferred): Replace with ASTM E2886-listed vent. Typical cost: $150–$400 CAD per vent installed.

Retrofit (budget): Install a retrofit honeycomb intumescent matrix (e.g., Vulcan VM Series) behind existing vent from the attic side. Add 2mm stainless mesh behind the matrix. Typical cost: $80–$200 CAD per vent.

Retrofit (minimum): Overlay existing vent with 1/8” (3mm) corrosion-resistant non-combustible metal mesh, secured with stainless steel screws. Remove the existing 1/4” mesh if it restricts airflow behind the new finer mesh. Typical cost: $20–$60 CAD per vent.

3.2 Foundation/Crawlspace Vents — HIGH RISK

Foundation vents face directly into wind, similar to gable vents. They connect to crawlspaces that typically contain stored materials, floor insulation, and wooden floor framing — all ignitable by a single ember. Combustible debris (leaves, pine needles) commonly accumulates against foundation walls and around vent openings, providing a ready ignition source even before embers enter the vent itself.

Recommended Actions

New construction: Specify ASTM E2886-listed foundation vents with intumescent closing technology. These vents remain open for airflow under normal conditions and self-close when exposed to high heat, sealing the crawlspace from flame and ember intrusion.

Retrofit (preferred): Replace with ASTM E2886-listed foundation vents. Typical cost: $80–$250 CAD per vent installed.

Retrofit (minimum): Overlay with 2–3mm stainless steel mesh from the exterior. Seal all gaps around vent frame with intumescent caulking (e.g., EverKem 814+). Maintain a 1.5m non-combustible zone around all foundation vents — remove mulch, stored firewood, vegetation, and debris.

FIRESMART REQUIREMENT

FireSmart Canada requires a 1.5m non-combustible surface zone extending from the building on all sides. This zone is especially critical around foundation vents. Replace organic mulch with gravel, river rock, or non-combustible ground cover within this zone.

3.3 Soffit/Eave Vents — MODERATE TO HIGH RISK

Vulnerability depends heavily on eave construction type:

- **Open-eave (exposed rafters): HIGH RISK.** Vents in the blocking between rafters face upward and outward. Wind drives embers directly at the vent face. IBHS testing found this construction type significantly more vulnerable than soffited eaves.
- **Soffited-eave (boxed-in): MODERATE RISK.** Vents in the horizontal soffit panel are partially shielded. Embers must travel horizontally under the overhang to reach the vent opening. However, the gap between the fascia board and roof sheathing remains vulnerable.

Recommended Actions

New construction: Use soffited-eave construction exclusively. Specify continuous soffit vents with ASTM E2886-listed ember screening or baffled design. Install a metal drip edge at the roof edge to close the fascia-to-sheathing gap. Size soffit vent area to provide at least 60% of total attic ventilation (with 40% at the ridge).

Retrofit, open-eave: Convert to soffited-eave if structurally feasible. If not, replace blocking vents with ASTM E2886-listed eave vents. At minimum, overlay with 2mm mesh and install intumescent fire caulking around all vent perimeters.

Retrofit, soffited-eave: Overlay existing soffit vents with 2–3mm mesh. Install metal drip edge at roof edge if not already present. Seal any gaps between soffit panels and fascia with non-combustible caulking.

3.4 Ridge Vents — MODERATE RISK

Ridge vents run along the roof peak and are less directly exposed to wind-driven embers than gable or foundation vents. However, embers landing on the roof surface can slide or be blown

along the roof slope into the ridge vent opening. Debris accumulation inside the ridge vent channel is a secondary concern.

Recommended Actions

New construction: Specify an external-baffle ridge vent with integrated 2mm mesh. Use a design that provides weather protection and ember resistance without restricting airflow. The ridge vent should be the primary exhaust for a balanced soffit-to-ridge system.

Retrofit: If the existing ridge vent is a simple open-slot design, retrofit with an external-baffle cover or replace entirely. Install 2–3mm mesh inside the ridge vent channel from the attic side if exterior retrofit is not feasible.

3.5 Dormer Vents — MODERATE RISK

Dormer vents are installed on the vertical face of a roof dormer. Their vulnerability is similar to gable vents but they are typically smaller in area. They provide exhaust ventilation for specific sections of the attic that may not be adequately served by the main ridge vent system.

Recommended Actions

New construction: Specify ASTM E2886-listed dormer vents. Available in half-round, low-profile, and rectangular configurations from BrandGuard, Vulcan Vents, and FireStorm.

Retrofit: Replace with listed vent or install retrofit intumescent matrix from the attic side. At minimum, overlay with 2–3mm mesh.

3.6 Dryer Vents, Exhaust Fans & Service Penetrations — VARIABLE RISK

Every penetration through the building envelope is a potential ember entry point. While individual penetrations are small, most homes have dozens of them: dryer vent, bathroom fan exhausts, range hood vent, HRV/ERV intake and exhaust, electrical service entry, gas line entry, plumbing stack flashings, cable/internet entry, and hose bib penetrations.

Recommended Actions

Dryer vent: Install a metal dryer vent termination with a self-closing damper flap and 2–3mm mesh behind the damper. Ensure the damper is not clogged with lint (fire hazard independent of wildfire). Do not use plastic or vinyl vent terminations — they melt.

Bathroom/range hood exhaust: Verify that the exterior termination has a functional damper flap and that it closes fully. Replace any plastic or louvered covers with metal, dampered covers. Add 2–3mm mesh behind the damper if not already present.

HRV/ERV intakes and exhausts: These are typically metal with mesh. Verify mesh is 3mm or finer. Ensure the intake is not located near combustible materials, beneath a deck, or in a re-entrant corner where embers accumulate.

Electrical, gas, plumbing, cable: Seal all gaps around penetrations with non-combustible caulking or intumescent fire sealant. Any gap larger than 2mm can admit an ember. Use metal flashing collars on plumbing stacks. Replace any degraded or missing caulking around conduit entries.

THE 2mm RULE (from AS 3959)

Australia's bushfire construction standard states that any gap or opening greater than 2mm in the building envelope must be screened with 2mm non-combustible mesh. This principle should be applied to every penetration on a WUI home: if you can slide a credit card into it, an ember can get through it.

4. The Unvented Attic: Eliminating the Problem Entirely

The most effective way to prevent ember entry through attic vents is to eliminate attic vents altogether. An unvented (sealed) attic assembly moves the insulation and air barrier from the ceiling plane to the roof plane, bringing the attic space inside the building's thermal envelope.

4.1 How It Works

- **No soffit vents, ridge vents, or gable vents** — eliminating all attic-level ember pathways.
- Continuous insulation on the underside of the roof deck (closed-cell spray foam or rigid board insulation with sealed joints).
- **Air-tight ceiling plane:** All penetrations through the ceiling (light fixtures, hatches, chases, exhaust ducts) must be carefully sealed to prevent warm, moist interior air from reaching the roof sheathing.
- **Moisture management becomes critical:** Without ventilation to remove moisture, the assembly relies entirely on air-sealing and vapour control. Poor execution leads to condensation, mould, and sheathing deterioration.

4.2 Suitability for BC

British Columbia's wet climate and significant temperature differentials make unvented attics feasible but demanding. The approach works well in new construction where the air barrier can be carefully detailed from the start. Retrofitting an existing vented attic to an unvented design is more challenging and more expensive, requiring professional assessment of the existing structure, vapour permeance of materials, and mechanical ventilation capacity.

When to consider: New construction in high-exposure WUI zones where elimination of all attic vents provides the highest level of ember protection. Particularly suited to simple roof geometries where continuous insulation application is straightforward.

When to avoid: Complex roof geometries with valleys, dormers, and intersections where continuous insulation is difficult to detail. Retrofit situations where air-sealing the ceiling plane is impractical. Homes without adequate mechanical ventilation (HRV/ERV) to manage indoor humidity.

Building science reference: BSI-129 (Lstiburek, 2023) provides detailed guidance on wildfire-resistant unvented assemblies, including the use of rockwool insulation, fire-retardant treated plywood, and non-combustible soffit materials.

5. Construction Details: Step-by-Step

This section provides specific construction sequences for the most common vent hardening tasks. Each detail is written for a competent DIY homeowner or general contractor.

5.1 Retrofit: Overlaying Existing Vents with Ember Mesh

This is the simplest, lowest-cost retrofit and applies to all vent types. It does not replace the existing vent; it adds a layer of finer mesh behind or over it.

Materials

- Corrosion-resistant metal mesh: 316 stainless steel, 2mm (1/16”) aperture for maximum protection, or 3mm (1/8”) for easier maintenance
- Stainless steel staples, screws, or rivets (do not use galvanized fasteners against stainless mesh — galvanic corrosion)
- Aviation snips or mesh-cutting shears
- Intumescent fire caulking (e.g., EverKem 814+) for perimeter sealing
- Measuring tape, marker, straight edge

Procedure

6. Identify all vent openings on the home. Check attic, soffit, gable, foundation, and all service penetrations. Photograph each for reference.
7. Measure each vent opening. Cut mesh pieces 50mm (2”) larger than the opening on all sides to allow for overlap onto the surrounding frame or wall material.
8. For attic-accessible vents (gable, soffit from attic side): work from inside the attic. Lay the mesh over the back of the existing vent, overlapping onto the framing. Secure with stainless steel staples or screws at 75mm (3”) intervals around the perimeter.
9. For exterior-only access (foundation vents, some soffit vents): work from outside. Lay the mesh over the face of the existing vent. Secure with stainless steel screws through the mesh into the vent frame or surrounding wall material.
10. Run a continuous bead of intumescent fire caulking around the full perimeter of the mesh, sealing the mesh to the surrounding material. This prevents embers from bypassing the mesh through edge gaps.
11. Inspect the installation from the opposite side if accessible. Verify no gaps, no lifted edges, and that the mesh lies flat against the vent without bulging (which could allow debris accumulation in the pocket).

5.2 Retrofit: Installing ASTM E2886-Listed Replacement Vents

For the highest level of protection, replace existing vents entirely with tested, listed ember-resistant vents. These products combine multiple defense layers: fine mesh screening, baffled or honeycomb pathways, and intumescent coatings that expand to seal the vent shut when exposed to extreme heat.

Selecting a Product

- Verify the product is listed to ASTM E2886 (Standard Test Method for Evaluating the Ability of Exterior Vents to Resist the Entry of Embers and Direct Flame Impingement)
- Confirm the product is listed on the California State Fire Marshal's Building Materials Listing (BML) if you want the highest verification standard available
- **Major manufacturers:** Vulcan Vents (stainless steel + intumescent honeycomb), BrandGuard Vents (baffle design + intumescent), FireStorm EmberVents (various configurations), Wildfire Defense Mesh (retrofit mesh rolls + pre-made vent screens)
- Match the vent type (gable, soffit, foundation, dormer, ridge) and size to your existing openings. Most manufacturers offer custom sizes.
- Check Net Free Vent Area (NFVA) specifications. Ember-resistant vents typically provide 15–30% less NFVA than standard vents. You may need to add additional vents to maintain the 1/300 ventilation ratio required by BCBC Section 9.19.

Installation Principles

12. Remove the existing vent. Clean the opening of any debris, old caulking, or damaged framing.
13. Dry-fit the new vent to verify sizing and flange alignment.
14. Apply a continuous bead of intumescent fire caulking (e.g., EverKem 814+) behind the mounting flange before installation. This creates a fire-resistant seal between the vent and the building material.
15. Secure the vent per manufacturer instructions. Use the fasteners provided or specified — typically stainless steel screws or nails.
16. Apply a second bead of intumescent caulking around the exterior perimeter of the vent where the flange meets the building material, ensuring no gaps.
17. From the attic side, verify no daylight is visible around the vent perimeter. If gaps are visible, add caulking from the interior.

5.3 New Construction: Soffited Eave with Ember-Resistant Continuous Soffit Vent

This is the recommended eave ventilation detail for new WUI construction. It provides balanced intake ventilation while minimizing ember vulnerability.

Key Dimensions

- **Soffit overhang:** 400–600mm (16–24") typical. Wider overhangs provide more wind/rain protection but may increase debris accumulation.
- **Vent position:** Centre of soffit panel, set back from fascia edge. This positions the vent where ember impingement is lowest.
- **Vent area:** Size to provide 60% of total required attic ventilation area at the soffit (with 40% at ridge). Per BCBC 9.19.1.2, total unobstructed vent area must be at least 1/300 of insulated ceiling area (1/150 for roof slopes less than 1 in 6).
- **Airspace above insulation:** Maintain minimum 63mm (2.5") clear airspace between top of insulation and underside of roof sheathing, per BCBC 9.19.1.3. Install baffles at eave edge extending at least 50mm above insulation top.

Detail Sequence

18. Frame the soffited eave with non-combustible or ignition-resistant soffit material. Fibre cement board, metal soffit panels, or fire-retardant treated plywood are preferred. Do not use vinyl soffit — it melts at low temperatures and exposes the attic.
19. Install the ASTM E2886-listed continuous soffit vent per manufacturer specifications. Position in the centre of the soffit width.
20. Install a metal drip edge at the roof edge, overlapping the fascia board and extending under the first course of roof covering. This closes the gap between the fascia and roof sheathing — a critical ember entry point identified by IBHS research.
21. Install eave baffles (polystyrene or cardboard wind baffles) at each rafter bay to maintain the 63mm airspace and prevent insulation from blocking airflow at the eave edge.
22. Seal all joints between soffit panels and fascia/wall with non-combustible caulking. Seal the perimeter of the vent with intumescent caulking.
23. From the attic, verify continuous unobstructed airpath from each soffit vent bay through to the ridge vent.

5.4 Sealing Service Penetrations

Every pipe, duct, wire, and conduit that passes through the building envelope must be sealed against ember intrusion.

Materials

- Intumescent fire caulking (EverKem 814+, 3M Fire Barrier, or equivalent) for gaps up to 12mm
- Intumescent fire putty or mineral wool firestop for gaps 12–50mm
- Non-combustible metal flashing collars for plumbing stacks and larger pipe penetrations
- Metal sleeve or escutcheon plates for conduit entries
- 2mm stainless steel mesh for backing larger openings before filling

Procedure

24. Walk the exterior of the home and identify every penetration. Common locations: dryer vent (laundry wall), bathroom fan exhaust (exterior wall or soffit), range hood vent (exterior wall), HRV/ERV intake and exhaust (typically opposite walls), electrical meter and service entry, gas meter and line entry, plumbing stacks (through roof), hose bibs, cable/internet entry, AC refrigerant lines.
25. At each penetration, assess the gap between the pipe/duct/conduit and the surrounding wall or roof material. Any gap wider than 2mm requires sealing.
26. For gaps up to 12mm: apply intumescent fire caulking to fill the gap completely. Build up in layers if needed — do not leave voids.
27. For gaps 12–50mm: pack with mineral wool firestop material, then cap with intumescent caulking on both sides.
28. For plumbing stacks through the roof: verify the existing lead or rubber flashing is intact. Install a non-combustible metal storm collar above the flashing. Seal the collar to the stack with high-temperature silicone or intumescent caulking.
29. For dryer vents: replace any plastic or vinyl termination with a metal termination that includes a self-closing damper. Add 2–3mm mesh behind the damper. Secure with stainless steel screws.

30. Photograph each sealed penetration for your records. This documentation may be useful for insurance claims or FireSmart assessments.

6. Product Reference: Ember-Resistant Vent Products

The following table summarises the major ember-resistant vent products available for purchase in or delivery to Canada. FireHard Canada does not endorse specific brands — we list products that meet the performance criteria discussed in this guide. Always verify current certifications before specifying.

Manufacturer	Technology	Certifications	Vent Types	Retrofit Kits	Notes
Vulcan Vents	SS mesh + intumescent honeycomb matrix	ASTM E2886, ASTM E119 (1hr), CA SFM listed	Gable, soffit, foundation, dormer, ridge	Yes (VM Series)	Only vent meeting both WUI and 1-hr fire test. Custom sizes available.
BrandGuard Vents	Overlapping baffle design + intumescent	ASTM E2886, ASTM E119, CA SFM listed	Gable, soffit, foundation, dormer, garage, eave	Yes	Invented by a firefighter (2003). Patented baffle system. Wide product range.
FireStorm EmberVents	Fine mesh + baffle design	ASTM E2886, ASTM E84, ASTM E2768, CA Ch. 7A, IBHS compliant	Gable, soffit, dormer, foundation, flat retrofit	Yes (flat vent, two-way vent)	Affordable positioning. Two-way vent works for new build and retrofit.
Wildfire Defense Mesh	SS woven mesh (Mesh 98)	ASTM E2886 (vertical), AS 3959, ASTM E84	Mesh rolls + pre-made soffit and foundation screens	Mesh rolls for DIY	Meets both US and Australian standards. Good DIY retrofit option for mesh overlay.
Embers Out	Multi-layer filtration design	ASTM E2886	Attic/ridge, foundation, soffit	Yes	Also claims wind, rain, dust, insect, rodent protection (6-way).

Shipping to Canada: All manufacturers listed above are US-based and ship to Canada. Verify current shipping costs and import duties before ordering. FireHard Canada is working to establish Canadian distribution partnerships for these products — contact us at firehard.ca for current availability and pricing.

7. Maintenance: Keeping Your Vent Protection Effective

Ember-resistant vents and mesh are not install-and-forget. Their effectiveness depends on regular inspection and maintenance, particularly in BC's climate where organic debris accumulates quickly.

7.1 Seasonal Inspection Checklist

Perform these checks twice annually: once in late spring (before fire season) and once in late autumn (after leaf fall).

Check	Action Required
Mesh condition	Look for holes, tears, corrosion, or detachment from frame. Replace damaged mesh immediately.
Debris accumulation on mesh	Brush or vacuum debris from mesh surface. Use compressed air from the attic side to blow debris outward. Pine needles, cobwebs, and dust clog fine mesh within one season.
Perimeter caulking integrity	Inspect all caulked joints around vent perimeters and penetrations. Re-apply intumescent caulking where cracked, peeled, or separated.
Damper operation (dryer, exhaust)	Verify damper flaps open and close freely. Remove lint buildup. Replace dampers that are stuck open.
Foundation vent zone (1.5m)	Remove all combustible materials within 1.5m of foundation vents: mulch, firewood, vegetation, leaf litter, stored materials.
Gutter debris above soffit vents	Clean gutters of all accumulated pine needles, leaves, and debris. Ember ignition of gutter debris is a primary secondary ignition pathway for soffit vents. Consider ember-resistant gutter guards.
Attic interior inspection	From inside the attic: verify no daylight visible around any vent (indicates gaps). Check for signs of animal intrusion (nesting material). Verify insulation has not shifted to block vent baffles.
Roof penetration flashings	Check all plumbing stack flashings, chimney flashings, and vent pipe boots for cracks or separation. Seal or replace as needed.

7.2 Pre-Fire-Season Preparation

In addition to the bi-annual inspection above, complete these tasks before the start of each fire season (typically May in BC):

- Remove all accumulated debris from roof surface, valleys, and gutters
- Clear all vegetation and combustible materials from within 1.5m of the building perimeter
- Verify all exterior vent screens are intact and clear of obstruction
- Test all exhaust fan dampers for free operation
- Close all ground-level windows and doors if a wildfire warning is issued (embers enter through any opening)

- Move combustible patio furniture, doormats, and planters away from the building if a warning is issued

FIRE HARD SHUTTERS: THE LAST LINE OF DEFENCE FOR OPENINGS

Vents can be screened, sealed, and upgraded. But windows remain the largest unprotected openings on most homes. When radiant heat cracks or breaks window glass, embers enter the living space and ignite furnishings within minutes. Fire Hard exterior roller shutters provide a deployable barrier of double-wall extruded aluminium that blocks ember intrusion, reduces radiant heat transmission, and protects against wind-driven debris. Learn more at firehard.ca.

8. BC-Specific Considerations

8.1 Current Regulatory Landscape

As of February 2026, British Columbia has no mandatory WUI building code. The BC Building Code (BCBC 2018) addresses structural fire protection for fire spread between buildings (Part 3 and Part 9) but does not address wildfire exposure from the exterior. The National Research Council's National Guide for WUI Fires (2021) provides voluntary guidance but has not been adopted as regulation in any Canadian province.

This means that new homes built in BC's wildfire interface zones are constructed to the same vent specifications as homes in downtown Vancouver — standard 1/4" rodent mesh with no ember resistance requirements. The gap between current practice and best available science is enormous, and it is the primary reason FireHard Canada exists.

FireSmart BC Begins at Home provides voluntary guidance and homeowner education, but does not specify construction details at the level of AS 3959 or California Chapter 7A. FireSmart community recognition programs encourage but do not require vent upgrades.

8.2 Climate Considerations

BC's climate creates specific challenges for vent hardening:

- **Moisture:** BC's wet climate makes attic ventilation particularly important for moisture management. Reducing vent NFA with finer mesh must be compensated with additional vent area. Unvented attic assemblies require meticulous air-sealing and vapour control.
- **Snow load:** Interior BC communities experience significant snow loads that can block soffit and ridge vents seasonally. Vent designs must account for snow accumulation and ensure vents are not permanently obstructed.
- **Coniferous debris:** BC's forests are predominantly coniferous (pine, fir, cedar, spruce). Pine needle and cedar debris accumulates rapidly on mesh surfaces, gutters, and around foundation vents. Maintenance frequency is higher than in deciduous or mixed-forest regions.
- **Wildlife:** Finer mesh also blocks insects and small rodents more effectively. However, mesh installations must be robust enough to resist investigation by raccoons, squirrels, and bears common in BC interface communities.

8.3 Insurance Implications

Canadian insurers are increasingly aware of WUI construction quality. The Intact Centre on Climate Adaptation at the University of Waterloo has published research showing that WUI-hardened homes experience significantly lower loss rates. While Canadian insurers have not yet implemented formal programs equivalent to California's IBHS Wildfire Prepared Home insurance discount mandate, the trend is clear: homes with documented wildfire hardening measures will increasingly be rewarded with better coverage availability and lower premiums.

Document everything you do. Photograph before and after conditions. Keep receipts for ember-resistant vent products and sealants. Maintain a file of product certifications (ASTM E2886 test reports). This documentation may become the difference between coverage and non-renewal as insurers refine their WUI risk models.

9. Neighbouring Structure Exposure: Vents & Penetrations

Vents and penetrations on faces adjacent to close neighbouring structures face a specific challenge: sustained ember and radiant heat exposure for the full duration of a neighbouring structure fire (30–90 minutes). This differs fundamentally from the brief but intense exposure of a passing vegetation fire front. For full details, see Module 6.

Duration changes the equation

Standard vents may resist ember entry from a brief vegetation fire front lasting 5–15 minutes. A burning neighbouring structure produces embers continuously for 30–60 minutes from a fixed position. The sustained exposure means that any weakness in vent screening — mesh that is slightly oversized, a damper that does not seal completely, a gap at the vent frame — will be tested repeatedly. ASTM E2886 ember-resistant vents are designed for this sustained exposure scenario. On faces adjacent to close neighbours, baffled vent designs provide additional protection by forcing embers through a tortuous path rather than a direct opening.

Radiant heat on vent components

At 3–6 metres from a burning structure, radiant heat flux of 20–50 kW/m² can soften or deform plastic vent components, cause aluminium mesh to lose tension, and degrade sealants around vent frames. On close-neighbour faces, all vent components should be non-combustible metal with corrosion-resistant steel or bronze mesh (no aluminium mesh at WER-3+ per AS 3959). Sealants should be fire-rated silicone or intumescent.

10. References & Further Reading

Standards & Codes

- AS 3959:2018, Construction of Buildings in Bushfire-Prone Areas (Standards Australia)
- California Building Code, Title 24, Chapter 7A — Materials and Construction Methods for Exterior Wildfire Exposure (California Building Standards Commission)
- ASTM E2886, Standard Test Method for Evaluating the Ability of Exterior Vents to Resist the Entry of Embers and Direct Flame Impingement (ASTM International)
- ASTM E2957, Standard Test Method for Resistance to Wildfire Penetration of Eaves, Soffits, and Other Projections (ASTM International)
- BCBC 2018, British Columbia Building Code, Section 9.19 Roof Spaces (Province of British Columbia)
- CAN3-A93-M, Natural Airflow Ventilators for Buildings
- NFPA 1144, Reducing Structure Ignition Hazards from Wildland Fire (National Fire Protection Association)

Research & Guidance

- Quarles, S.L. (2017). Vulnerability of Vents to Wind-Blown Embers. Insurance Institute for Business & Home Safety (IBHS).
- National Research Council Canada (2021). National Guide for Wildland-Urban Interface Fires. NRC Publication DOI: 10.4224/40002647.
- FireSmart Canada (2022). Wildfire-Resilience Best-Practice Checklist for Home Construction. CHBA / University of Alberta / Intact Centre / University of Waterloo.
- FireSmart BC. Begins at Home Guide. firesmartbc.ca.
- CSIRO (Australia). Bushfire Best Practice Guide. research.csiro.au/bushfire.
- Queensland Reconstruction Authority / CSIRO (2020, updated 2024). Queensland Bushfire Resilient Building Guidance.
- Lstiburek, J. (2023). BSI-129: Wildfire. Building Science Corporation. buildingscience.com.
- Quarles, S.L. et al. (2010). Home Survival in Wildfire-Prone Areas: Building Materials and Design Considerations. UC ANR Publication 8393.
- IBHS (2025). Wildfire Prepared Home Standard. wildfireprepared.org.

Product Certifications

- California State Fire Marshal, Building Materials Listing (BML) Program: osfm.fire.ca.gov
- WUI Product Handbook: California Building Standards Commission

ABOUT FIREHARD

FireHard Canada provides free, detailed construction guidance for wildfire-resilient homes in British Columbia. Our detail library translates the world's best wildfire building science — from Australia's AS 3959, California's Chapter 7A, and Canada's NRC Guide — into actionable construction details adapted for Canadian conditions, materials, and building practices.

We also manufacture and supply Fire Hard exterior roller shutters and distribute curated partner products for WUI home hardening. For project-specific guidance, contact us at firehard.ca.

All construction details are free, always. No paywall. No subscription. Because everyone deserves to know how to protect their home.

Standards and Codes

AS 3959:2018 + Amd 2:2020. *Construction of Buildings in Bushfire-Prone Areas.* Standards Australia. Sections 3.6 (vents, weepholes, gaps), 5.4.3–9.4.3 (vent screening by BAL level), 5.6–9.6 (roof and eave ventilation).

AS 1530.8.1 / 8.2. *Methods for Fire Tests on Building Materials, Components and Structures — Part 8: Tests on Elements of Construction for Buildings Exposed to Simulated Bushfire Attack.* Standards Australia.

ASTM E2886/E2886M. *Standard Test Method for Evaluating the Ability of Exterior Vents to Resist the Entry of Embers and Direct Flame Impingement.* ASTM International. Primary test standard for ember-resistant vent products.

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

ASTM E2768. *Standard Test Method for Extended Duration Surface Burning Characteristics of Building Materials.* ASTM International.

California Building Code, Chapter 7A [SFM]. *Materials and Construction Methods for Exterior Wildfire Exposure.* 2022 Edition. Sections 706A (vents), 707A (exterior walls and penetrations).

Guides and Resources

Bénichou, N., et al. (2021). *National Guide for Wildland-Urban Interface Fires.* National Research Council Canada. doi:10.4224/40002647.

FireSmart Canada (2018). *FireSmart Begins at Home Manual.* Partners in Protection Association / CIFFC. firesmartcanada.ca.

IBHS (2025). *Wildfire Prepared Home Standard.* Insurance Institute for Business and Home Safety. ibhs.org.

Queensland Reconstruction Authority and CSIRO (2024). *Bushfire Resilient Building Guidance for Queensland Homes.* qra.qld.gov.au.

Research Papers and Reports

Quarles, S.L. (2017). *Vulnerability of Vents to Wind-Blown Embers.* Insurance Institute for Business and Home Safety. Gable vent, soffit vent, and ridge vent ember intrusion testing. Mesh aperture performance comparison.

Quarles, S.L., Valachovic, Y., Nakamura, G.M., Nader, G.A., and De Lasaux, M.J. (2010). *Home Survival in Wildfire-Prone Areas: Building Materials and Design Considerations.* University of California, Agriculture and Natural Resources, Publication 8393.

CSIRO (2020). *Bushfire Best Practice Guide.* Commonwealth Scientific and Industrial Research Organisation. research.csiro.au/bushfire. Building vulnerability framework, ember entry pathways.

Porter, K.A., Scawthorn, C.R., and Sandink, D. (2021). *An Impact Analysis for the National Guide for Wildland-Urban Interface Fires.* Institute for Catastrophic Loss Reduction, prepared for NRC Canada. doi:10.4224/40002649.

Product Manufacturers Referenced

Vulcan Vents — vulcanvents.com. Stainless steel mesh + intumescent technology. ASTM E2886, CA Ch. 7A listed. Gable, soffit, foundation, dormer.

BrandGuard Vents — brandguardvents.com. Overlapping baffle design. ASTM E2886, CA Ch. 7A listed. Gable, soffit, foundation, ridge.

Embers Out — embersout.com. Multi-layer mesh system. ASTM E2886. Attic, ridge, soffit, foundation.

Wildfire Defense Mesh (Mesh 98) — wildfiredefensemesh.com. Stainless steel woven mesh. ASTM E2886, AS 3959. Mesh rolls and pre-made soffit and foundation applications.

FireStorm (Embers Guard) — firestormwildfire.com. Fine mesh + baffle. ASTM E2886. Gable, soffit, foundation, dormer.

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.

Disclaimer

This document 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.

Not professional advice: This document 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.

No building is fireproof: Compliance with the recommendations in this document 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.

Building code responsibility: Building codes vary by province, territory, and municipality. This document does not warrant that any specification satisfies the requirements of any specific jurisdiction.

Site-specific conditions: The specifications in this document are general in nature. A qualified professional familiar with local conditions should assess applicability to a specific property.

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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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