



WILDFIRE-RESILIENCE BEST-PRACTICE CHECKLIST FOR HOME CONSTRUCTION, RENOVATION AND LANDSCAPING



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WILDFIRE-RESILIENCE BEST-PRACTICE CHECKLIST FOR HOME CONSTRUCTION, RENOVATION AND LANDSCAPING IN WILDLAND URBAN INTERFACE AREAS OF CANADA

INTRODUCTION

This checklist was compiled by FireSmart Canada™, the Canadian Home Builders' Association, University of Alberta and the Intact Centre on Climate Adaptation at the University of Waterloo. The goal of the checklist is to encourage the use of wildfire resilience best practices in home construction, renovations and landscaping to reduce the risk of wildfire property damage in wildland urban interface areas of Canada.

The best practices featured in the checklist align with the National Guide for Wildland-Urban Interface Fires: ***Guidance on hazard and exposure assessment, property protection, community resilience and emergency planning to minimize the impact of wildland-urban interface fires*** (National Research Council Canada, 2021). The checklist also includes links to resources that provide more detailed guidance for consideration.

For more information, and for contact information, please visit www.firesmartcanada.ca.

CONFLICT WITH APPLICABLE CODES

This checklist is based on the assumption that the project complies with applicable building codes.

Building code regulations differ among provinces and territories and nationally. It is therefore possible that some code requirements may be in conflict with best practices on this checklist, or that some of the checklist's requirements may result in unintended consequences in regard to other applicable requirements (e.g. higher-tier energy requirements). If this is the case, please contact FireSmart Canada at general@firesmartcanada.ca to connect with science and research organizations to find a design that works. One of the goals of the checklist is to continue to build a practical source of solutions for such technical conflicts.

SHARE YOUR FEEDBACK

The checklist is intended to serve as a regularly updated living document that reflects the most up-to-date information available at the time of publication. Feedback is welcome to help us continually improve the checklist for accuracy, completeness and ease of use. Please email general@firesmartcanada.ca if you would like to make comments or suggestions to improve the checklist.

HOW TO USE THIS CHECKLIST

The checklist can be applied in its entirety (every measure) or partially, for example during renovations. Each improvement has the potential to limit the probability of a home being damaged beyond repair during a wildland fire, and the potential to make the home more resilient. However, applying any or all measures does not guarantee the absence of damage or destruction during a wildland fire.

The checklist contains several voluntary best practices to consider when building or renovating homes for greater wildfire resilience. The simplest application of the list is as a decision-making tool for home builders, renovators, and landscapers in their discussions with homeowner clients.

The technical guidance provided here consists of two complementary parts:

- **Home/property-level** considerations that address fire resilience of roofing, flashing, vents, soffits, wall cladding, windows, doors, skylights, fencing, decks, balconies, patios and porches; and
- **Lot-level landscaping** considerations that address the fire resilience of the types of vegetation/surfaces around the perimeter of the home.

PROPERTY-LEVEL CHECKLIST

NOTE: Please see Appendix A for details and discussion on building-material selection for each consideration. See Appendix B for construction details.

ROOFING, FLASHING AND ROOF PENETRATIONS

1. Roof covering and underlayment has Class A fire rating.
2. Roofing does not consist of wood shingles and shakes.
3. Roof flashing consists of non-combustible material.
4. Roof ridges (metal roofing products) are sealed at their terminations.
5. Roofs are fitted with a metal drip-edge along both eaves and rakes (see Appendix B for details).
6. Roof penetrations are fitted with non-combustible flashing.
7. Chimneys connected to a solid-fuel burning appliance are fitted with an approved spark arrestor that is securely attached and made of welded or woven wire mesh screens, with mesh no coarser than 12 millimetres.
8. Chimney outlets have at least three metres of clearance from all vegetation and obstructions.

VENTS IN ROOFS, ATTICs AND WALL-MOUNTED VENTS

9. Vents are of non-combustible material.
10. Gable-end vents are not present.
11. Soffit venting have vent perforations of less than three millimetres in any direction, or follow the details provided in Appendix B.
12. External vent terminations and service opening connected to internal venting equipment (e.g., kitchen and bathroom exhaust fans, HRV intake and exhaust vents, etc.) are of non-combustible construction and are fitted with three-millimetre non-combustible screens.
13. All exhaust vents are equipped with non-combustible, self-closing flaps.
14. All external vents and air intakes are connected to metal ductwork that extends at least one metre from the point of connection.

SOFFITS, FASCIA AND GUTTERS

- 15. Eaves are closed. Roof systems that include a built-up roof above rafters do not include venting on the vertical face between rafters. Soffit venting can be used provided it follows item 11 above.
- 16. Soffits and fascia are constructed of non-combustible materials and are tight fitting.
- 17. Rain gutters and downspouts are of metal construction.
- 18. Rain gutters are fitted with non-combustible gutter caps.

EXTERIOR SIDING/CLADDING

- 19. Exterior siding is non-combustible or ignition resistant.
- 20. There is no vinyl siding and/or wood siding installed.
- 21. Exterior siding terminates a minimum of 15 centimetres above grade. The exposed foundation wall between the siding termination and grade is non-combustible. This applies to all homes whether built with a foundation, frost wall, or slab-on-grade.

WINDOWS, DOORS and SKYLIGHTS

- 22. Windows are equipped with a tempered exterior pane.
- 23. Exterior doors have a fire protection rating of at least 30 minutes.
- 24. Door lites are glazed with tempered glass.
- 25. Exterior screen doors are of non-combustible construction and have non-combustible screening.
- 26. Skylights or daylighting tubes, including flashing, is of non-combustible construction and incorporate tempered glass and not acrylic glazing.

EXTERIOR SEALING AND CAULKING

- 27. Where gaps in the exterior siding are incorporated to allow drying of the wall assembly, (e.g. rain screen walls) any gap larger than three millimetres is fitted with three millimetre non-combustible metal screening to prevent ember penetration.

- 28. Non-intentional gaps larger than three millimetres anywhere along the exterior of the structure are filled and sealed with a suitable fire-retardant caulking or sealing product.
- 29. Only suitable fire-retardant caulking or sealing products is used to seal exterior penetrations, joints and gaps.

FENCING

- 30. Where the property includes combustible fencing, a 1.5 metre metal gate or full break exists between a wood fence and the exterior wall of a home.

DECKS, BALCONIES, PATIOS AND PORCHES

- 31. Decks, balconies, patios, porches, and similar building extensions attached to, or within 10 metres of a home have a continuous, ignition resistant or non-combustible top surface without slots, openings or spaces, which terminate low to the ground. Decks with gaps or cracks in the deck surface have deck joists capped with corrosion resistant, non-combustible material, or are constructed with non-combustible deck joists.
- 32. Where deck, porch or balcony structures intersect with exterior walls, a non-combustible flashing is installed between the underside of the exterior siding and the top surface of the deck.
- 33. Where a deck, porch or patio structure sits above a graded surface, this surface is devoid of vegetation and graded with non-combustible materials. Additionally, 12-millimetre sheathing or three-millimetre metal non-combustible screens can be installed to enclose the space under the deck.
- 34. Where a deck, balcony, or porch requires a railing, the railing consists of non-combustible material.
- 35. Decks that are on, or directly above slopes of 10 per cent or greater are enclosed with 12-millimetre non-combustible sheet or panel-type material to minimize the incursion of radiant and convective heat from below.

LOT-LEVEL LANDSCAPING REQUIREMENTS

NOTE: It is good practice to create a landscaping and vegetation plan. The best practices are listed for information purposes only. See Appendix C for additional details.

PRIORITY ZONE 1a, Non-combustible Zone: (Immediate zone) zero - 1.5 metres from the foundation

- 36. The house has a 1.5-metre wide, horizontal, non-combustible surface perimeter along the outer walls of the house and any attachments (e.g., decks).
- 37. This critical area adjacent to the home uses only non-combustible materials, such as gravel, brick, paving stones or concrete.
- 38. This critical area adjacent to the home does not have any woody shrubs, bark mulch, trees or tree branches.

Priority Zone 1: (Intermediate zone) 1.5 - 10 metres (or lot boundary, whichever comes first) from the foundation

- 39. In this zone some fire-resistant plants, trees and shrubs can be planted in low density.
- 40. This zone does not have any woody debris and landscaping materials (e.g., bark mulch, hay, etc.).
- 41. This zone does not have evergreen or coniferous trees.

Priority Zone 2: (EXTENDED ZONE) beyond 10 metres

For single lot applications where the lot extends beyond 10 metres from the home, and for all multi-home/subdivision applications, additional landscaping considerations may apply for areas beyond 10 metres for any dwelling.

In general, best practices for these applications exclude the presence of dense conifer groupings, or other landscape detail that would provide a fire pathway within the application area. A qualified landscaping assessor can provide specific guidance for the design of Priority Zone 2. Note that homeowners are not responsible for landscaping of adjacent lands over which they do not hold legal title or control.

APPENDIX A: EXAMPLES OF ACCEPTABLE WILDFIRE-RESILIENCE BUILDING

This appendix includes suggestions for acceptable wildfire resilient building materials; it addresses only details relevant to wildfire resilience. The material features and characteristics are meant as guidance, FireSmart Canada does not endorse or rate building materials, products or specific websites.

Component	Material	Testing standards that must be met	Notes and supplier examples
Roof covering	Asphalt fibreglass composition shingles, clay tiles, slate, (non-aluminum) metal roofs, and concrete tiles, Ethylene Propylene Diene Monomer (EPDM) roofing.	ASTM E108 Standard Test Methods for Fire Tests of Roof Coverings ULC S107 Fire Tests of Roof Coverings — “Class A” rating.	Widely available from multiple manufacturers, building suppliers and roofing installers.
Roof, attic and wall-mounted vents	ASTM Tested Ember Resistant Vents.	ASTM E 2886 and ASTM E 2886M.	Vulcan Technologies.
Soffits and fascia	Non-combustible sheetrock, fibre cement board and metal soffit and fascia material, fire retardant pressure treated (rated) wood.	ASTM E2957 Standard Test Method for Resistance to Wildfire Penetration of Eaves, Soffits and Other Projections CAN/ULC-S135, Standard Method of Test for Determination of Degrees of Combustibility of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter).	Non-combustible materials are widely available through manufacturers, building suppliers and installers.
Gutters	Non-combustible aluminum, copper, stainless steel.	CAN/ULC-S135, Standard Method of Test for Determination of Degrees of Combustibility of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter).	Aluminum gutters are widely available from multiple manufacturers, building suppliers and installers. Copper is available for order from many building suppliers; some installers offer copper gutters. Stainless steel gutters are rare. Non-combustible gutter caps are widely available through manufacturers, building suppliers and installers.
	Non-combustible metal three-millimetre screen, including screen frame.	CAN/ULC-S135, Standard Method of Test for Determination of Degrees of Combustibility of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter).	Widely available from multiple manufacturers, building suppliers and installers.

Component	Material	Testing standards that must be met	Notes and supplier examples
Exterior siding/ cladding	Non-combustible cladding systems, such as <ul style="list-style-type: none"> • metal • fibre cement panels/ boards • cementitious • stucco • stone • rock • concrete block 	ASTM E108 Standard Test Methods for Fire Tests of Roof Coverings ULC S107 Fire Tests of Roof Coverings — “Class A” rating.	Widely available from multiple manufacturers, building suppliers and roofing installers.
	Heavy timber or log	No standard	Available primarily through custom log-home builders.
Windows, doors and skylights	Minimum 30-minute fire-rated; non-combustible frame.	CAN/ULC-S104 SFM Standard 12- 7A-2 “Exterior Windows”.	The SFM Standard is a California Referenced Standards Code. Products that meet this standard are unlikely available in Canada.
Exterior sealing and caulking	Fire-retardant or high-temperature sealant and caulking.	No standard.	Products labelled fire-retardant or high-temperature sealant and caulking are available from many building suppliers.
Fencing	Non-combustible concrete, cement fibre and metal fence (aluminum, chain-link, page wire).	CAN/ULC-S135, Standard Method of Test for Determination of Degrees of Combustibility of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter).	James Hardie fibre cement siding is widely available in Canada. Duracrete-Roma fencing is manufactured in Canada. Metal fencing is widely available in Canada.
Decks, balconies, patios and porches	<ul style="list-style-type: none"> • Fire retardant pressure treated (rated) wood • Fire-rated composite decking • Class A fire-rated vinyl decking (with • Non-combustible, metal, concrete or stone • Foil bitumen tape capped deck joists 	ASTM E2632 / E2632M Standard Test Method for Evaluating the Under-Deck Fire Test Response of Deck Materials. ASTM E2726 / E2726M Standard Test Method for Evaluating the Fire-Test-Response of Deck Structures to Burning Brands CAN/ULC S107 Fire test of roof covering test method - Class A (vinyl deck).	CRAFT BILT non-combustible aluminum decking is available in Canada. Duradek Class A fire-rated decking is available in Canada. Amera Deck composite Class A fire-rated decking is available for shipping to Canada. Non-combustible concrete or stone decks – multiple Canadian manufactures, suppliers and installers. Exterior fire-retardant treated wood, available through distributors in Canada. Foil-bitumen roofing tape is widely available.

APPENDIX B: EXAMPLES OF WILDFIRE-RESILIENCE CONSTRUCTION BEST PRACTICES AND NOTES

This appendix includes suggestions for acceptable wildfire resilient construction approaches; it addresses only details that differ from conventional practices. The intent of each detail is addressed in the notes. The solutions descriptions and illustrations are meant as examples. FireSmart Canada does not endorse or rate building materials, products or specific websites.

Roof underlayment detail

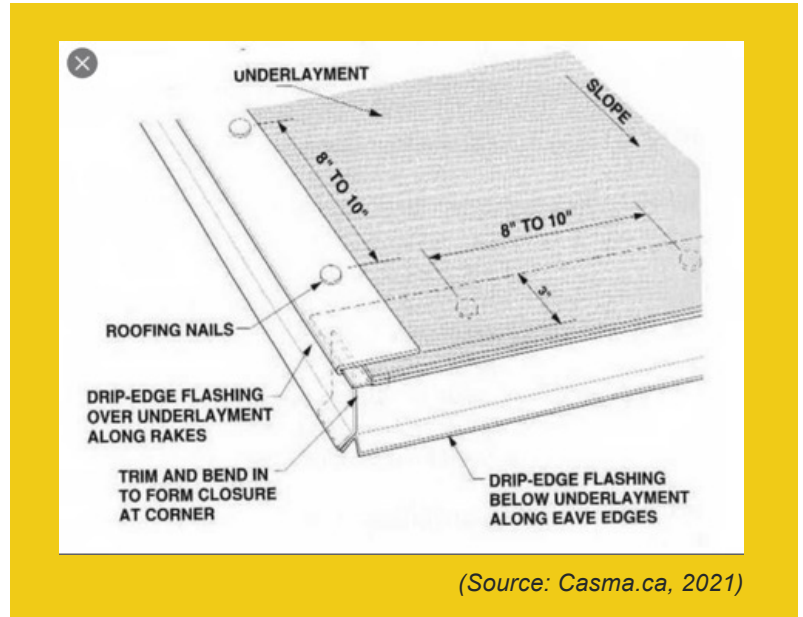
Non-combustible underlayment is used to reduce the risk of roof deck ignition resulting from ember penetration under the exterior roofing material during the high wind conditions typical of wildfire situations.

Non-combustible roofing underlayment should be installed on all roof edges, including rakes, and must have a minimum width of 75 millimetres.

Drip-edge detail

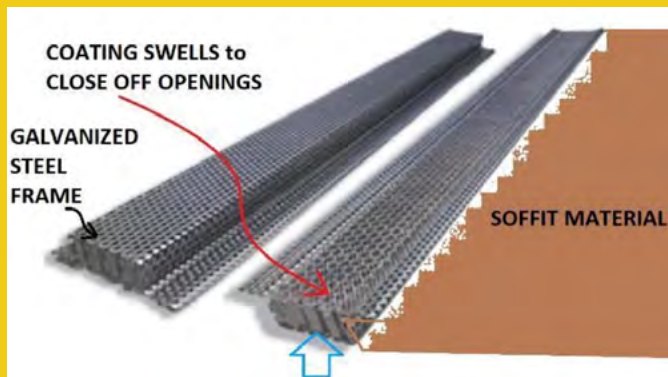
The addition of rake-edge drip edging is intended to reduce the risk of roof deck ignition resulting from ember penetration under the rake exposure of roofing material during the high wind conditions typical of wildfire situations.

Eave-edge drip edging should be installed in the normal manner. Drip edge installed on rakes should be installed above the roofing underlayment to prevent water penetration beneath the underlayment.



Soffit vent detail

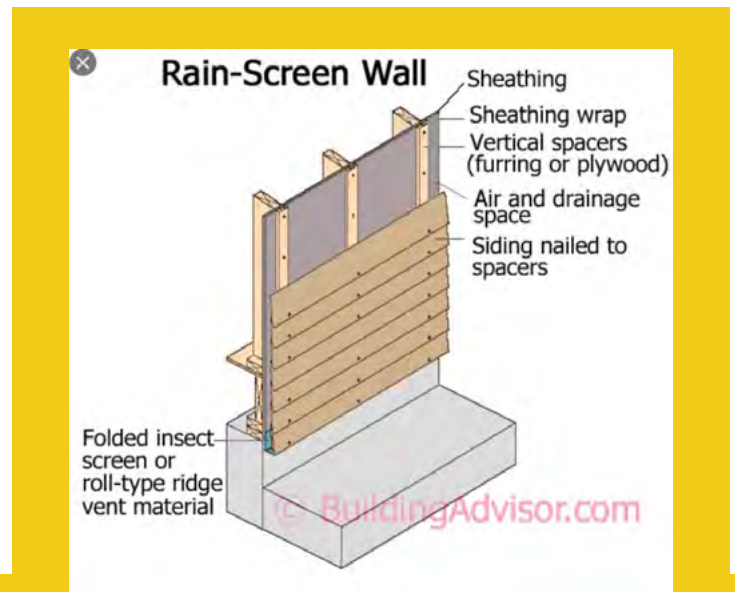
Soffits and ridge vents are particularly prone to allowing ember penetration into the attic space. There are several commercial products available (may require special orders) that reduce this risk.



(Source: Vulcanvents.com, 2021)

Detailing on rain screen and wall assembly voids for drying purposes

Where a rain screen-type wall assembly is utilized, openings to allow drying that are more than three millimetres wide should incorporate non-combustible screening to reduce the risk of ember penetration into the wall cavity.



(Source: BuildingAdvisor.com, 2021)

APPENDIX C: KEY CRITERIA FOR WILDFIRE-RESILIENT LANDSCAPE AND VEGETATION PLAN

Note: For additional information about nationally recognized FireSmart landscaping best practices and plant selection guidance, please visit the *FireSmart Canada yard and landscaping web page*.

Priority zone	Key principles	Professional guidance
<p>Priority Zone 1A, Non-Combustible Zone: (Immediate Zone)</p> <p>0-1.5 metres from perimeter of structure and any extensions, including under projections (balconies, porches, decks, cantilevered floors, pier foundations)</p>	<p>Non-combustible surface of mineral soil, pavement, concrete, concrete pavers, stone/ rock, brick.</p>	<p>Landscape architect, landscaper, horticulturist, contractor with FireSmart Home Partners online module training completion.</p>
<p>Priority Zone 1: (Intermediate Zone)</p> <p>1.5-10 metres from perimeter of structure and any extensions, including under projections (balconies, porches, decks, cantilevered floors, pier foundations)</p>	<p>Manage cultivated/natural vegetation to minimize ember ignition, minimize surface fire spread and manage the short distance radiant heat transfer by using appropriate plant selection, creating breaks in vegetation and organic surface continuity, reducing heavy vegetation concentrations and maintaining distance between vegetation and structures. Mitigation of this zone must be appropriate for local topography and surrounding fire environment conditions, including conditions of Priority Zones 2 and 3.</p>	<p>Landscape architect, landscaper, horticulturist, arborist, or forest professional with FireSmart Home Partners Online Module training completion.</p>
<p>Priority Zone 2: (Extended Zone)</p> <p>10-30 metres from perimeter of structure and any extensions, including under projections (balconies, porches, decks, cantilevered floors, pier foundations)</p>	<p>Manage natural vegetation to reduce wildfire intensity, crown-fire transition spread and ember production by reducing surface vegetation concentrations and continuity, creating space between tree crowns, pruning, or “lifting” tree crowns and interrupting the vertical continuity of the forest through appropriate spacing of shrubs and trees. Mitigation of this zone must be appropriate for local topography and surrounding fire environment conditions, including conditions of Priority Zones 1 and 3.</p>	<p>Forest professional, arborist, landscape architect qualified with intermediate wildland fire behaviour training, or Home Partners Mitigation Specialist training with basic forest dynamics and forest ecology understanding, experience in wildfire mitigation fuels management and access to forest/environment professional advisors¹.</p>

Priority zone	Key principles	Professional guidance
<p>Priority Zone 3:</p> <p>30-100 metres from perimeter of structure and any extensions, including under projections (balconies, porches, decks, cantilevered floors, pier foundations)</p>	<p>Manage natural vegetation to reduce wildfire intensity, crown-fire transition spread and ember production by reducing surface vegetation concentrations and continuity, creating space between tree crowns, pruning, or “lifting” tree crowns and interrupting the vertical continuity of the forest through appropriate spacing of shrubs and trees. Management of this zone is typically at a lesser intensity than Priority Zone 2 and must be appropriate for local topography and surrounding fire environment conditions, including conditions of Priority Zones 1 and 2.</p>	<p>Forest professional with advanced wildland fire behaviour training, advanced forest dynamics and forest ecology knowledge, knowledge of local, provincial, and federal environmental/ forest regulations.</p>

¹ Assumes that this zone will not be intensely landscaped/managed to Priority Zone 1 standards; if managed to Priority Zone 1 standards please refer to qualified professional guidance for Priority Zone 1