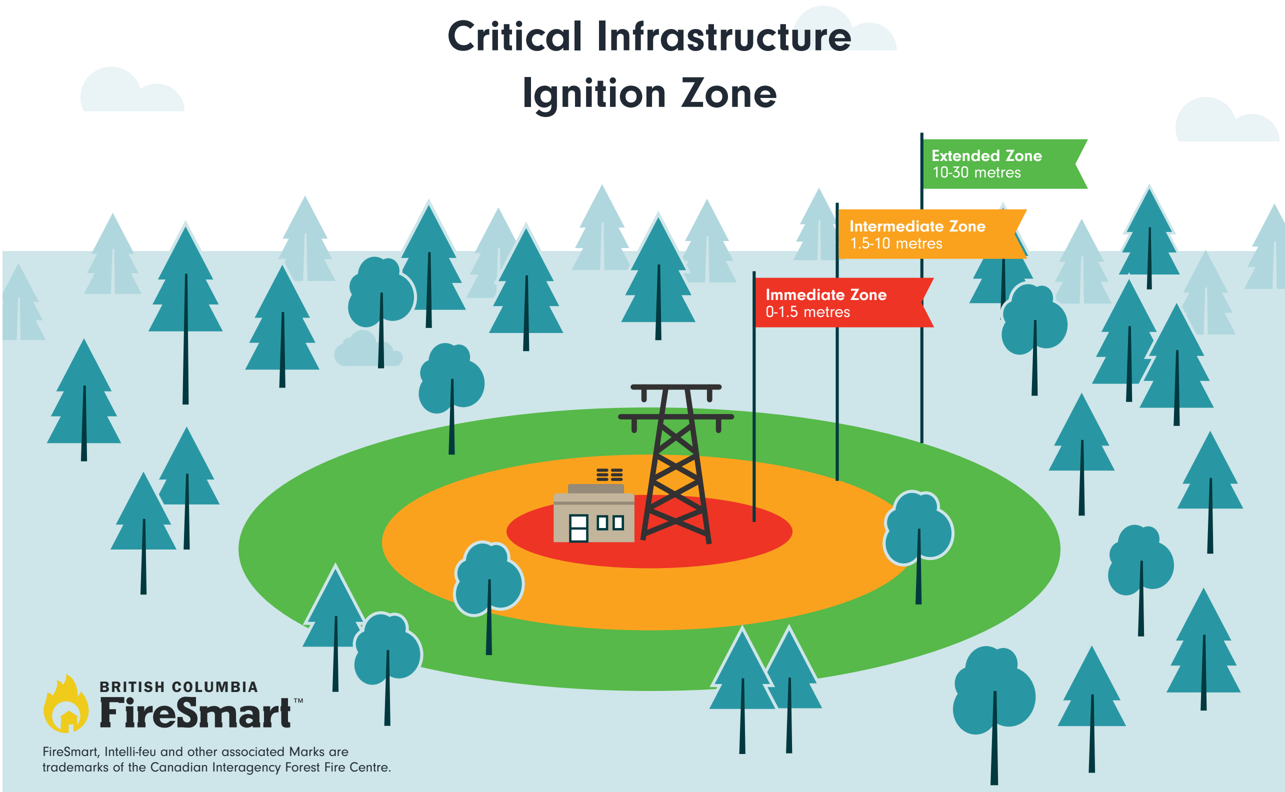
FIRESMART® CRITICAL INFRASTRUCTURE GUIDE



INTRODUCTION

The FireSmart Critical Infrastructure (CI) Hazard Assessment Form is a numerically ranked process that is intended for assessing vulnerability of systems, facilities, technologies, networks, assets and services essential to the healthy, safety, security or economic well being of British Columbians and the effective functioning of government.

The assessment form is separated into 5 separate sections:

A. Building
B. Structure
C. Immediate Zone
D. Intermediate Zone
E. Extended Zone

Depending on the features of the CI, the Building Section or Structure section may not be applicable; or they may be both applicable. The Immediate Zone, Intermediate Zone and Extended Zone will apply for all CI assessments.

This assessment should be undertaken by an individual who is deemed by the organization the individual represents to have the appropriate knowledge and experience in the wildfire vulnerability of that organization's infrastructure.

In many cases, the assessment and subsequent mitigation will extend beyond the legal land parcels on which the critical infrastructure occupies; therefore, mitigation to the full extend of the assessment will require collaboration with adjacent land managers.

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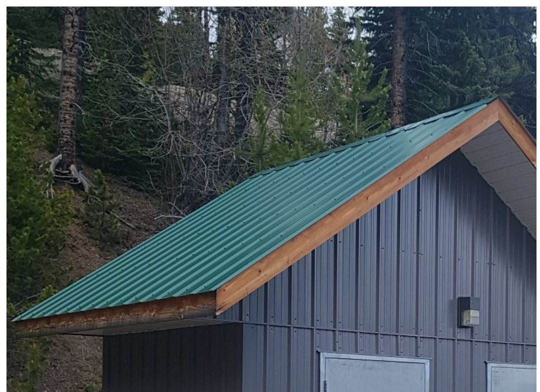
A. CRITICAL BUILDINGS

All buildings that are critical to the function of the CI, and any non-critical buildings that are within 15 meters.

ROOF (QUESTIONS A-1 AND A-2)

Class A UL/ASTM fire rated roof is recommended to ensure that embers, or other burning debris that land on the roof do not ignite the building.

Gaps and openings (Poor Condition)



No Gaps and openings (Good Condition)

Figure 1. Example of class A rated (metal) roof in poor conditions with gaps and openings that allow ember penetration (left) and good condition (right), with no gaps or openings.

The roof covering should also not have gaps or openings that will allow embers or flames to contact combustible surfaces, accumulate or lodge against the combustible roof sheathing under the roof covering or penetrate the attic space, or interior building space.

GUTTERS (QUESTIONS A-3 AND A4)

Gutters should be constructed of non-combustible material such as aluminum, metal or copper. Wood, plastic or vinyl gutters can ignite from embers and propagate fire under the roof covering, or into the interior spaces of the building. Vinyl or plastic gutters can melt and fall to the base of the building, igniting the base of walls.

Gutters should be clear of any debris. During a wildfire, embers can land in gutters and ignite the combustible debris (leaves, conifer needles, branches, etc.) and propagate fire under the roof covering, or into the interior spaces of the building.

EAVES (QUESTIONS A-5)

Eaves (the space on the underside of the roof that extends past the outer walls of a building) should be closed using blocking between roof rafters, soffit or sheathing. Many buildings require attics to be vented to prevent interior building moisture problems. All vents in the eaves should be covered with 1/8" non-combustible screening, or ASTM rated ember resistant vents. If vents have louvres or flaps, ensure that they self-close when the vents are not expelling air.

Open Eaves | Closed Eaves

Figure 2. Open eaves with blocking and screening" (left) vs closed eaves using soffit with attic venting (right)

HVAC AND ACTIVE VENTING SYSTEMS (QUESTION A-6)

In the event of a wildfire, HVAC and active venting systems should be shut down to prevent the intake of embers into the venting system and the interior of the building. This requires either direct, or remote 24 hours onsite monitoring capability.

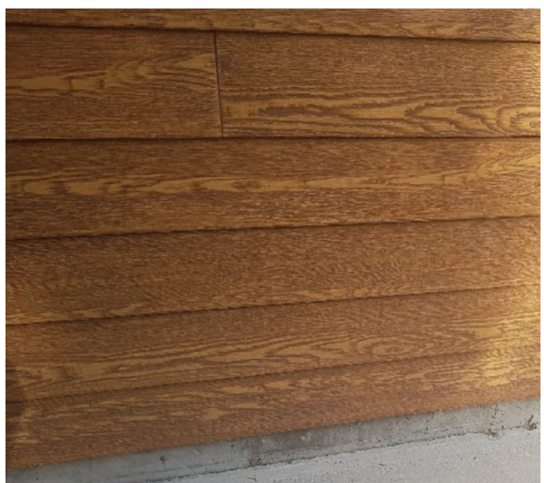
SIDING AND WALLS (QUESTIONS A-7, A-8 AND A-9)

The exterior siding of the building should be of ignition resistant (cement fibre board, log), or non-combustible construction (stucco, metals, concrete, brick/stone) to reduce the potential of the walls being ignited from radiant heat produced by adjacent burning vegetation or buildings. Non-combustible siding should be the minimum for buildings in locations where the priority zone standards, or slope set-back standards cannot be achieved.

Siding should be free of gaps or holes that will allow embers to accumulate or lodge against combustible material in between, or behind the siding, or penetrate the interior spaces of the building.

There should be a minimum of 15cm ground-to-siding, non-combustible clearance to prevent siding ignition from ember accumulation along the base of the building

15 cm non-combustible clearing absent



15cm non-combustible clearance

Figure 3. Example of no non-combustible clearance between ground and siding (left) and recommended 15cm of non-combustible (concrete foundation) between the ground and siding (right).

Windows and Doors (Question A-10)

Window types should be double pane (2 layers of glass) at a minimum. Doors should have all weather stripping intact and have no gaps or openings where embers can accumulate, lodge, or penetrate the interior of the building.

Windows are the most vulnerable component of a wall. Glass will break at much lower radiant heat temperatures than combustible walls will ignite. When window glass breaks it can expose the interior spaces of the building to embers. The more layers of glass in place the lower the likelihood of all layer of glass breaking. Tempered glass should be the minimum for buildings in locations where the priority zone standards, or slope set-back standards cannot be achieved.

Doors with worn or missing weather stripping, or doors that have gaps when closed can allow embers to lodge against combustible door frames or wall components or penetrate the interior spaces of the building. Pay particular attention to gaps around overhead garage doors, sliding doors, exterior “barn” swing doors, outside storage spaces, crawl spaces, or access openings.

Balconies, Decks and Open Foundations (Question A-11)

Balconies, decks, open foundations, or “cantilevered” floors should be closed in with non-combustible or ignition resistant skirting that meets the same standards as exterior wall construction, or constructed of heavy timber, non-combustible or fire rated materials. The building components should have no gaps, or cracks where embers can lodge, accumulate, or penetrate the interior spaces of the building.

Finally, there should be no combustible debris or material under these features and a non-combustible surface should be maintained under and extending for 1.5 metres beyond the furthest extend of the feature.

Open foundation with combustible debris

Deck with non-combustible surface and no combustibles stored below

Figure 4. Example of an open foundation with combustible debris below (left) and a deck with a non-combustible surface and no combustibles stored below (right).

These features of the buildings create enclosed spaces under the building where combustible debris and embers can accumulate, or on slopes convective heat can be trapped. These spaces are also convenient spaces to store combustible materials that can further increase the ignition potential. Furthermore, the underside of decks, balconies and building floors is typically constructed of exposed combustible material.

Building Slope Set-Back (Question A-12)

All buildings situated mid-slope, or at the top of a slope should be set-back at least 10 metres (30 feet) per story from the crest of the slope to reduce the compounding heat exposure of convective heat (in addition to radiant heat).

In situations where buildings are located on slopes, the convective heat generated from a wildfire will begin to align with the slope and compound the effects of radiant heat on the building. This situation presents the potential of siding, windows and doors being exposed to greater intensities of heat, as well as the potential for high intensity heat being trapped under decks, balconies and open foundations. The most effective way to address this is ensure the structure is set- back from the zone where slope-affected convective heat is likely to influence the heat exposure to a structure. Additional mitigation includes a combination of slope-adjusted priority zones 1 and 2, as well as adjustments to structural component features such as siding, windows, and deck/open foundation construction

B. CRITICAL STRUCTURES

The critical structure component of CI, such as utility poles, communications towers, tsunami warning towers, bridges, pipeline valve stations and other key structures should be assessed for their susceptibility to wildfire. Wood utility poles are typically easily replaced if they burn; however, the critical importance of wood poles is determined by the critical status of the facilities they supply power to.

Valve station/Substation/ Propane Tanks (Question B-1)

The surface under and immediately surrounding these structures should be non-combustible. The physical components of valve stations, substations and propane tanks are generally not directly susceptible to wildfire, however, combustible surfaces and materials immediately under or adjacent to these structures can result in damaging exposure to radiant or convective heat. In the case of propane tanks, or other pressurized flammable gas vessels, this can result in flammable gas ignition and in worst case scenarios, explosion.

The area surrounding the structure should be assessed using the priority zone component of this form.

Utility Line Poles or Critical Component Supporting Structure Construction Material (Question B-2 and B-3)

The supporting structures of CI, such as weather stations masts, antennae masts, cellular towers should be constructed of non-combustible material to reduce the CI susceptibility to radiant and convective heat, as well as embers. If the supporting structures are constructed of combustible material, they should be free of gaps, cracks or openings that will allow embers to lodge, accumulate or penetrate combustible components of the structure.

Critical Components Susceptibility to Embers and Radiant Heat (Question B-4 and B-5)

Critical components should be constructed of materials, or protected from the embers lodging, accumulating or penetrating the pieces of these components that can be damaged from heat.

The area surrounding the critical component should be assessed using the priority zone component of this form

Figure 5. Example of critical infrastructure components that can be damaged by ember accumulation

Bridges (Questions B-6 and B-7)

Bridges should be constructed of non-combustible materials or heavy timber construction that is free of gaps, cracks, or openings where embers can lodge, accumulate, or penetrate. The Immediate Zone and Intermediate Zone should also be treated to mitigate radiant heat.

Although bridge construction tends to be made of non-combustible materials or heavy timber construction, features such as railings or decking (lighter weight combustible materials) may display cracks, gaps, or openings which can cause bridge susceptibility to either embers, and/or radiant heat. The area surrounding the critical component should be assessed using the priority zone component of this form.

Figure 6. Example of bridge construction gaps and cracks where embers can penetrate and lodge

C, D AND E IMMEDIATE ZONE, INTERMEDIATE ZONE AND EXTENDED ZONE

Ember, radiant and convective heat susceptibility should be mitigated for all components of critical infrastructure through the assessment process and appropriate combined management of the entire Structure Ignition Zone, which includes the Immediate Zone, Intermediate Zone, and Extended Zone. The distances of these zones should be slope-adjusted. The following Structure Ignition Zone graphic provides guidance in the assessment and management of these zones.

Unmitigated Immediate Zone and Intermediate Zone

Mitigated Immediate Zone

Figure 7. Example of an unmitigated Immediate Zone and Intermediate Zone (left) and a mitigated Immediate Zone (right)