CONTINUING EDUCATION PRESENTATION

CASCADIA WINDOWS & DOORS



WILDFIRE RESISTANCE

Window Strategies for Wildland-Urban Interface (WUI) Design

WILDFIRE RESISTANCE:
Window Strategies for Wildland-Urban Interface (WUI) Design

CASCADIAWINDOWS.COM

AGENDA

- Intro to Cascadia Windows
- Why Fiberglass?
- A Look at Wildfires
- Wildfire Resistance of Buildings
- Windows in Wildfires
- Learnings from Early Testing



INTRO TO CASCADIA WINDOWS & DOORS

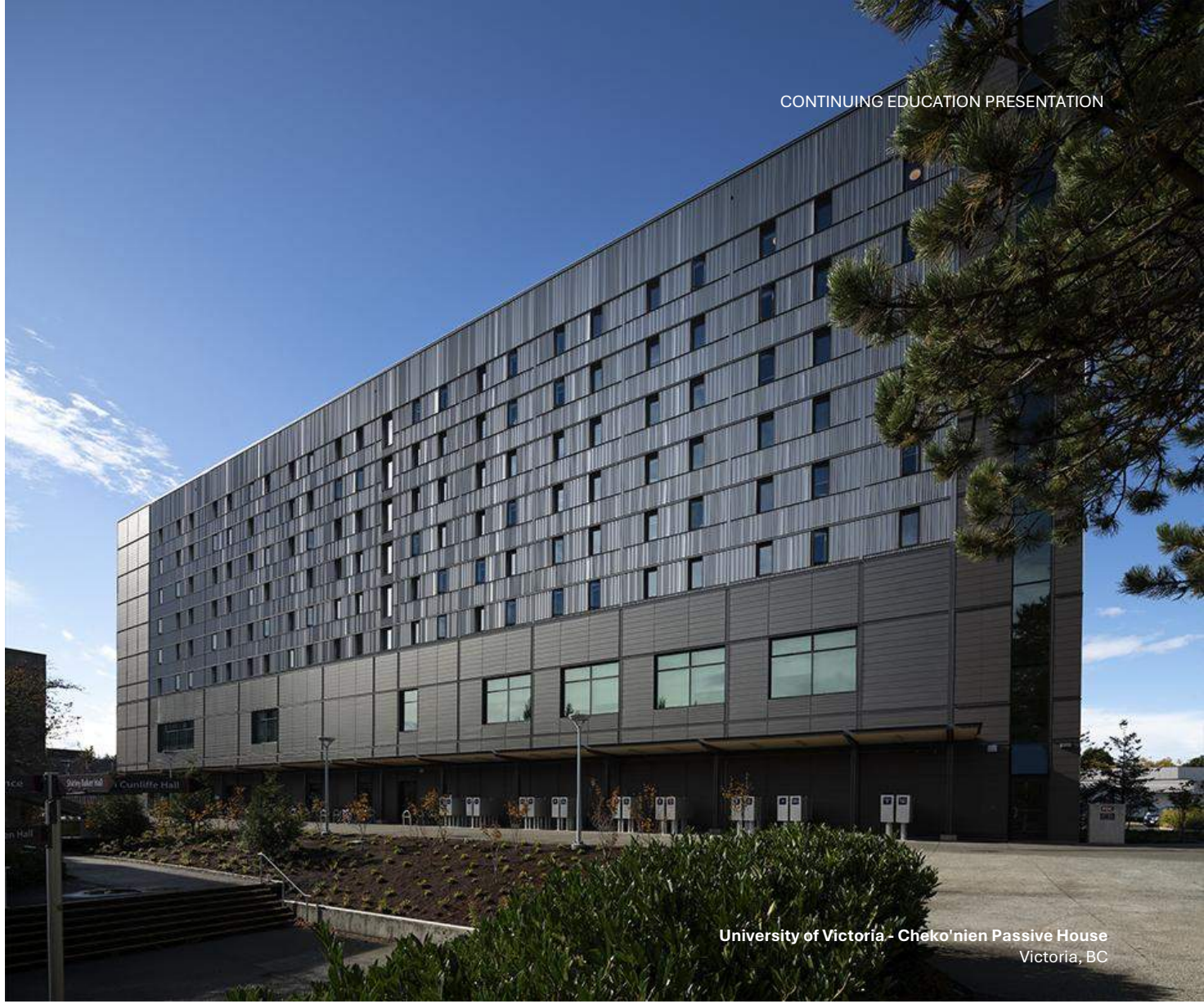
WILDFIRE RESISTANCE:
Window Strategies for Wildland-Urban Interface (WUI) Design

FIBERGLASS INNOVATION

COMMERCIAL & MULTI-FAMILY
Windows & Window Wall
Storefront Glazing

RESIDENTIAL
Fixed & Operable Windows
Swing & Sliding Doors
Passive House Windows & Doors

THERMAL SPACER
Exterior Cladding Assemblies
Low-sloped Roofs & Soffits



University of Victoria - Cheko'nien Passive House
Victoria, BC

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Westside Clerestory
Vancouver, BC

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Belmont Park Village
Elmont, NY



WHY FIBERGLASS?

WILDFIRE RESISTANCE:
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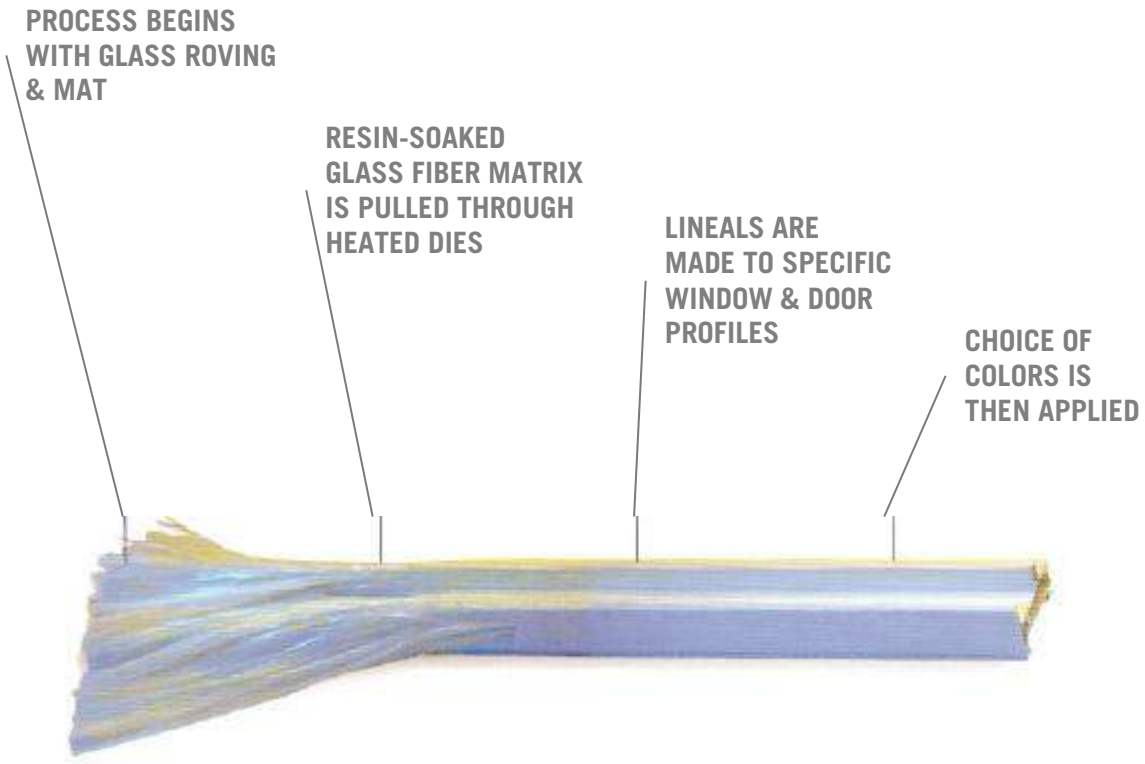
DIFFERENT KIND OF FIBERGLASS

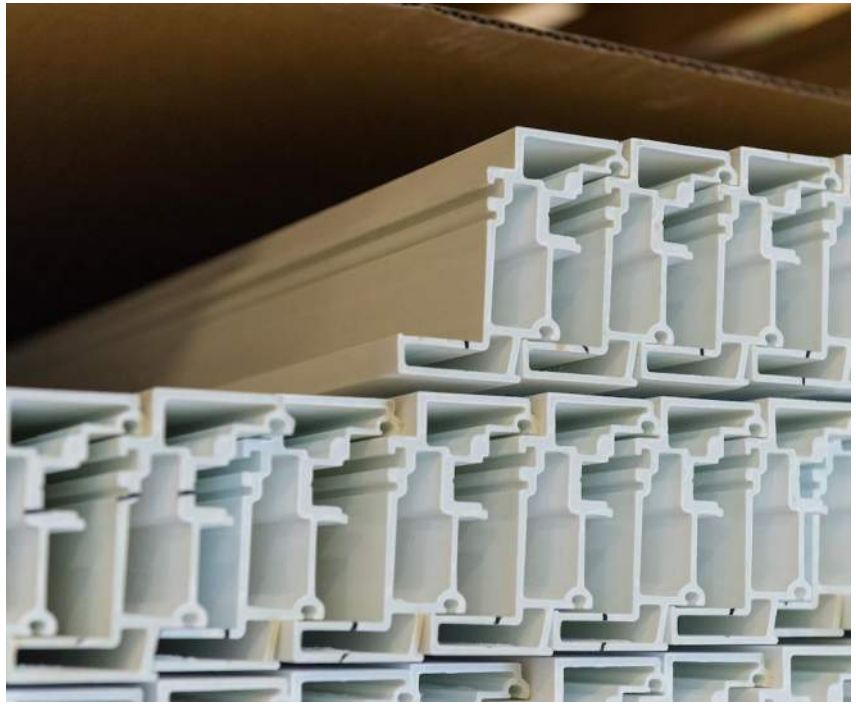
Commercial grade (big and strong) and *energy efficient* used to be mutually exclusive terms

Most fiberglass window manufacturers make products that are more durable versions of similar PVC products, but not commercial grade



MANUFACTURING PROCESS





MANUFACTURING PROCESS







COMMERCIAL-GRADE STRENGTH

10x STIFFER THAN TRADITIONAL VINYL

THERMOSET FIBERGLASS

WITHSTAND EXTREME TEMPERATURES
(- 40°F TO 350°F)

≈80-YEAR LIFESPAN
(MODELED)

WINDOW FRAMES

	STRENGTH	THERMAL PERFORMANCE	LONGEVITY	LOW CARBON IMPACT	FIRE RESISTANCE
ALUMINUM					
VINYL / PVC					
FIBERGLASS					

WINDOW FRAMES



ALL THESE BENEFITS BY SIMPLY CHANGING THE FRAME MATERIAL



A LOOK AT WILDFIRES

WILDFIRE RESISTANCE:
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DO YOU KNOW SOMEONE WHO HAS LOST A BUILDING IN A WILDFIRE?

MOST PEOPLE DO...



A STORY CLOSE TO HOME













CABIN COMPLETE







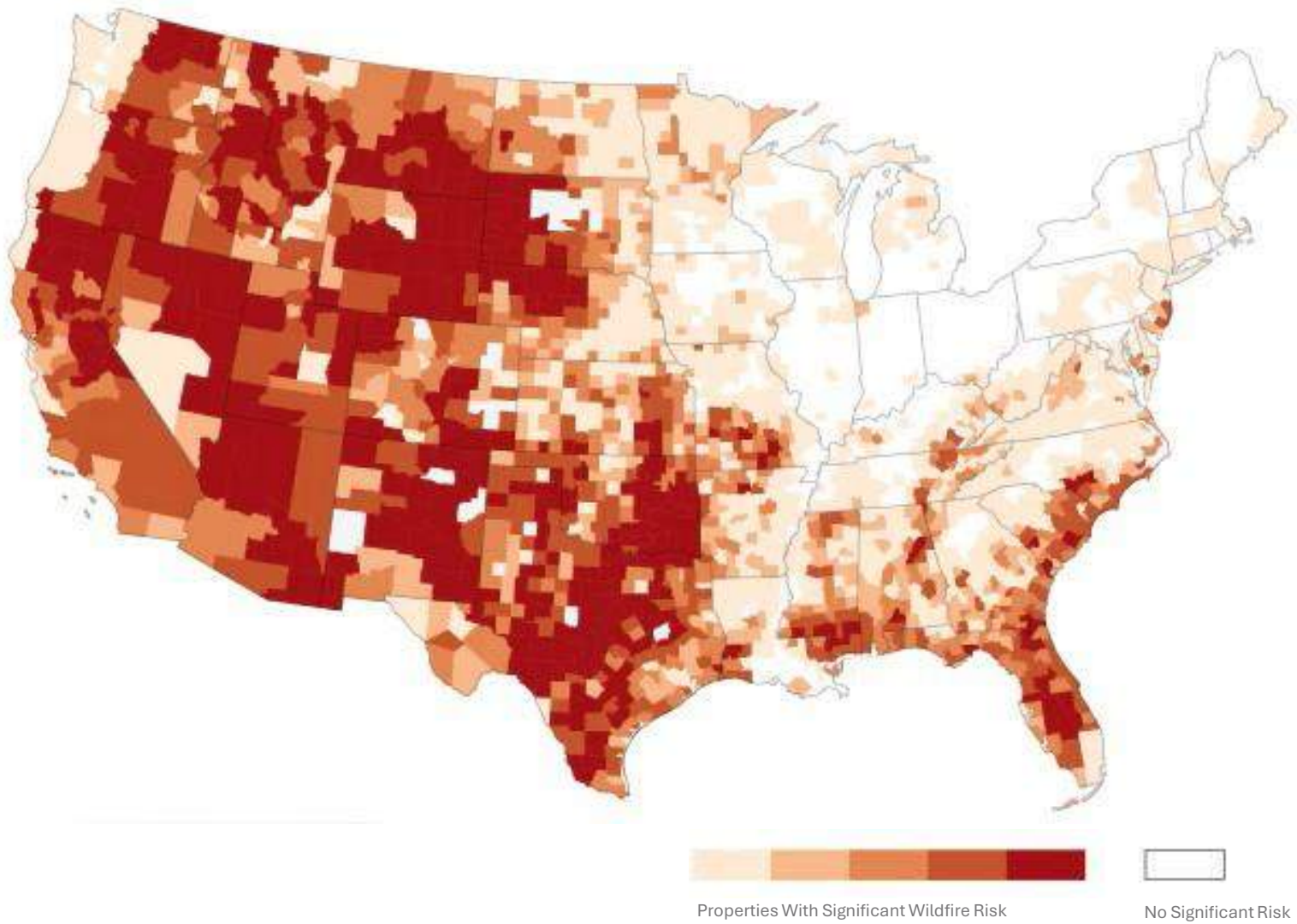




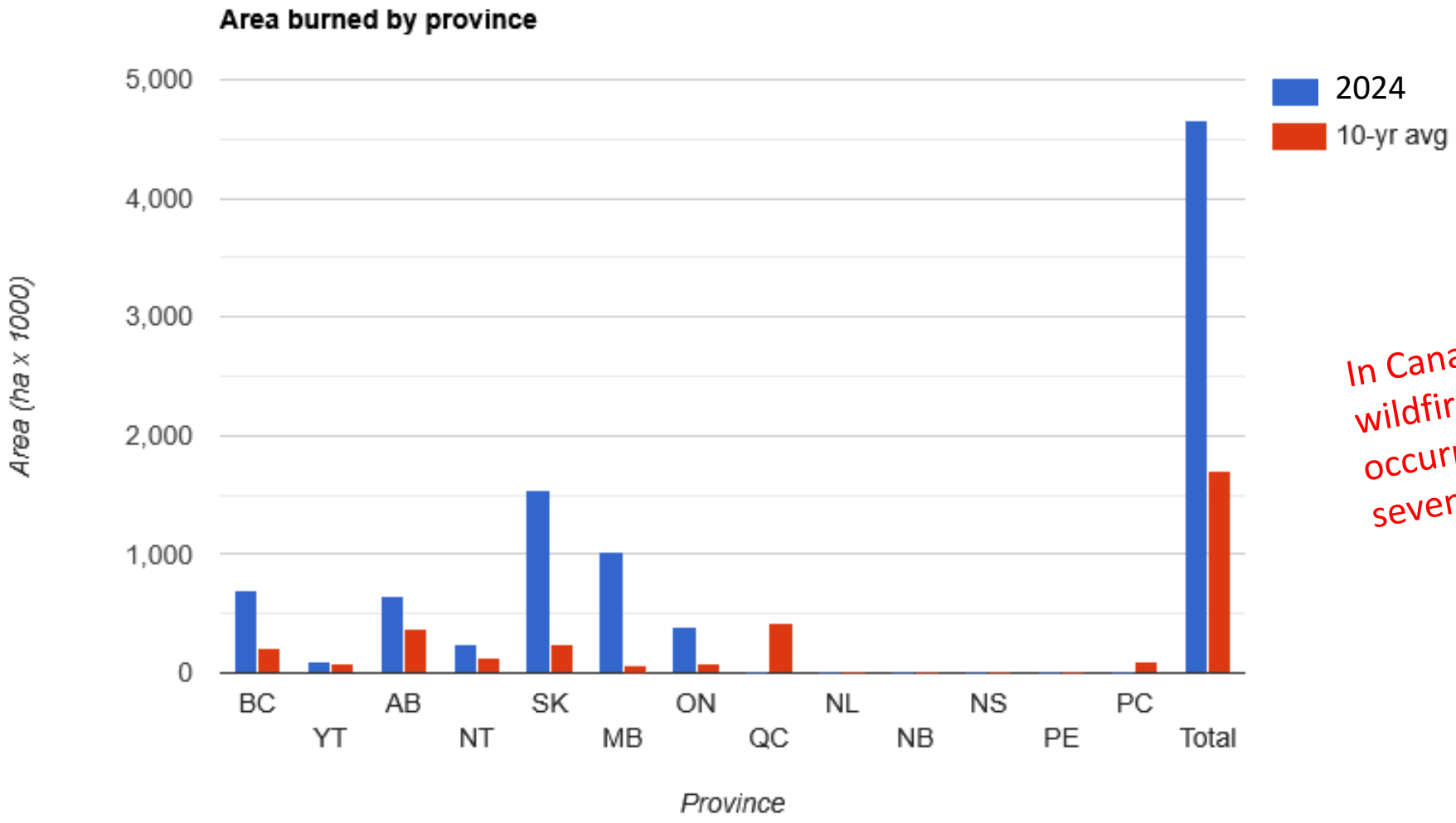


1 in 6

AMERICANS LIVE IN AREAS WITH SIGNIFICANT WILDFIRE RISK

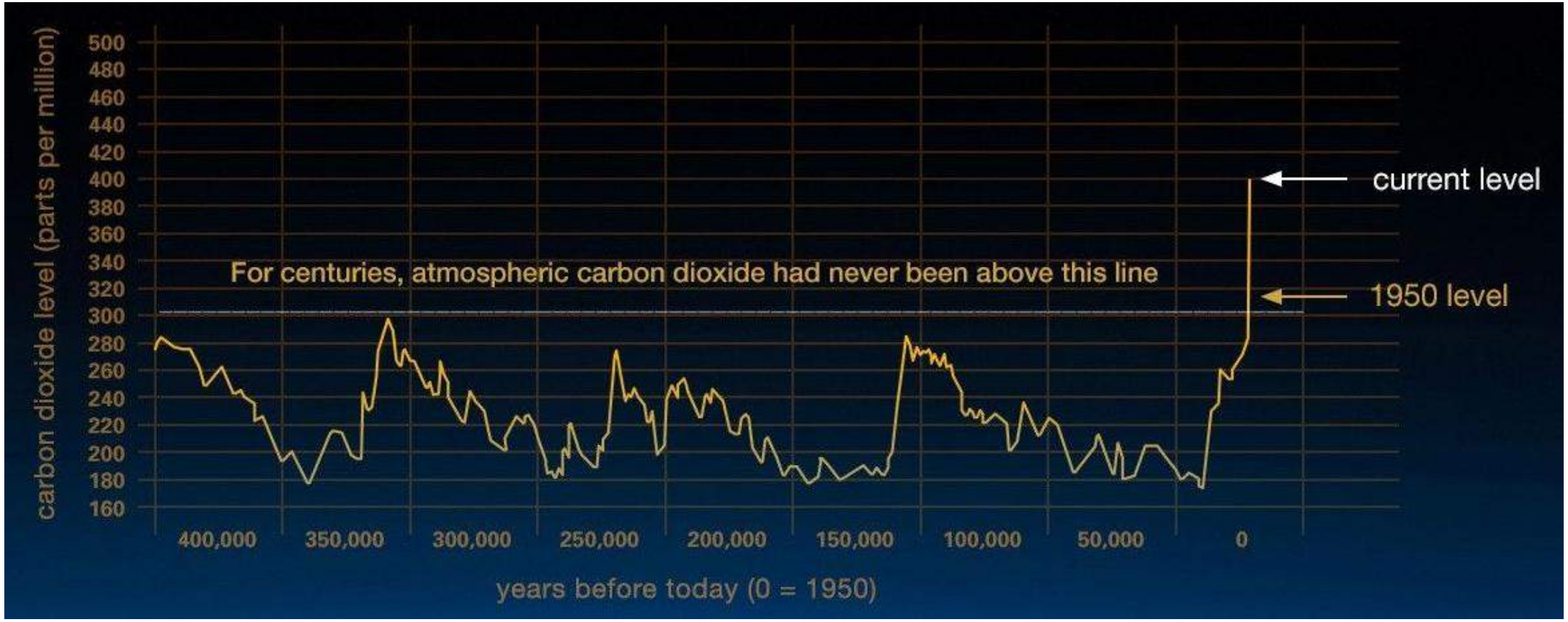


Washington Post: May 17, 2022



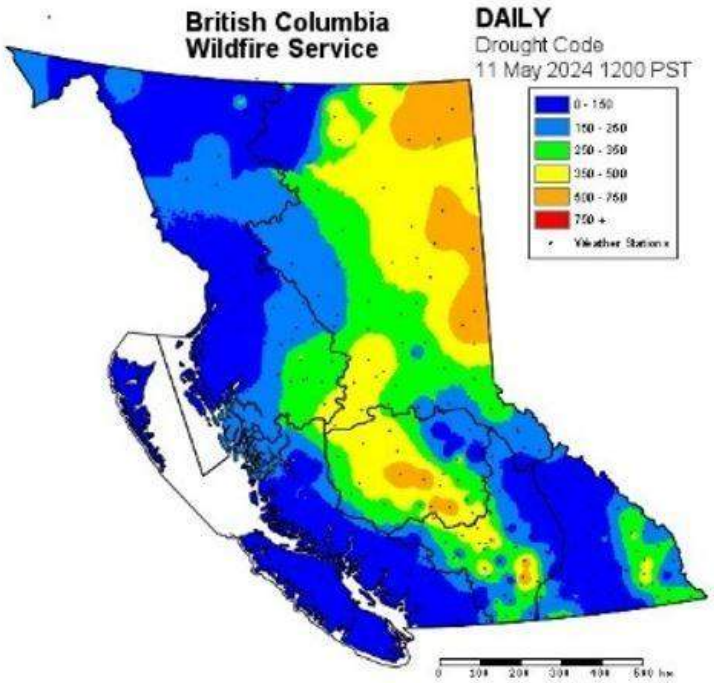
In Canada, the five worst wildfire years on record have occurred within the last seven years

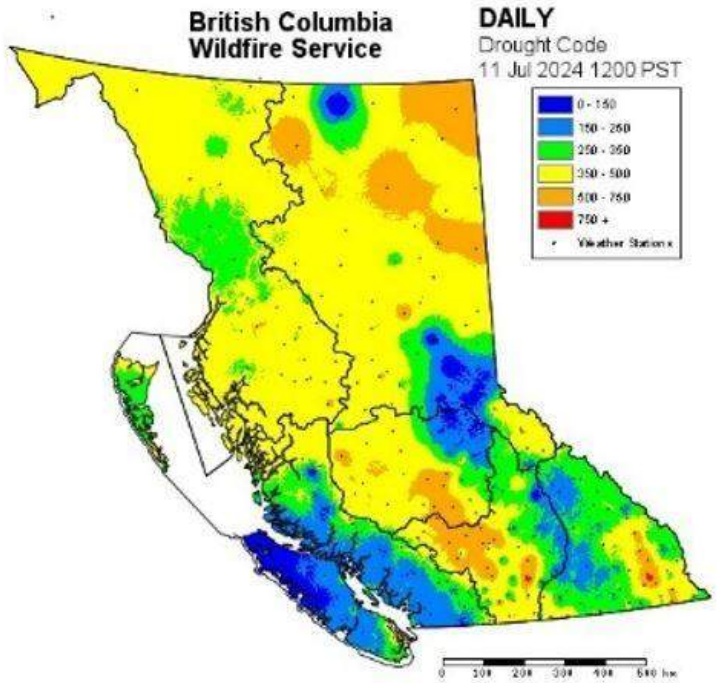
CHANGING ATMOSPHERE

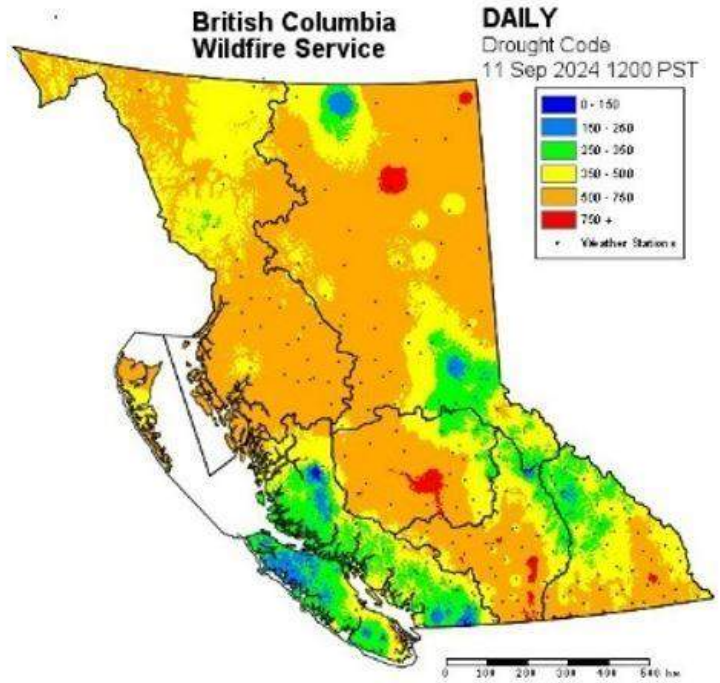


NASA Science Editorial Team
Satellite data confirm annual carbon dioxide minimum above 400 ppm, Jan 31, 20217

CHANGING WEATHER









WILDFIRE RESISTANCE OF BUILDINGS

WILDFIRE RESISTANCE:
Window Strategies for Wildland-Urban Interface (WUI) Design

CHANGING OUR APPROACH



AUSTRALIA

The New York Times

SUBSCRIBE FOR $0.50 (CDN)/WEEK

LOG IN

In Australia, an Architect Designs for a Future of Fire

As the country rebuilds after its devastating wildfires, Ian Weir is leading the push for integrating houses with the land, rather than mass clearance of vegetation.

Share full article

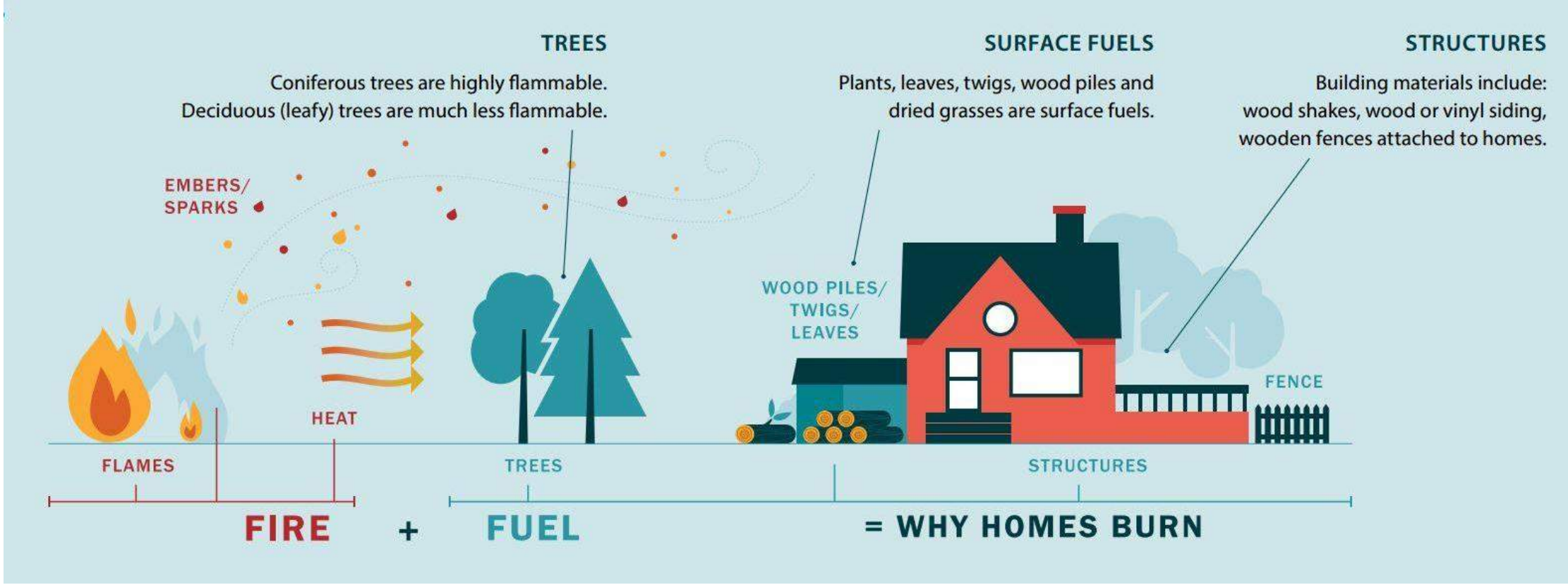
New York Times: April 17, 2020

CHANGING OUR APPROACH



Image courtesy of Lloyd Sadd

CHANGING OUR APPROACH



CHANGING OUR APPROACH





FIRE IGNITION AND WINDOW FAILURE

- Fire started when partially lit cigarette butts ignited a garbage bag below a vinyl window
- Heat from the burning bag melted the vinyl window frame and caused the glass to blow out



FLAME ENTRY AND INTERIOR DAMAGE

- With the glass gone, flames entered the home and ignited curtains and interior finishes
- Wood framing around the window remained largely intact, but the interior suffered heavy smoke damage
- Replacement windows will use Cascadia's wildfire-resistance fiberglass windows









WINDOWS IN WILDFIRES

WILDFIRE RESISTANCE:
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WHY FOCUS ON WINDOWS?

BEST-PRACTICE APPROACH COMBINES

- Intentionality about landscaping / planting (surrounding environment)
- Accumulation vs occupant control of surface fuels and combustibles (behavior)
- Building materials (material selections during design or renovation)

- Of these elements, material selections during design are much more reliable at a population level than the environment or occupant behaviours

- Window products are part of material selections
- They deserve specific focus because they are a specific vulnerability



Image from Park.ca Insurance

REDUCE LIKELIHOOD OF PROPERTY LOSS

WINDOWS ARE A KEY WEAKNESS IN BUILDING MATERIALS

- Why a specific weakness?
- Limited industry knowledge
- Limited guidance (best-practice guides and/or regulations)
- Very few product options (none made in Canada until recently)



Image from Fire Safe Marin

WINDOW TESTING OR GUIDANCE (FROM ANYWHERE)

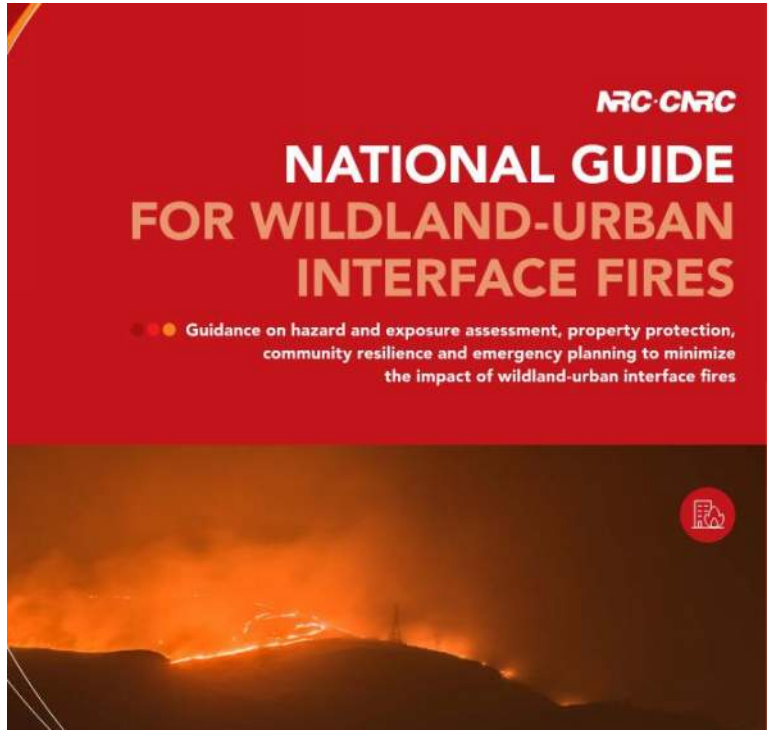
WINDOWS CAN BE TESTED TO A CALIFORNIA STANDARD

- Used in some California counties / regions
- Referenced in the Canadia guidelines

Canada



WINDOW TESTING OR GUIDANCE



3.3.9 Doors and Windows

1) Exterior doors on *buildings* in *Construction Classes CC1*(FR) and *CC1* should
    a) be *noncombustible*, and
    b) have a *fire-protection rating* of not less than 20 min when tested using CAN/ULC-S104, "Standard Method for Fire Tests of Door Assemblies" [93].
2) Glazing in exterior doors in *Construction Classes CC1*(FR) and *CC1* should include an outer pane of tempered or heat-strengthened glass.
3) Where installed, secondary screen doors provided for exterior doors should
    a) be *noncombustible*,
    b) be fitted with
        i) a corrosion-resistant, *noncombustible* wire mesh with a maximum mesh aperture of 3 mm, or
        ii) shutters conforming to Sentence (6),
    c) have no gaps greater than 3 mm at the perimeter of the screen assembly where it is fitted to the door, and
    d) be equipped with a self-closing device to keep the screen door in the closed position when not in use.
4) Window glazing and skylights should be tested using SFM Standard 12-7A-2, "Exterior Windows" [94].
5) All windows should be fitted with a screen that
    a) is made of corrosion-resistant, *noncombustible* wire mesh with a maximum mesh aperture of 3 mm,
    b) has no gaps greater than 3 mm at its perimeter where it is fitted to the window, and
    c) is supported by a metal frame.

WINDOW TESTING OR GUIDANCE

FireSmart™ Canada

Builders Checklist

Structural and Architectural Considerations

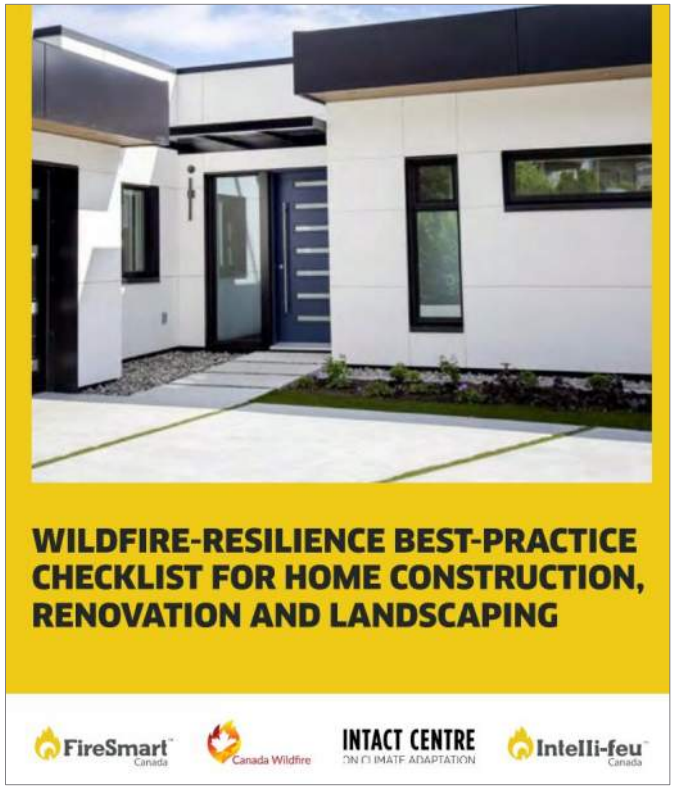
This short form Builders Checklist is meant to be a companion to the FireSmart™ Residential Development Guide. The following list should be kept available on building sites for reference.

Local Codes and Standards Apply

This checklist is created on the assumption that the project complies with current applicable building codes. As building codes and requirements differ across provinces and municipalities, development professionals should always reference local building codes should questions arise from this list of FireSmart best practices.

5. Doors & Windows[2]		
A	Windows are to be multi-pane (minimum double) including an exterior tempered pane.	
B	Exterior doors are finished with non-combustible material and have a fire protection rating of a minimum of 20 minutes.	
C	Door lites are glazed with tempered glass.	
D	If screens are installed, they must be made of a non-combustible material.	
E	Skylights, or daylighting tubes, including flashing shall be made of non-combustible construction, incorporating tempered glass and not acrylic glazing.	
F	If shutters are used, they must be made with non-combustible material.	
G	Window and door frames should be a non-combustible finish (e.g.: metal clad wood, fiberglass, thermally broken steel).	
H	Ensure all door seals are tight, with no gaps or cracks. This includes the garage doors.	

WINDOW TESTING OR GUIDANCE



Component	Material	Testing standards that must be met	Notes and supplier examples
Exterior siding/ cladding	Non-combustible cladding systems, such as • 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.

WHAT IS WILDFIRE RESISTANCE FROM A WINDOW

WHAT IS TESTING FOR WINDOW WILDFIRE RESISTANT?

- A window resists fire penetration during an 8-minute test



Images courtesy of Cascadia Windows & Doors

WHAT IS WILDFIRE RESISTANCE FROM A WINDOW

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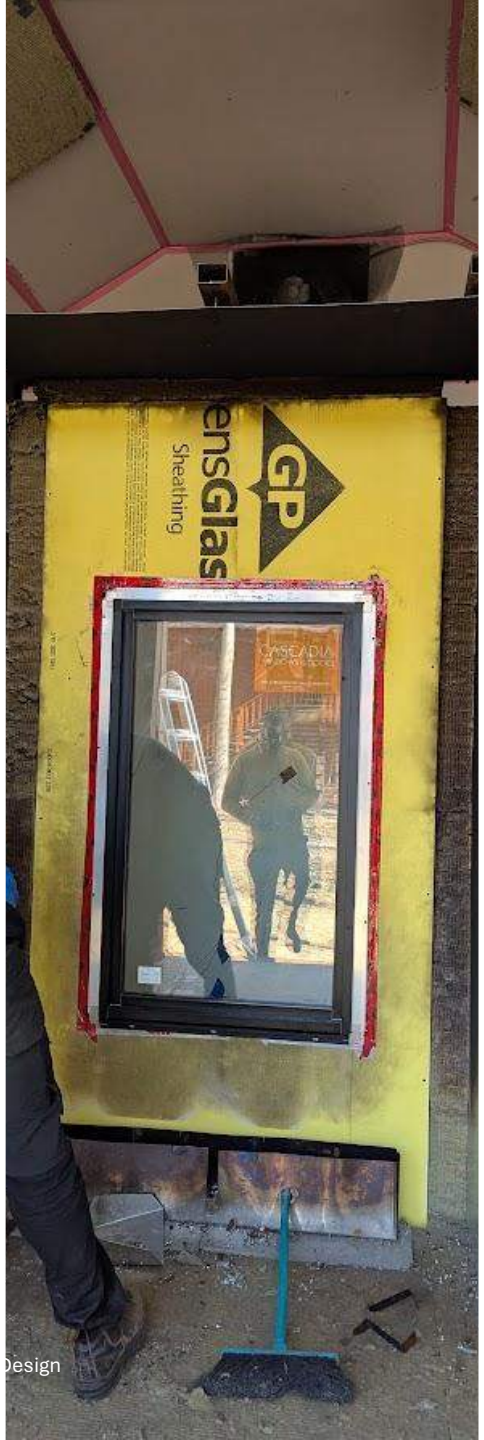
- What situation does this simulate?
- If burning material lands near your window or
- Radiant heat from nearby burning vegetation

- What must not happen during the test?
- Fire or smoke did not penetrate in a way that would risk setting something on fire (furniture, window coverings, wood trim, etc.)



Images courtesy of Cascadia Windows & Doors









WILDFIRE RESISTANCE:
Window Strategies for Wildland-Urban Interface (WUI) Design

Images courtesy of Cascadia Windows & Doors



LEARNINGS FROM EARLY TESTING

WILDFIRE RESISTANCE:
Window Strategies for Wildland-Urban Interface (WUI) Design

TESTING APPROACH - PRODUCTS

BASIC



TESTING APPROACH - PRODUCTS

BASIC

STANDARD



TESTING APPROACH - PRODUCTS

BASIC

STANDARD

PREMIUM



TESTING APPROACH - PRODUCTS

BASIC

STANDARD

PREMIUM

ELITE



WHAT DID WE LEARN

ABOUT GLASS

ABOUT FIBERGLASS

WHAT DID WE LEARN

GLASS OBSERVATIONS

- 6mm glass is a good idea



Images courtesy of Cascadia Windows & Doors

WHAT DID WE LEARN

GLASS OBSERVATIONS

- 6mm glass is a good idea
- *Not* tempered exterior is a good idea (if the exterior lite cracks, but substantially stays in place, this helps to shield the interior lite and improve its chance of survival)



Images courtesy of Cascadia Windows & Doors

WHAT DID WE LEARN

GLASS OBSERVATIONS

- 6mm glass is a good idea
- *Not* tempered exterior is a good idea (if the exterior lite cracks, but substantially stays in place, this helps to shield the interior lite and improve its chance of survival)
- Tempered interior lite is ~~a good idea~~ **essential**



Images courtesy of Cascadia Windows & Doors







Images courtesy of Cascadia Windows & Doors

WHAT DID WE LEARN

FIBERGLASS OBSERVATIONS

- **FIBERGLASS IS SURPRISINGLY GOOD**
- Tested four levels of increasing wildfire resistance; **ALL WORKED**
- Heavy, multi-chamber fiberglass frames help themselves
- All configurations pass a single round of testing



Images courtesy of Cascadia Windows & Doors







WILDFIRE RESISTANCE:
Window Strategies for Wildland-Urban Interface (WUI) Design

Images courtesy of Cascadia Windows & Doors

WHAT DID CASCADIA LEARN FROM FIBERGLASS WINDOW TESTING

EXTENDED DURATIONS?

- After 8 min, we tested again for an additional 20 min
- Not much happened





Images courtesy of Cascadia Windows & Doors





8 MIN + 20 MIN

WILDFIRE RESISTANCE:
Window Strategies for Wildland-Urban Interface (WUI) Design

Images courtesy of Cascadia Windows & Doors

WHAT DID WE LEARN ABOUT OTHER WINDOWS?

BASIC VINYL PRODUCTS ARE NOT LIKELY TO PERFORM

- Based on some comparison testing using off-the-shelf vinyl windows commonly available in Canada and the USA
- Won’t disclose the manufacturer, because they did not have the chance to be present

General observations

- Thinner glass (3mm) breaks earlier than thicker glass
- Vinyl frames both burnt *and* distorted, whereas heavy fiberglass frames burnt on the exposed surface, but did not distort
- Frame distortion increases the likelihood of fire breach



Images courtesy of Cascadia Windows & Doors

RELATED CHARACTERISTICS OF VINYL

POTENTIAL FOR DISTORTION WITH HEAT (NOT JUST FIRE)

- Dark colours vs summer heat and southwest exposure

MELTING AND BURNING POINTS

	Glass Transition Point (becomes soft and rubbery)	Melts	Ignites
Vinyl	180° F (82° C)	338-414° F (170-212° C)	736° F (391° C)
Fiberglass	Never	Does not melt	830° F (433° C)



RESULTS DIFFERED

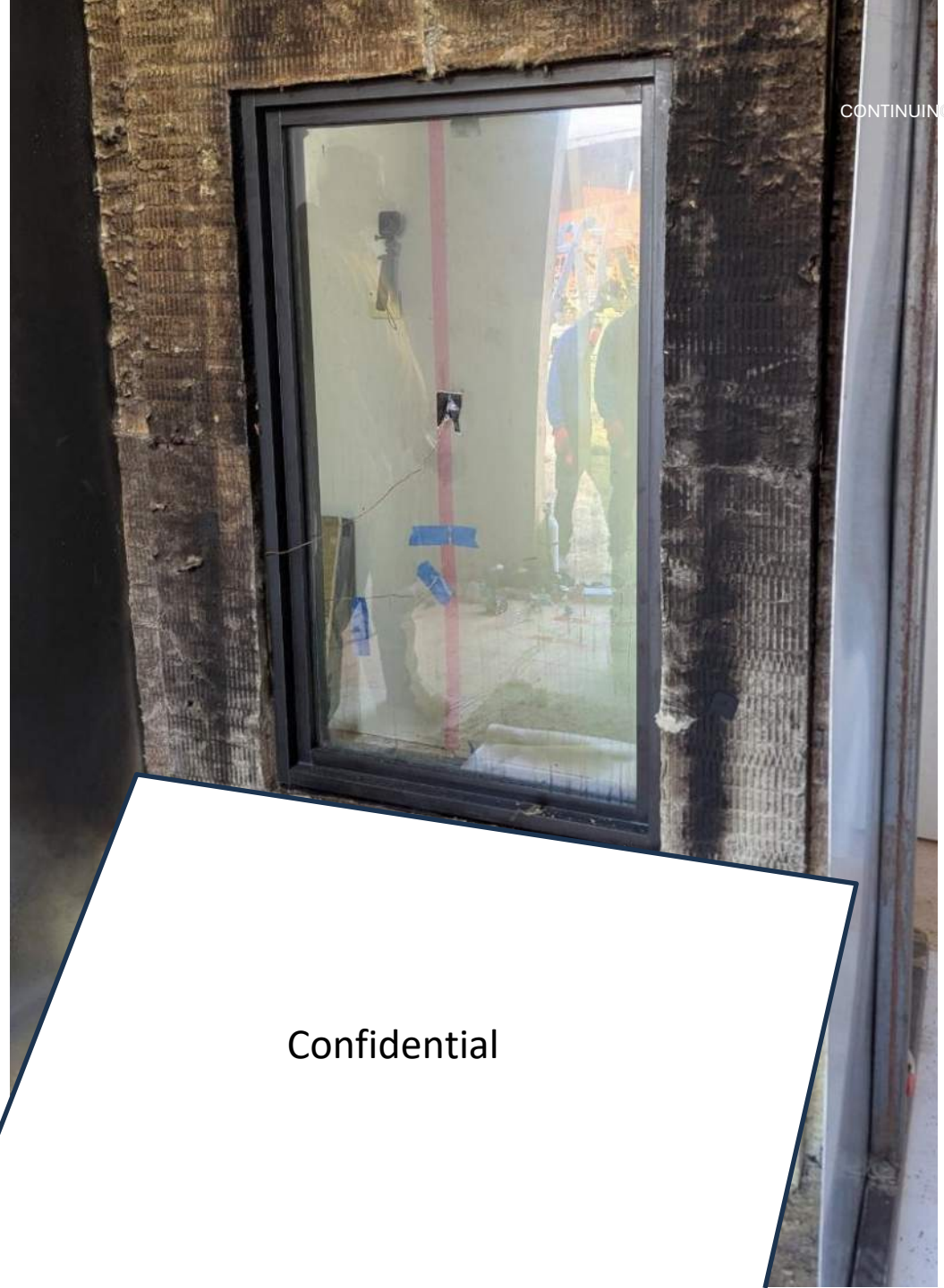
Images courtesy of Cascadia Windows & Doors

WILDFIRE INNOVATIONS

Trial testing of non-combustible temporary window covering materials… with **FIBERGLASS WINDOWS**

Exceptional fire resistance results

WIPE IF OFF, GOOD AS NEW



Confidential



Images courtesy of Cascadia Windows & Doors



KEY TAKEAWAYS

WILDFIRE RESISTANCE:
Window Strategies for Wildland-Urban Interface (WUI) Design

Art Rutkin Elementary School
Tigard, OR

WILDFIRE RESISTANCE – IMPROVE YOUR ODDS

CONTROLS

Understand three three-part approach for enhancing the fire resistance for your property

- Surrounding environment
- Surface combustibles
- Building materials

You often have (at least) partial control of these

MATERIAL SELECTIONS

Best approach during design is to target weak points

- For windows, choose:
  - Heavy fiberglass, or metal / metal-clad frames
  - Heavy glass thickness (e.g. 6mm) with tempered interior lite

Example product used in this learning session:

- Fiberglass window: Universal Series by Cascadia

TESTING → NEW PRODUCT VARIANTS



- UNIVERSAL SERIES – STANDARD
- UNIVERSAL – **WFR** (WILDFIRE RESISTANT)
- UNIVERSAL – **WFR+** (ENHANCED WILDFIRE RESISTANCE)

QUESTIONS?





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CASCADIA
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