
QAI LABORATORIES
CERTIFICATION TESTING INSPECTION
The Fast Lane To Certification
QAI
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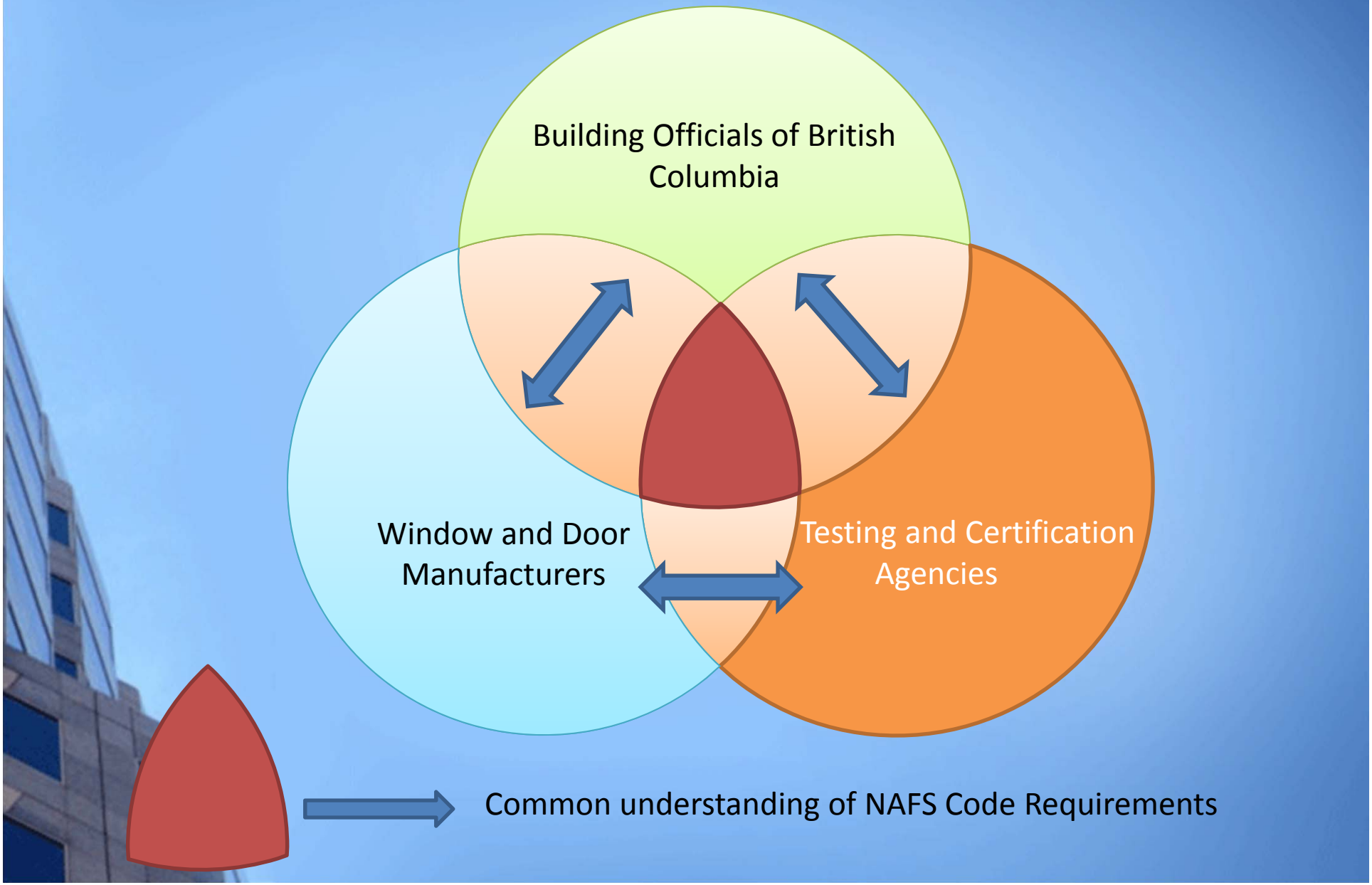
TESTING, CERTIFICATION AND LABELING OF WINDOWS/DOORS

(a Building Inspectors Perspective)

Presented by Quality Auditing Institute (QAI):
Graeme Huckell
&
Kevin Saito

Overview

- Building Code Compliance for Fenestration Products
- Basics of NAFS 2008
- Windows – Individual and Combination
- Doors – Single/Double and Mulled Assemblies
- What to look for during an inspection
- Tools at your disposal
- Other Services


Building Officials of British Columbia
Window and Door Manufacturers
Testing and Certification Agencies
Common understanding of NAFS Code Requirements

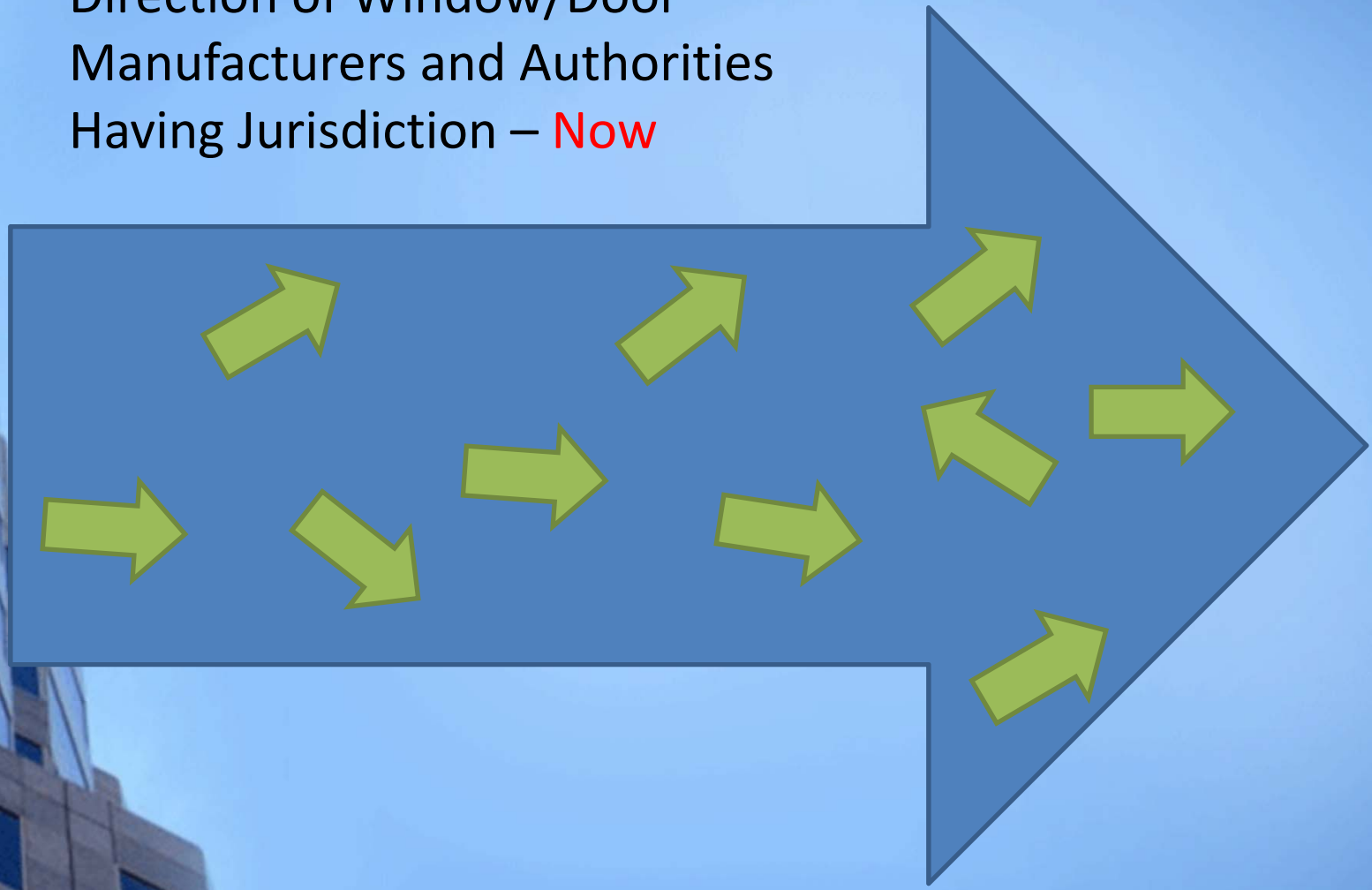
3 Types of Manufacturers

Tested and certified manufacturers – substantially compliant to code

Going through process of testing and certification

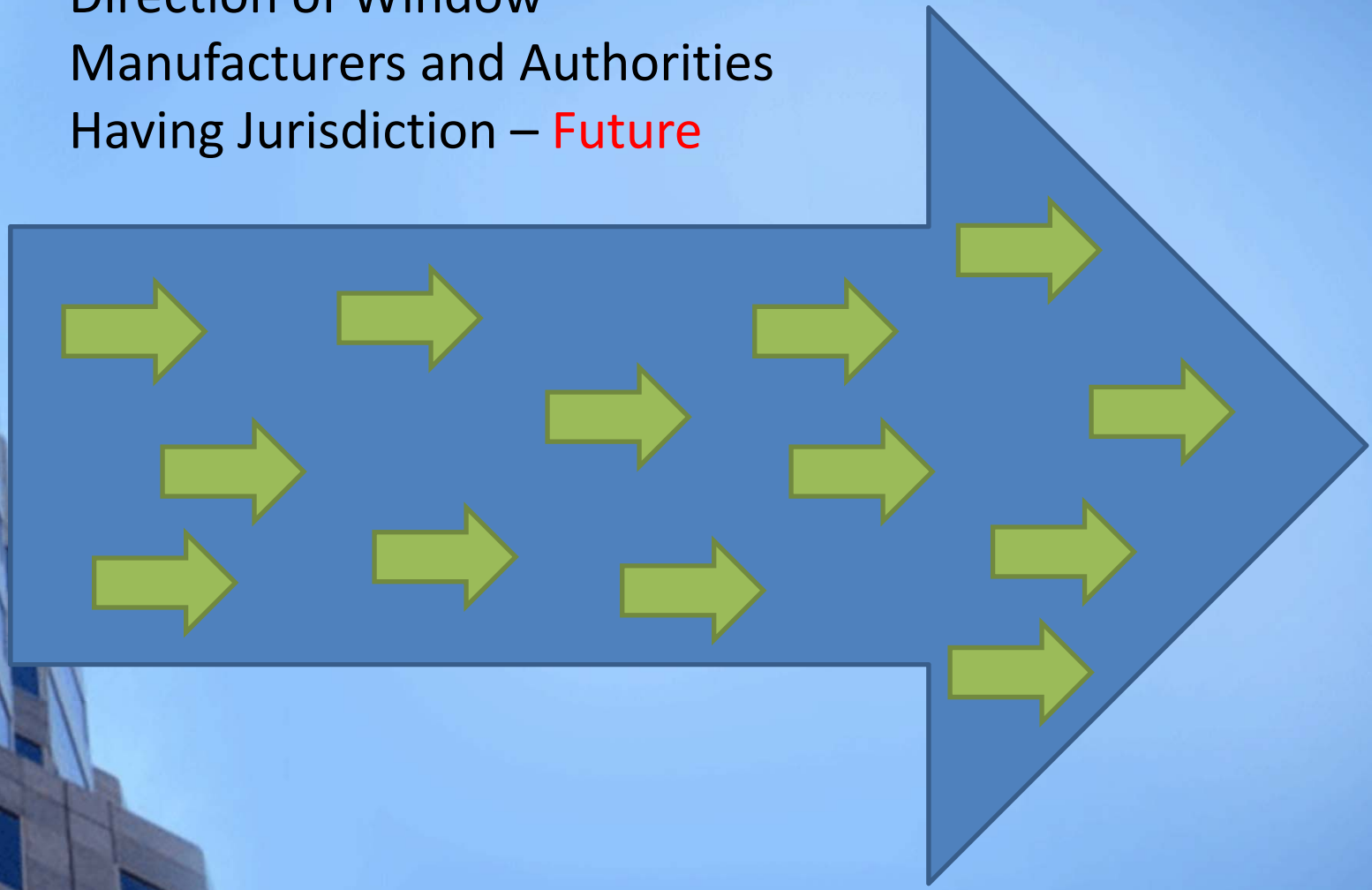
Actively avoiding testing/certification (possibly counterfeiting labels)

Direction of Window/Door Manufacturers and Authorities Having Jurisdiction – Now



Building Code Compliance

Direction of Window Manufacturers and Authorities Having Jurisdiction – Future



Building Code Compliance

BC Building Code

- December 20th, 2013 - NAFS-08 and NAFS-08 Canadian Supplement are officially adopted
  - Scope includes windows, doors, and skylights

- Certification not required by code although preferable to ensure ongoing conformity

Why Test?

- Required by Building Code
- Proves to building officials, engineers, architects, distributers that the product meets the code
- Learning opportunity in how to improve their product
  - Results in less service calls

Why Certify?

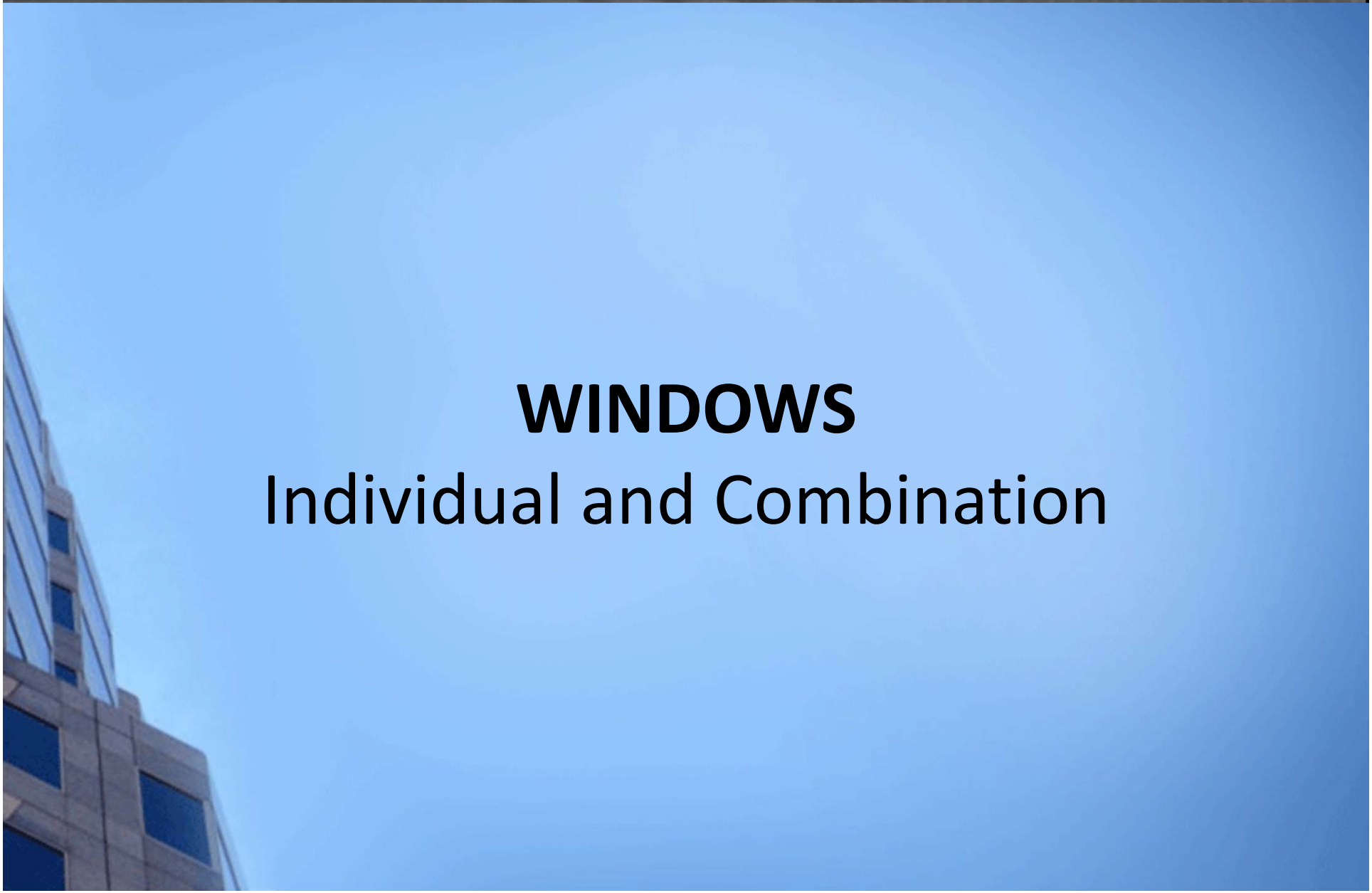
- Can increase the number of qualified assemblies without testing
- Third party inspection agency gives a level of assurance that the installed product is the same as that tested
- Labels with certification mark
- Product listings are available for all AHJs and customers to assess conformance to the Building Code

NAFS 2008 – Basic Overview

- **Operability**
  - Per ASTM E2068
- **Air Leakage Resistance**
  - Per ASTM E283
- **Water Penetration Resistance**
  - Per ASTM E547 and ASTM E331
- **Structural/Deflection Test**
  - Per ASTM E330
- **Forced Entry Resistance**
  - Per ASTM F588, ASTM F842, AAMA 1304

NAFS 2008 – Performance Classes

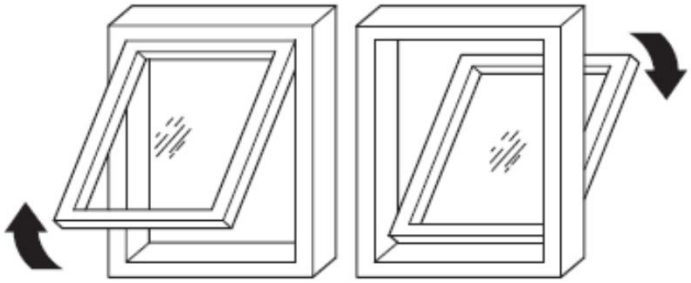
- **R Class – Residential**
  - Light Duty; One and two family dwellings
- **LC Class – Light Commercial**
  - Moderate Duty; Low-rise and multi-family
- **CW Class – Mid rise Commercial**
  - Heavy Duty; Low-rise and multi-family with higher loading and larger sizes
- **AW Class – Architectural**
  - Severe Duty; Mid and high-rise, high exposure, or institutions



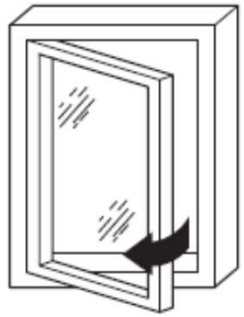
WINDOWS

Individual and Combination

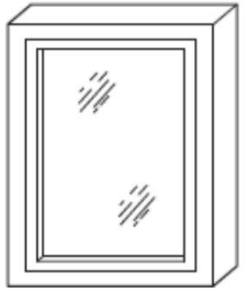
Individual Windows



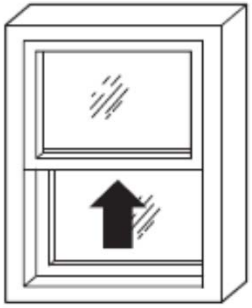
Awning, hopper, projected window



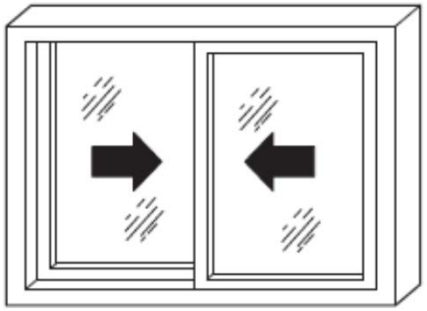
Casement window



Fixed window



Hung window (single, double, triple)



Horizontal sliding window

Individual Windows – What to Look For

- **Does it have proper labeling? (Permanent and temporary)**
- **Dimensions – Width and Height equal to or less than tested?**
  - ***Note – not based on square footage area**
- **Rating – Meets minimum rating for area?**
- **Is it the correct series number? (vinyl windows)**

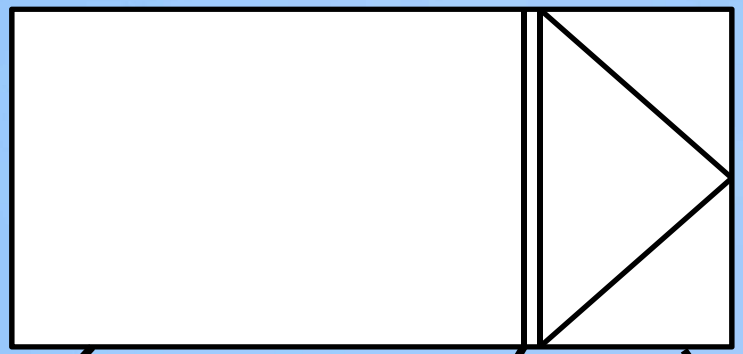
Combination Windows

Combination Windows – What to Look For

- **Does it have proper labeling? (Permanent and temporary)**
- **Rating – Meets minimum rating for area?**
- **Are all components tested?**
  - **Individual windows**
  - **Longest unsupported mullion**
- **Individual windows tested to equal or greater size?**
- **Mullion tested to equivalent length and tributary area?**

Combination Window – Broken Down

Combination Fixed beside Casement Window



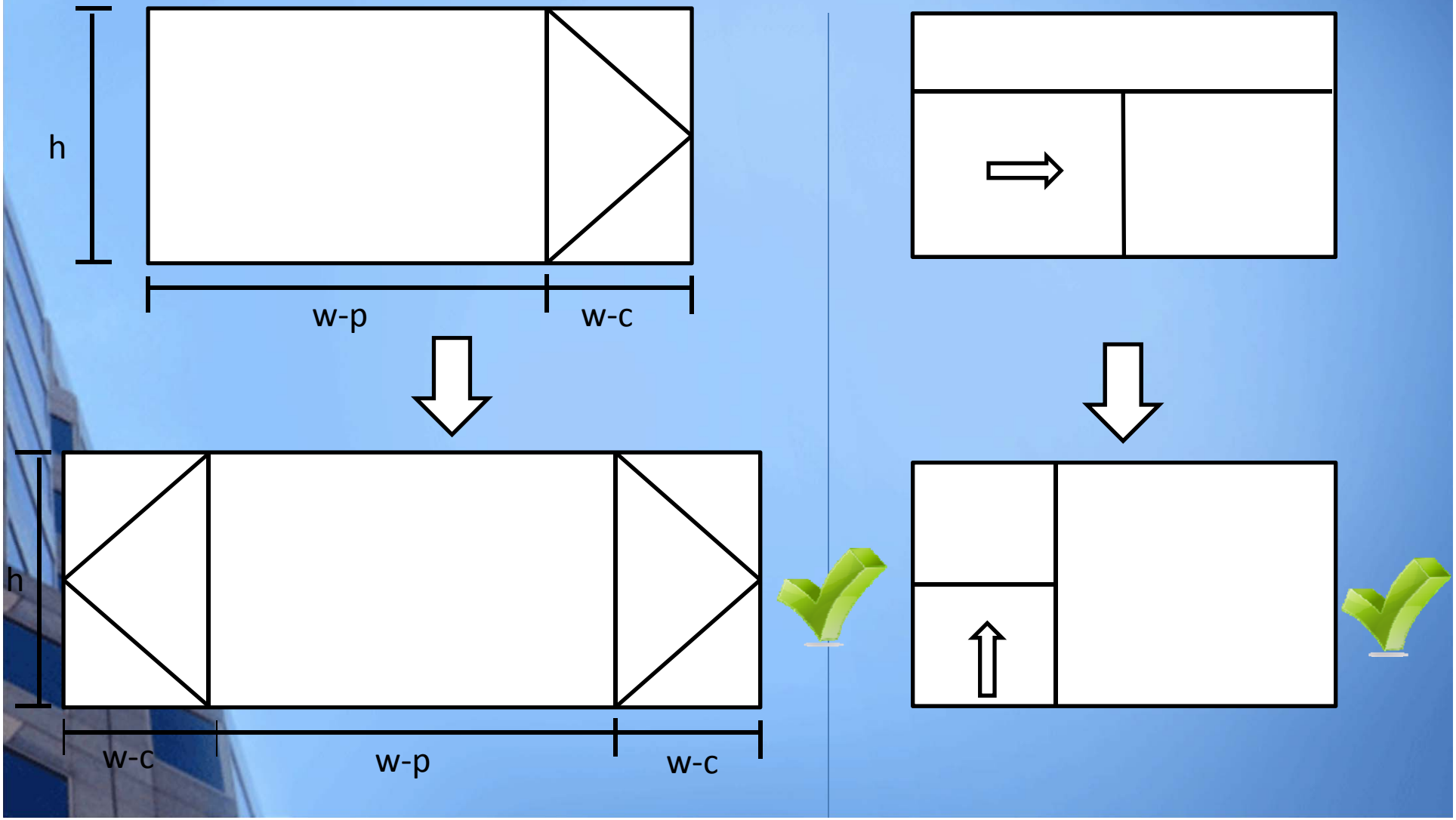
Fixed Window – PG 60

Mullion – PG 40

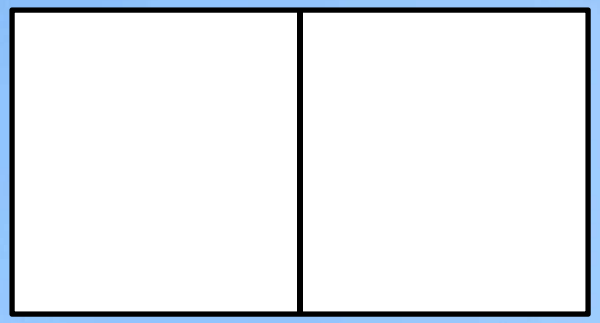
Casement Window – PG 50

Overall Window Rating → PG 40

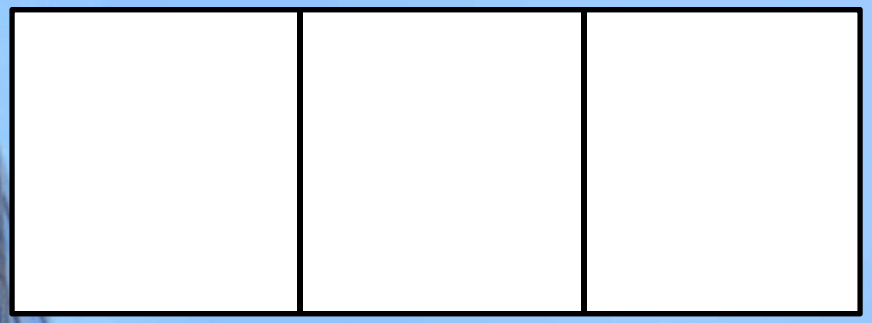
Combination Windows – Mullions Part 1



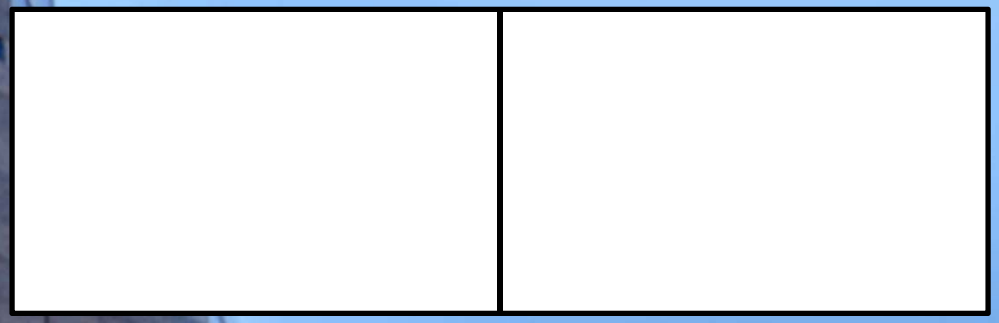
Combination Windows – Mullions Part 2



Tested



Approved, same width x height for individual windows

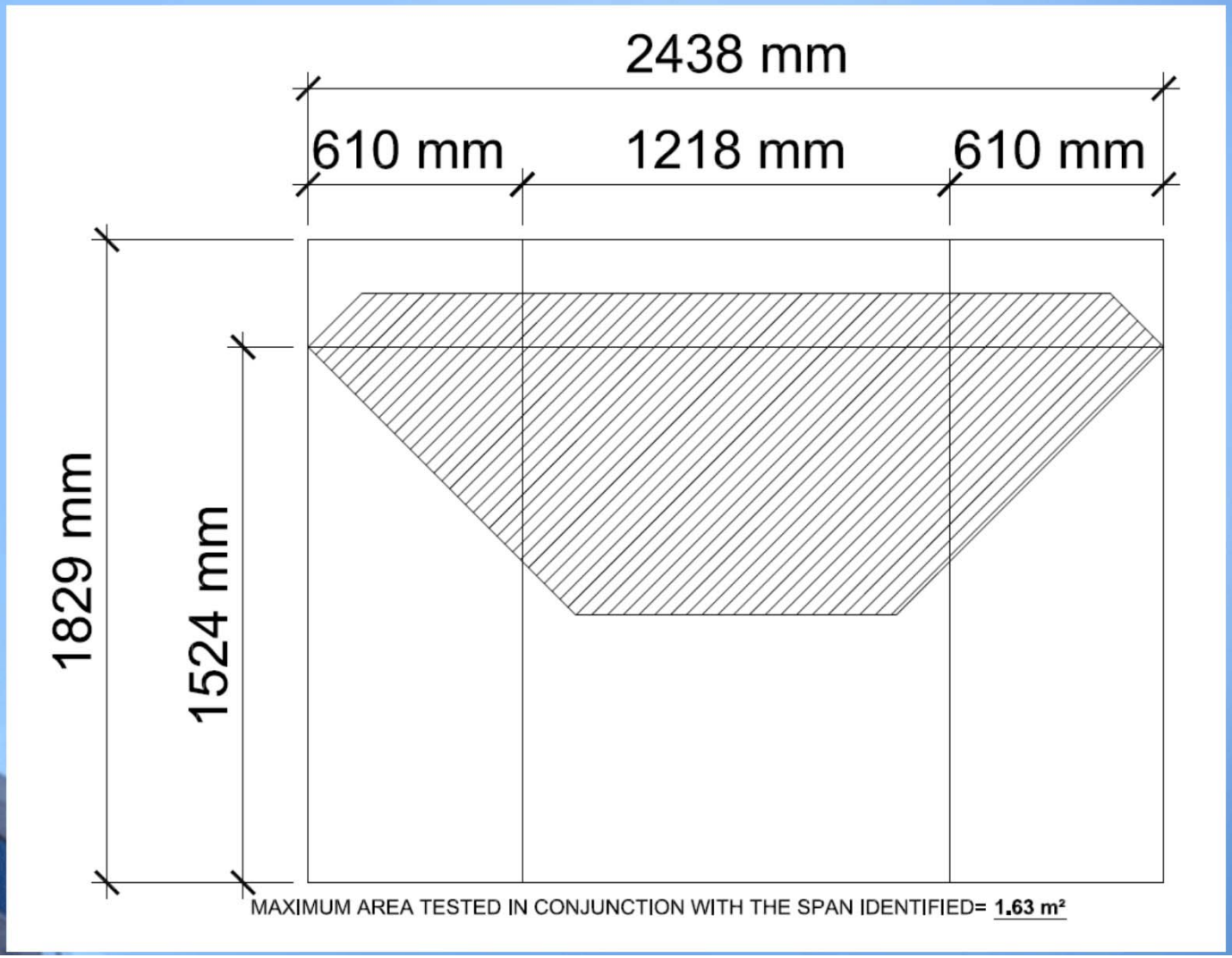


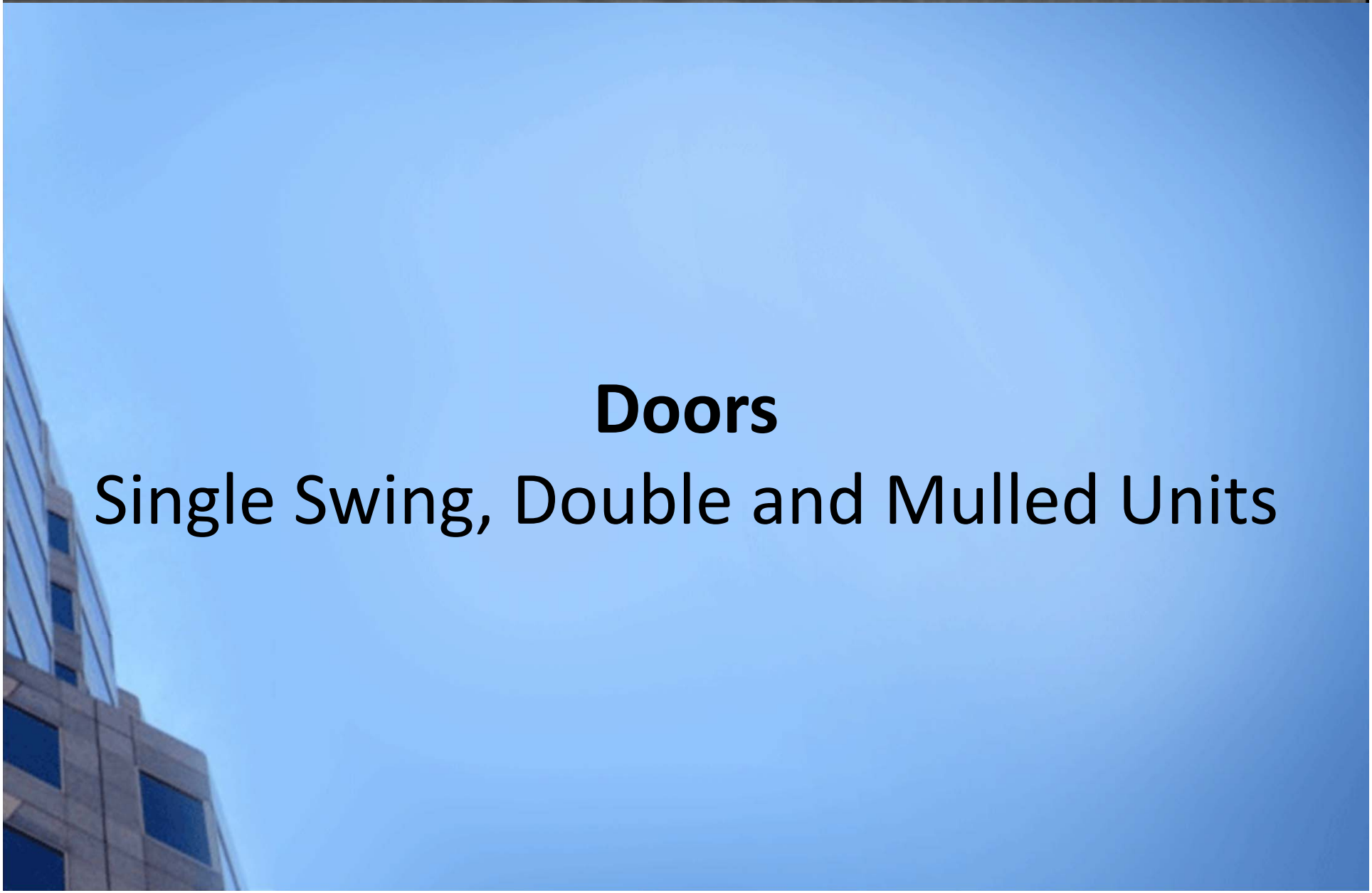
Not allowed, width exceeds tested width and tributary mullion area

Engineering Approach?

- **Can only calculate deflection under load**
- **Cannot determine operability/air/water/structural performance of the product**
- **Does not take in to account quality of manufacturing (or lack thereof)**

Combination Windows - Mullions





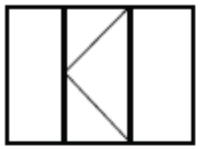
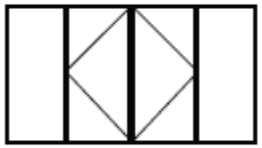
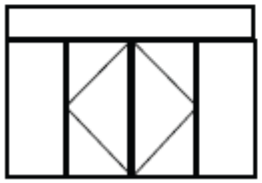
Doors

Single Swing, Double and Mulled Units

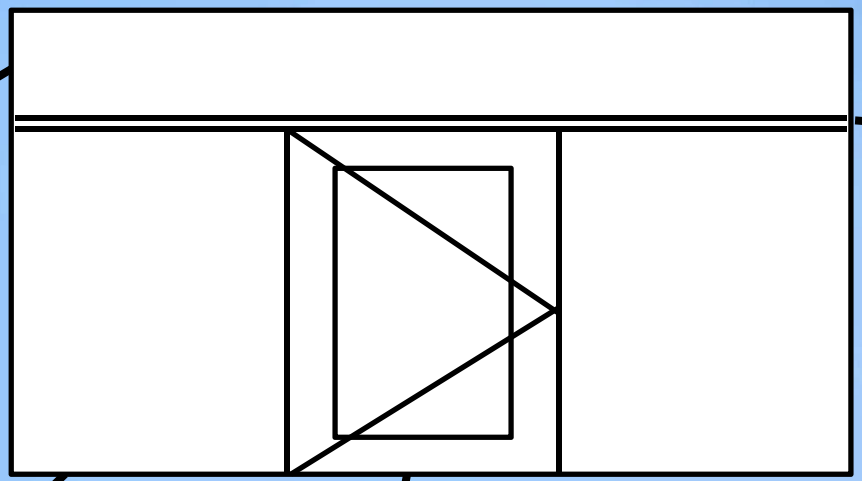
Door Assemblies and Qualifications

A		Qualifies any single fixed side lite or single fixed door system. Test A qualifies A. Does not qualify B, C, D, E, F, or G.
B		Qualifies any single side-hinged door system with the same hinge location and not more than one operable leaf or operable side lite. Test B qualifies B. Does not qualify A, C, D, E, F, or G.
C		Qualifies any single side-hinged door system combination assembly or composite door system with the same hinge location (side jamb) and not more than one operable leaf or operable side lite. Test C qualifies A, B, and C. Does not qualify C hinged-at-center mull, D, E, F, or G. Test C hinged-at-center qualifies A, B, or C hinged-at-center. Does not qualify C side jamb hinged, D, E, F, or G.
D		Qualifies any single side-hinged door system combination assembly or composite unit with the same hinge location and not more than two operable side lites. Test D qualifies B, C, and D. Does not qualify A, E, F, G, or C hinged-at-center.

Door Qualifications Cont'd

E		Qualifies any single side-hinged door system combination assembly or composite unit with the same hinge location and not more than one operable leaf or operable side lite. Test E qualifies A, B, C, E, and C hinged-at-center mull. Does not qualify D, F, or G.
F		Qualifies any single side-hinged door system combination assembly or composite unit with the same hinge location and not more than two operable leaves or two operable side lites. Test F qualifies A, B, C, D, E, F, and C hinged-at-center. Does not qualify G.
G		Qualifies any single side-hinged door system combination assembly or composite unit with the same hinge location and not more than two operable leaves or two operable side lites and a transom. Test G qualifies A, B, C, D, E, F, G, and C hinged-at-center.

Door with Mullion – Broken Down



Transom – PG 60

Mullion– PG 60

Sidelite– PG 50

Single Inswing Door – PG 40

Sidelite – PG 50

Overall Door Assembly Rating → PG 40

Doors – What to Look For

- **Weatherstripping – is it continuous?**
- **Hardware – Double drilled or multipoint?**
- **Sill – Is it drainable if inswing? Are the weephole covers operating correctly?**
- **Slab – Does the size and type match?**
- **Lite Kit – Do they have evidence the lite kit passed?**
- **Wood Panel – Do they seal between the panel and stiles/rails?**

Allowable Substitutions (under Certification)

- Wood Species – Denser wood means stiffer and stronger slab or frame
- Slab Thickness - Can increase slab thickness
- Panel Dimensions – Test maximum size
- Lite Kit – Test maximum size
- Locks – Double drilled qualifies multipoint (in some cases)
- Sill – Test narrower sill to qualify wider
- Jamb – Test narrower jamb to qualify wider

Tools at your Disposal

- **QAI Performance Grade Calculator**
- **Overhang Calculator – Limited Water Door**
- **Labels**
- **Test Reports**
- **On-Site Testing**
- **On-Site Checks**

QAI Performance Grade Calculator

http://qai.org/PerformanceCalc/

QAI LABORATORIES

WINDOW AND DOOR PERFORMANCE GRADE CALCULATOR

Province	British Columbia
Geographical Location	North Vancouver
Height of building	10 m
Terrain	Open / Rough
Product Class	LC-Light commercial
Product Type	Operable

Air	Water	Structural
A2	290 Pa	1440 Pa

PG 30

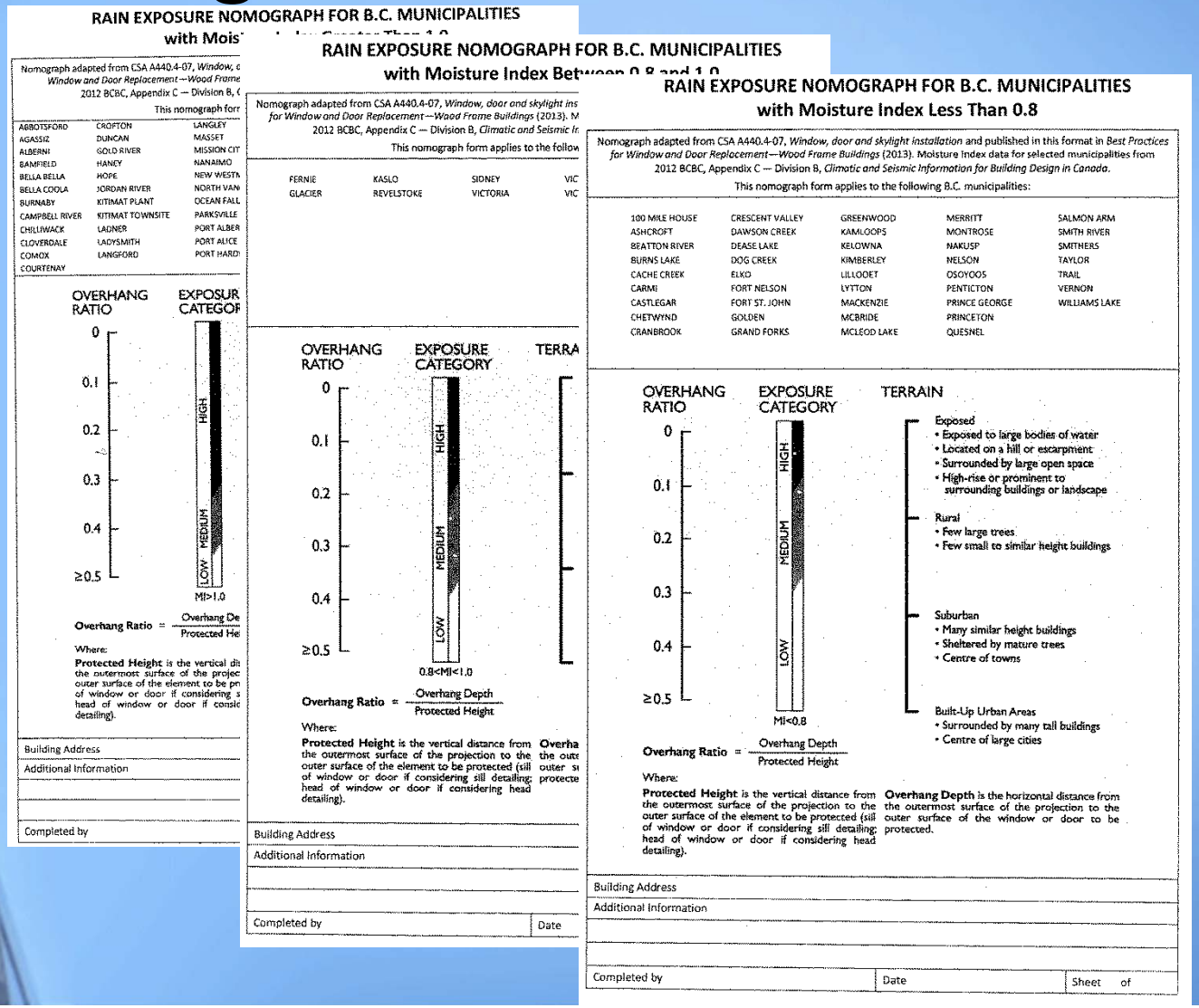
Reset Submit

Rough Terrain – Open Terrain

- **Rough Terrain – Suburban, urban or wooded terrain extending upwind from the building uninterrupted for at least 1km or 10 times the building height, whichever is greater**

- **Open Terrain – Level terrain with relatively few buildings, trees, or other obstructions and relatively little open water or shoreline**

Overhang Calculator – Limited Water



RAIN EXPOSURE NOMOGRAPH FOR B.C. MUNICIPALITIES
with Mois

Nomograph adapted from CSA A440.4-07, *Window,* *Window and Door Replacement—Wood Frame* 2012 BCBC, Appendix C — Division B, *(*

This nomograph for

ABBOTSFORD	CROFTON	LANGLEY
AGASSIZ	DUNCAN	MASSET
ALBERNI	GOLD RIVER	MISSION CIT
BAMFIELD	HANEY	NANAIMO
BELLA BELLA	HOPE	NEW WESTN
BELLA COOLA	JORDAN RIVER	NORTH VAN
BURNABY	KITIMAT PLANT	OCEAN FALL
CAMPBELL RIVER	KITIMAT TOWNSITE	PARKSVILLE
CHILLIWACK	LADNER	PORT ALBER
CLOVERDALE	LADYSMITH	PORT ALICE
COMOX	LANGFORD	PORT HARDI
COURTENAY		

OVERHANG RATIO: 0, 0.1, 0.2, 0.3, 0.4, ≥0.5
EXPOSUR CATEGOF: HIGH, MEDIUM, LOW
MI>1.0

Overhang Ratio = Overhang De / Protected He

Where:
Protected Height is the vertical di the outermost surface of the projec outer surface of the element to be pr of window or door if considering s head of window or door if consic detailing).

Building Address
Additional Information
Completed by

RAIN EXPOSURE NOMOGRAPH FOR B.C. MUNICIPALITIES
with Moisture Index Between 0.8 and 1.0

Nomograph adapted from CSA A440.4-07, *Window, door and skylight ins for Window and Door Replacement—Wood Frame Buildings* (2013). M 2012 BCBC, Appendix C — Division B, *Climatic and Seismic In*

This nomograph form applies to the follow

FERNIE	KASLO	SIDNEY	VIC
GLACIER	REVELSTOKE	VICTORIA	VIC

OVERHANG RATIO: 0, 0.1, 0.2, 0.3, 0.4, ≥0.5
EXPOSURE CATEGORY: HIGH, MEDIUM, LOW
TERRA
0.8<MI<1.0

Overhang Ratio = Overhang Depth / Protected Height

Where:
Protected Height is the vertical distance from the outermost surface of the projection to the outer surface of the element to be protected (sill of window or door if considering sill detailing; head of window or door if considering head detailing).
Overha the oute outer su protecte

Building Address
Additional Information
Completed by | Date

RAIN EXPOSURE NOMOGRAPH FOR B.C. MUNICIPALITIES
with Moisture Index Less Than 0.8

Nomograph adapted from CSA A440.4-07, *Window, door and skylight installation* and published in this format in *Best Practices for Window and Door Replacement—Wood Frame Buildings* (2013). Moisture Index data for selected municipalities from 2012 BCBC, Appendix C — Division B, *Climatic and Seismic Information for Building Design in Canada.*

This nomograph form applies to the following B.C. municipalities:

100 MILE HOUSE	CRESCENT VALLEY	GREENWOOD	MERRITT	SALMON ARM
ASHCROFT	DAWSON CREEK	KAMLOOPS	MONTROSE	SMITH RIVER
BEATTON RIVER	DEASE LAKE	KELOWNA	NAKUSP	SMITHERS
BURNS LAKE	DOG CREEK	KIMBERLEY	NELSON	TAYLOR
CACHE CREEK	ELKO	LILLOOET	OSOYOOS	TRAIL
CARMI	FORT NELSON	LYTTON	PENTICTON	VERNON
CASTLEGAR	FORT ST. JOHN	MACKENZIE	PRINCE GEORGE	WILLIAMS LAKE
CHETWYND	GOLDEN	MCBRIDE	PRINCETON	
CRANBROOK	GRAND FORKS	MCLEOD LAKE	QUESNEL	

OVERHANG RATIO: 0, 0.1, 0.2, 0.3, 0.4, ≥0.5
EXPOSURE CATEGORY: HIGH, MEDIUM, LOW
MI<0.8

TERRAIN
- **Exposed**
  - Exposed to large bodies of water
  - Located on a hill or escarpment
  - Surrounded by large open space
  - High-rise or prominent to surrounding buildings or landscape
- **Rural**
  - Few large trees
  - Few small to similar height buildings
- **Suburban**
  - Many similar height buildings
  - Sheltered by mature trees
  - Centre of towns
- **Built-Up Urban Areas**
  - Surrounded by many tall buildings
  - Centre of large cities

Overhang Ratio = Overhang Depth / Protected Height

Where:
Protected Height is the vertical distance from the outermost surface of the projection to the outer surface of the element to be protected (sill of window or door if considering sill detailing; head of window or door if considering head detailing).
Overhang Depth is the horizontal distance from the outermost surface of the projection to the outer surface of the window or door to be protected.

Building Address
Additional Information
Completed by | Date | Sheet of

Labels

COMPANY NAME:	CONFIGURATION
ADDRESS:	
PRODUCT:	

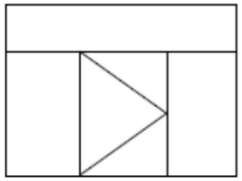
Positive Design Pressure (DP)
Negative Design Pressure (DP)
Water Penetration Resistance Test Pressure
Canadian Air Infiltration/Exfiltration

Complies with AAMA/WDMA/CSA 101/I.S.2/A440-08 and CSA A440AS1-09

- Remove label only after final inspection – Retain label for your records
- PG Rating must meet or exceed the performance level requirement for installed conditions

COMPANY NAME:
EXAMPLE WINDOOR COMPANY LTD.
ADDRESS:
123 Address St, Coquitlam BC
PRODUCT:
Series Single-Swing Outswing Door (Vinyl)

CONFIGURATION



Class R – PG60 – Size Tested 800 x 1600mm Type SHD

C QAI ® Quality Auditing Institute

Positive Design Pressure (DP)	1440 Pa
Negative Design Pressure (DP)	-1440 Pa
Water Penetration Resistance Test Pressure	330 Pa
Canadian Air Infiltration/Exfiltration	A3 Level

Complies with AAMA/WDMA/CSA 101/I.S.2/A440-08 and CSA A440AS1-09

*Note
- PG Rating must meet or exceed the performance level requirement for installed conditions
- Door must be finished and has been rated excluding the hardware
- Certification does not include installation detail, follow recommended manufacturers installation
- Remove label only after final inspection – Retain label for your records
- Label must be verified at www.qai.org listing directory to confirm this is not a counterfeit label

Example Window/Door Company Ltd.

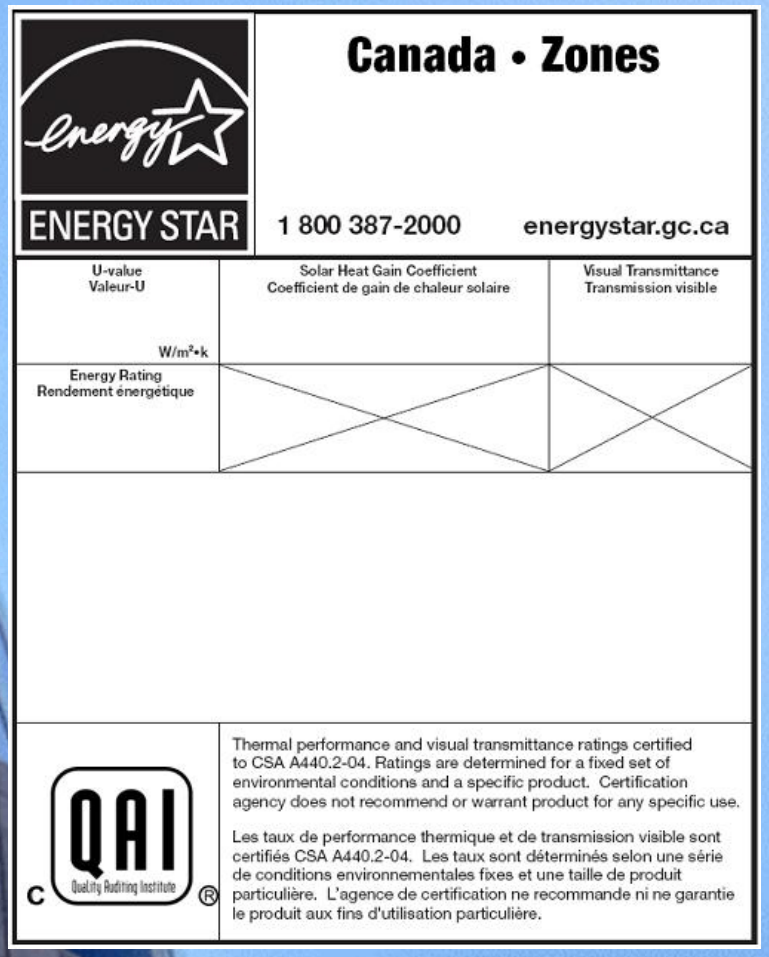
C QAI ® Quality Auditing Institute

Evaluation for physical performance to AAMA/WDMA/CSA 101/I.S.2/A440-08 and CSA A440AS1-09

L'évaluation de la performance physique de AAMA/WDMA/CSA 101/I.S.2/A440-08 et CSA A440AS1-09

File # W400

Certified Product Marking



Canada • Zones

ENERGY STAR

1 800 387-2000 energystar.gc.ca

U-value Valeur-U W/m²•k	Solar Heat Gain Coefficient Coefficient de gain de chaleur solaire	Visual Transmittance Transmission visible
Energy Rating Rendement énergétique		

Thermal performance and visual transmittance ratings certified to CSA A440.2-04. Ratings are determined for a fixed set of environmental conditions and a specific product. Certification agency does not recommend or warrant product for any specific use.

Les taux de performance thermique et de transmission visible sont certifiés CSA A440.2-04. Les taux sont déterminés selon une série de conditions environnementales fixes et une taille de produit particulière. L'agence de certification ne recommande ni ne garantie le produit aux fins d'utilisation particulière.

Example Ltd.

Evaluated to CSA A440-00 and CSA A440.2-04
Évalué à CSA A440-00 et à CSA A440.2-04
File # ###

BC Energy Efficiency Act Labels

IGU Manufacturer Ltd.

Verified to meet Schedule 1 item 41 of the BC Energy Efficiency Act

Refer to QAI Verified Directory for proof of conformance (www.qai.org)

Door Slab Manufacturer Ltd.

Verified to meet Schedule 1 Item 42 of the BC Energy Efficiency Act for Doors
Door slab verified to meet minimum thermal resistance (RSI) 0.875 x (m² x K)/W

Refer to QAI Verified Directory for proof of conformance (www.qai.org)

Test Reports

- **Ask for them when label is not clear**
- **Know what to look for**
  - **Does the test report size meet or exceed the product size?**
  - **Check the results table**
  - **Basic dimensional check of profile drawing**
  - **Basic check of select components**
    - **Weatherstripping**
    - **Hardware**

Test Reports – Ratings

Performance Classification: CW
Performance Grade: 35 PG
Maximum Size Tested: 1569 mm wide x 1263 mm tall (62" x 50")

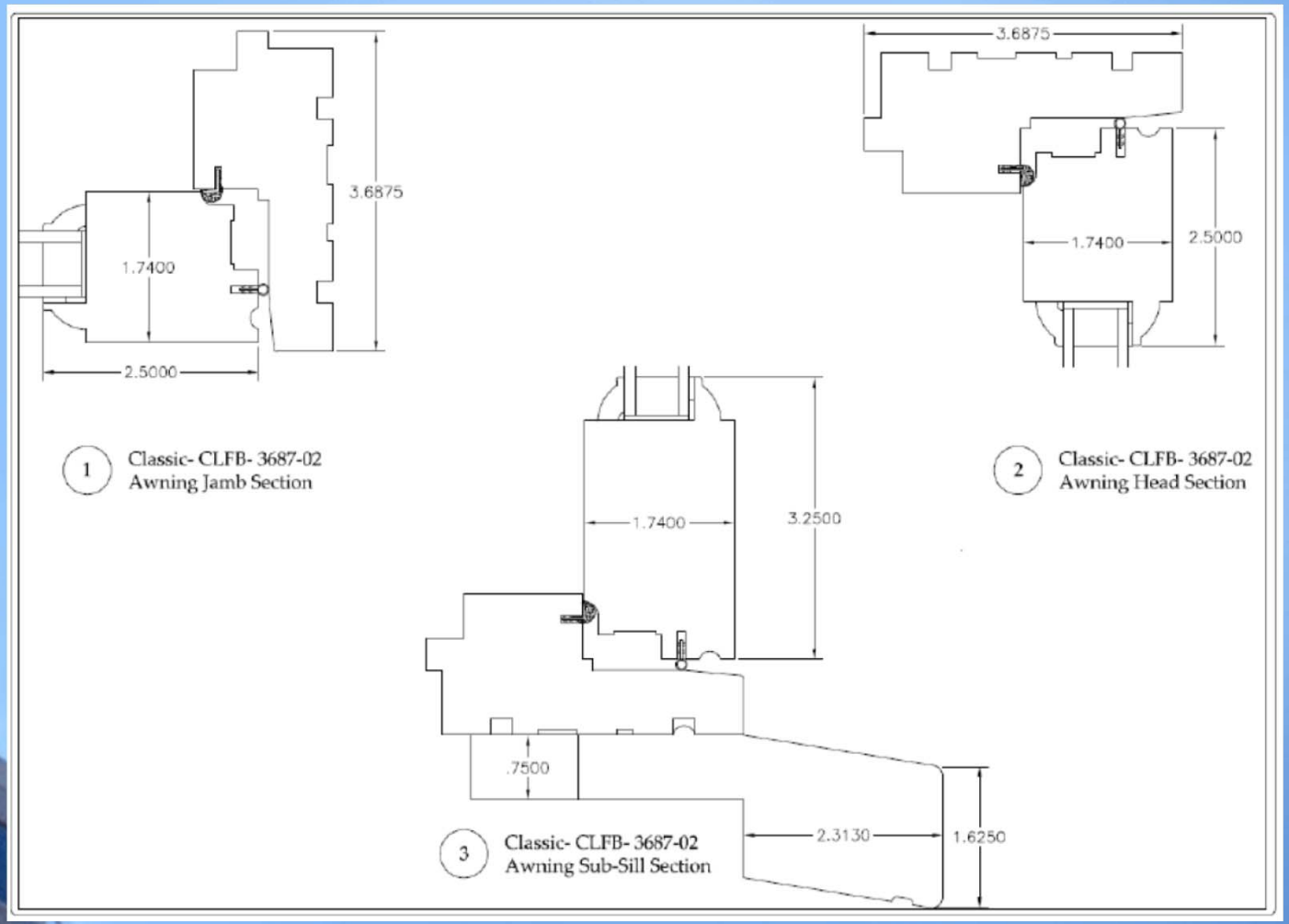
Primary Designator:
Class CW – PG35: Size tested 1569 x 1263 mm (62 x 50 in) – Awning Window (Type AP)
Class CW – PG1680 (metric): Size tested 1569 x 1263 mm – Awning Window (Type AP)

Secondary Designator:
Positive Design Pressure (DP) = 1680 Pa (35 psf)
Negative Design Pressure (DP) = -1680 Pa (-35 psf)
Water Penetration Resistance Test Pressure = 720 Pa (15.00 psf)
Canadian Air Infiltration / Exfiltration = A3 Rating

Test Reports – Parts List

Classic Series Wood Awning Window		
Frame:	Description	Wood, Fir. Mountainview Designs Ltd. Part # Classic Frame CLFB 3687-02 Sill, part # SSIL 2312-02 and SSSB 1250-00 Frame dimensions: Width: 1569 mm, Height: 1263 mm
	Joints:	Corners are mitre cut and fastened with two 3-1/4" x 1-1/4" staples, two1-1/4" screws and one 2-1/2" screw per corner. 180 Acrylic Latex Silicone is applied to both sides of the mitre joint.
Sash:	Description	Wood, Fir. Mountainview Designs Ltd. Part # Classic 2.5 Sash for three sides and Classic 3.25 Sash Profile for the bottom rail. Sash dimensions: Width: 1522 mm, Height: 1220 mm
	Joints:	Corners are butt joined, and screwed with one 3" screw per corner, oriented horizontally, a two part glue (WB1010 Wonderbond PVAC White glue and M188L Arylsulphonic Acid) applied to each the stile and rail before joining.
Weather-stripping:	Sash:	4 strips of black hollow bulb seal around perimeter of sash, fit into a kerf. Both sides of the two corners at the top of the sash have the weather-stripping cut short approximately 1/2" for each side. From Schlegel, part # RBD-064127BL (14.51942) Approximately 1/4" wide and 1/4" tall.
	Frame:	4 strips of white, foam-filled bulb seal around the perimeter of the frame, fit into a kerf. From Schlegel, part # QEZD-225 Approximately 1/4" wide and 0.20" tall.
Glazing Method:	Interior Seal (glazing bead):	Wood, Fir. Mountainview Designs Ltd. Part # Ovolo Glazing Bead GBOO 3125-02 Pinned to sash every 4-6"
	Exterior Seal (glazing Tape):	White Glazing tape from Cascade Aquatech, PART # AR2021W11614 2021W, 1/16" x 1/4", applied to the sash as four strips. The entire perimeter of the sealed unit is filled with silicone from Dow Corning, part # DCGLZSEACTGCLR
	Setting Blocks:	Black setting block, 1" x 1/16" x 0.4-0.7" part # PPSETBLK 116x1 Four setting blocks were used under the sealed unit and two were used along each side.

Test Reports – Assembly Drawing

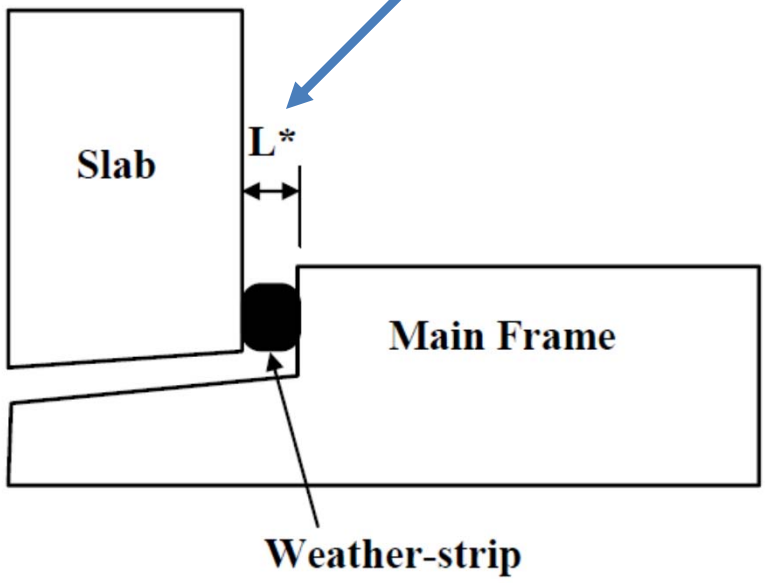


On-Site Testing

- **Water Testing**
  - **For untested products**
  - **To confirm rating of tested products**

On-Site Checks

- **Operability – Operate smoothly?**
- **Latch and deadbolt – Latch without excessive force?**
- **Weatherstripping contact – Consistent 1/8” ‘L’ along hinge and lock side?**
- **Correct Label?**
- **Flashlight test**



*Record a minimum of one measurement for each corner of the slab.

Energy Modeling of Fenestration Products

- Determines resistance to heat transfer (U-Value) and Energy Rating (ER)
- Uses two programs
  - THERM
  - WINDOW
- Simulation of Windows, Doors, and Skylights

Other Services

- **Roofing Inspections**
- **Building Envelope Inspections**
- **Railing Testing**
- **Fire Testing….**

Fire Testing

- **SMALL SCALE**
  - **Non-combustibility, rate of burn, spontaneous ignition temperature, cone calorimeter**
    - **CAN/ULC S114, CAN/ULC S135,ASTM E136, ASTM D635, ASTM D1929, NFPA 701 etc…**

Fire Testing

- **INTERMEDIATE**
  - **Roof materials, skins, flooring, plastics, pipe, treated lumber, coatings, insulation, etc…**
    - **ASTM E108, CAN/ULCS107, CAN/ULC S126, ASTM E84, CAN/ULC S102 & S102.2, ASTM E648, NFPA 253, ASTM E162, ASTM E662**



Fire Testing

- **LARGE SCALE**
  - **Doors**
    - **Neutral Pressure Fire Resistance Testing**
      - **UL 10b, CAN/ULC S104, NFPA 252 & UBC 7-2**
    - **Positive Pressure Fire Resistance Testing**
      - **UL 10c, ASTM 2074, NFPA 252 & UBC 7-2 Part 1**

Requirements: Flaming through, deflection, temp rise, hose-stream

Fire Testing

- **LARGE SCALE CONT'D**
  - **Room corner burns**
  - **Full scale furnace for ASTM E119, CAN/ULC S101, CAN/ULC S115, ASTM E814**
  - **Witnessing and reporting for multi-story fire testing to CAN/ULC S134**
  - **Subcontractors for performing intermediate story test NFPA 285 USA**

NFPA 286 Room Fire Test

Fire Door Field Labeling

- *FIELD LABELING: A practice where an approved agency inspects and verifies a fire-door assembly rating in the field and applies a label to the assembly to maintain compliance with the labeling requirements of the Code.*

- *To carry a fire-rating label, the door and components as installed must be traceable to a tested and/or listed assembly. QAI can field label doors if they can prove the assembly was tested and listed by UL, Intertek, FM, or other.*

DOOR LABEL

Certification Agency Logo

Rating

May also include:

- Temperature rise (450 F as required in exit passageways)
- Smoke rating
- Minimum latch throw (assumed ½" on singles, 5/8" on pairs if not shown)
- "To be Equipped with Fire Exit Hardware" (reinforcement required)
- "Singles, Pairs, Double Egress" (assumed single if not shown, depends on listing and hardware)

Missing Labels and Modified Doors

- Common occurrences: Label removed or painted over, label not applied at factory
- If modifications have been made to the door or frame, original rating on label may be null-and-void
- Common modifications: Change Hardware, Resizing, Holes for glass or viewing port

Common Locations

- Hospitals
- Care facilities (nursing, child-care, etc)
- Hotels and casinos
- schools
- Military facilities
- Prisons
- Office buildings
- Any other multiple occupancy or public buildings (airports, Stadiums, etc.)

Key Contacts

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