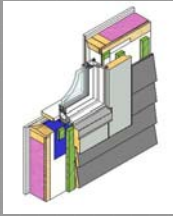




RDH Building Sciences Inc.

Widows Best Practice Guide

- Progress report
- Close to final draft stage



Dave Ricketts, M.Sc., P.Eng.


Background

- Jim Sasaki
- 1964 Canadian Building Digest no. 55 identified that "Rain penetration is a major problem with glazing and must be controlled..."
- *Rain Leakage of Residential Windows in the Lower Mainland of British Columbia*, published by NRC in 1984 stated that, "Many inquiries concerning rain penetration of exterior walls are received by the BC Regional Station."
- Problems are not confined to BC - Building Research Note No. 210, also published in 1984, reports on window performance problems in Atlantic Canada.
- More recently
 - Survey of Envelope Failures in the Coastal Climate of British Columbia
 - Wall Moisture Problems in Alberta Dwellings
 - Study of High-Rise Envelope Performance in the Coastal Climate of British Columbia

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Scope

- Practical and comprehensive guidance regarding the use of windows in residential buildings
- Canada wide – so a range of climatic conditions
- Wide range of building types - single family to high-rise multi-unit
- Windows and the window to wall interface

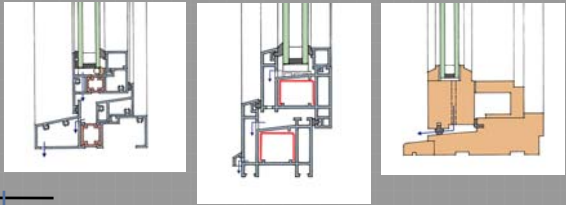


Appropriate window selection, wall design and interface detailing

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Scope

- Not
 - Curtain-wall – other BPG
 - Manufacturing – although some of the guidance should be a strong hint to some manufacturers
- Generic window frames used



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Description of Guide

- Follows the normal project process
- Smaller building projects may not follow all of these steps rigorously
 - not usually as many parties involved
 - the thought process should still be there even for a smaller project
- Appendices
 - Terminology
 - Exposure
 - Glazing
 - Installation checklist

Schematic Design
Establish context for window selection and detail design

↓

Design Development
Arrangement of windows and window selection

↓

Construction Documents
Details of the integration of windows into the building

↓

Construction
Ensuring windows are supplied and installed as intended

↓

Service Life
Proper operations, maintenance & renewals for windows

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Schematic Design – The Building and Site


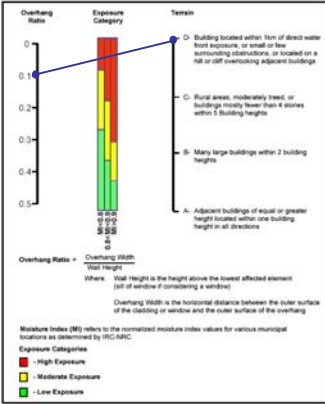
- Establishing context for window selection and detail design
 - Exterior environment
 - Siting and orientation
 - Building form
 - Interior environment
- An appendix deals with assessment of exposure conditions considering climate, overhang and local terrain



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Exposure

→ Exposure is a combination of exterior environment (wind and rain), local terrain factors and building form

Overhang Ratio = $\frac{\text{Overhang Width}}{\text{Wall Height}}$

Where: Wall Height is the height above the lowest affected element (set of window) if considering a window.
Overhang Width is the horizontal distance between the outer surface of the glazing or window and the outer surface of the overhang.

Moisture Index (MI) refers to the normalized moisture index values for various municipal locations as determined by IRC-MRC Exposure Categories

- High Exposure
- Moderate Exposure
- Low Exposure

Terrain

- D: Building located within 10m of direct water front exposure, or small or few surrounding obstructions, or located on a hill or cliff overlooking adjacent buildings
- C: Rural areas, moderately level, or buildings mostly fewer than 4 stories within 1 building heights
- B: Many large buildings within 2 building heights
- A: Adjacent buildings of equal or greater height located within one building height in all directions

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Design Development – Window Selection

→ Arrangement of windows and window selection

- Aesthetics
- General arrangement (punch strip or window-wall)
- Configuration (operable vent types and configuration within an opening)
- Selection of frame material
- Amount of glazed area
- Accommodating structural loads
- Water penetration control
- Control of air flow
- Control of heat flow
- Control of sound transmission
- Control of fire
- Security
- Durability




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Configuration

→ Coupled (mullled) windows

- Weight of units
- Handling at the plant
- Shipping and delivery to the site
- Storage and movement to the rough opening
- Installation
- Does the larger mullied unit meet all performance criteria?
 - Structural
 - Water
 - Thermal
 - Air




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Water Penetration Control

→ A440 requirements and limitations

→ More to it than just obtaining a B-rating

- How do we ensure that windows perform well over time
- Help the user understand how to evaluate frame sections
- Two lines of defense strategy for window itself, as well as the window to wall interface



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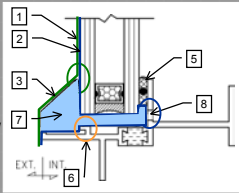
Good Features of Water Penetration Control

- Continuity of water shedding surface (WSS)
- Continuity of water resistive barrier (WRB)
- Vertical or sloped water shedding surface
- Use of continuous compression gaskets for operable vents
- Use of continuous compression gaskets or shimmed tape at glazing stops
- Unobstructed drainage path within window between WSS and WRB
- Capillary break between WSS and WRB
- Continuous air barrier
- Durable materials at frame joints

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Window Evaluation

- ✗ 1. Continuity of water shedding surface (WSS)
- ✗ 2. Continuity of water resistive barrier (WRB)
- ✓ 3. Vertical or sloped water shedding surface
- ? 4. Use of continuous compression gaskets for operable vents
- ✓ 5. Use of continuous compression gaskets or shimmed tape at glazing stops
- ✗ 6. Unobstructed drainage path within window between WSS and WRB
- ✓ 7. Capillary break between WSS and WRB
- ✗ 8. Continuous air barrier
- ? 9. Durable materials at frame joints

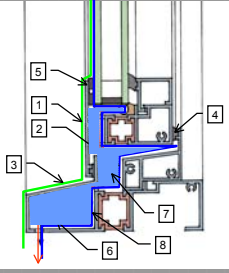


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Window Evaluation

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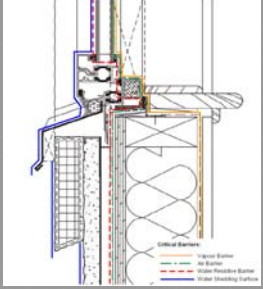


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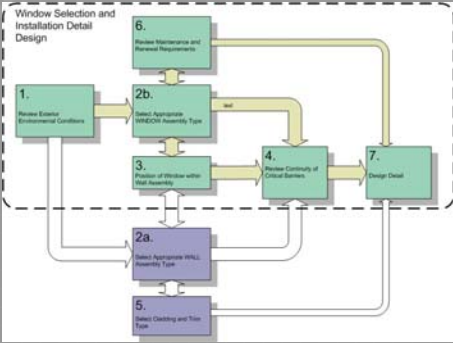
Construction Documents – Details & Specs

- Windows as an element of the building enclosure
- Functional requirements for detailing
- Components and Materials
- Detailing variables
 - Window type
 - Wall assembly
 - Cladding type
 - Window trim
 - Position of window within the wall
 - Sub-sill drainage
 - Continuity of critical barriers
 - Maintenance & Renewals



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Non Linear Process



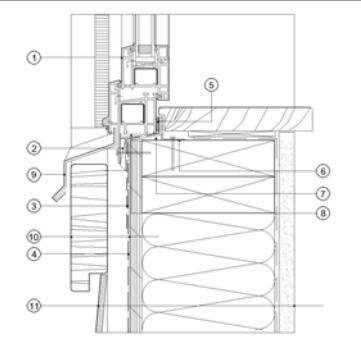
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Matrix of Details Included in the Guide

	New Construction				Retrofit
	Aluminum	Vinyl	Wood	Window-wall	Vinyl
Exterior Insulated Rainscreen, stucco cladding	H, S & J				
Strapped cavity rainscreen, cementitious composite siding		H, S & J			
Wood frame masonry veneer			H, S & J		
Poured-in-place concrete				H, S & J	
Face-sealed stucco on wood framing					H, S & J

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Sample Detail



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Construction

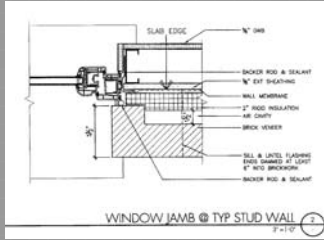
- Shop Drawings
- Mock-ups
- Testing
- Field Review (inspection)



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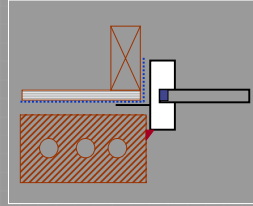
Service Life

- Durability Concepts
 - Environmental impact
 - Ease of maintenance and renewals
 - Service life of components and materials
- Operational guidance
- Maintenance plans
- Renewals plans



Relative Durability in Design

- 20 year flange window
- behind 50 year brick



- Poor choice of window
- Poor interface design

Questions & Comments