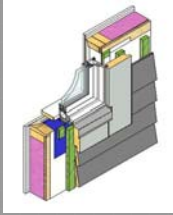**RDH** Building Sciences Inc.

Widows Best Practice Guide

- *Progress report*
- *Close to final draft stage*

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

CMHC ◆ SCHL | Homeowner Protection Office

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
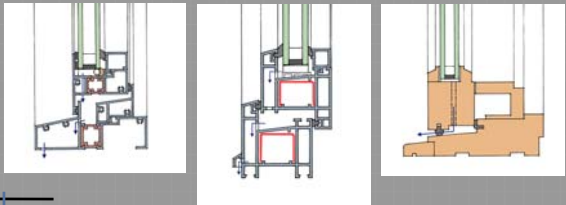- Windows and the window to wall interface

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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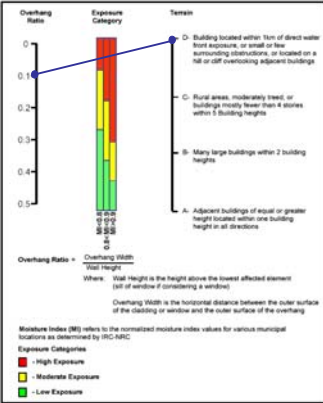## Schematic Design – The Building and Site

- 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

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*

Configuration

→ Coupled (mulled) 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 mulled unit meet all performance criteria?*
    · Structural
    · Water
    · Thermal
    · Air

8'-6" x 8'-0"!

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*
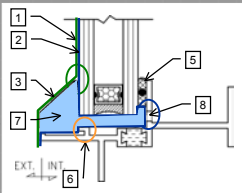 › *Two lines of defense strategy for window itself, as well as the window to wall interface*

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

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
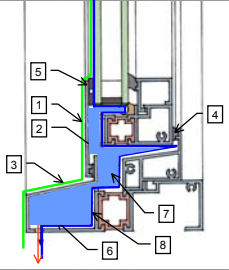✕ 8. Continuous air barrier
? 9. Durable materials at frame joints

3 to 5 / 9

Window Evaluation

✓ 1. Continuity of water shedding surface (WSS)
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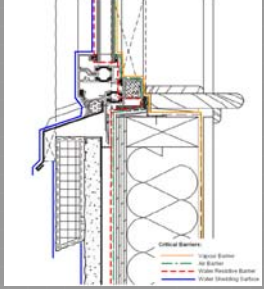✓ 8. Continuous air barrier
? 9. Durable materials at frame joints

8 or 9 / 9

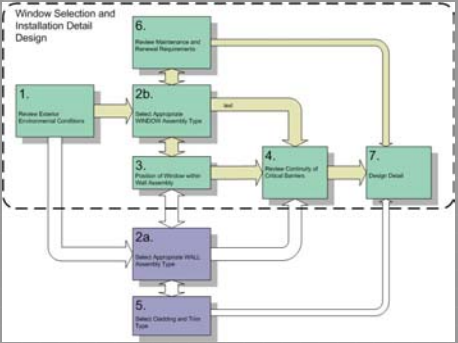**RDH** Building Engineering Ltd.

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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*

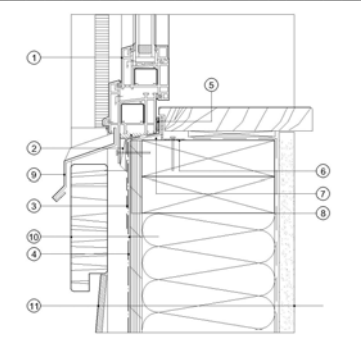**RDH** Building Engineering Ltd.

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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, cementicious 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

WINDOW JAMB @ TYP STUD WALL

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Relative Durability in Design

- → 20 year flange window
- → behind 50 year brick

- → Poor choice of window
- → Poor interface design

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Questions & Comments

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