Rain

- Rain is the largest source of moisture
- We need better control for better insulation and airtightness
- Rain penetration control
  - Site and massing
  - Surface features
  - Enclosure wall strategy
Controlling Rain Penetration

- **Deflection**
  - reduce water on building
  - redirect water away
  - slope surfaces, use flashing

- **Drainage / Exclusion / Storage**
  - enclosure design
  - provide drainage, or storage or barrier

- **Drying**
  - allow any remaining water to dry

**Deflection**

- Surface & site features are also important

**Rain Deposition and Wind Flow Patterns**
Overhangs

Percent of all walls which have problems

Width of overhang above wall (mm)

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Don’t concentrate water!

- Old Building in Toronto - multi-story, old windows
- Control Rain on the Surface
- Multiple shedding, drips, etc
- Reduced rain load on joints and openings
Surface Shedding

- Patios and decks lower than floors and slope away from building
- Garage floor lower than main floor and slope away from building
- Driveway lower than garage floor and slope away from building
- Grade lower than main floor and slope away from building
- Steps and walkways lower than main floor and slope away from building
- Kick out flashings or diverters direct water away from walls at roof/wall intersections

Wall System

- Imperfect Barrier
  - Mass or Storage Types
    - Less mass and lower permeability
    - More mass and more permeability
  - Screened Types
    - No Cavity
    - Face Sealed
    - Concealed Barrier
- Perfect Barrier Types
  - Ventilated
  - Unvented
  - Pressure moderated
  - Ventilated and pressure moderated

Categorization

- Elements and joints can be different
Claddings that leak

- Brick
- Stucco
- Wood, vinyl, fiber cement
- Adhered veneer
- EIFS
- Metal panels, metal roofs
- Shakes, shingles

Drainage

- Must have continuous drainage plane
- Drainage plane must be:
  1. Water tolerant
  2. Capillary inactive (water repellent / non-wicking)
- Small gap required
  - As small as 1 mm
- Flashing is very important
- Weep holes

Requirements for a Drained Enclosure

1. "Rainscreen" cladding
2. Drainage space
3. Drainage Plane
4. Flashing
5. Drain Opening ("weep")
Drainage Plane

Lapped Housewrap, paper

Drained Walls

- Lip Siding
- Panel Cladding System
- Masonry Veneer
Laps are the most reliable

Avoiding Fishmouths
Drainage Gaps

- Gap avoids hydrostatic pressure
  - drains away water
  - Requires only small gap, e.g. 1/16"
- Reduces time of wetness on housewrap sheathing membrane
- *May* allow ventilation drying if >1/8”-1/2”
Stucco sticks to paper/housewraps
Water drained astonishingly well between sheets of building paper.

- Vinyl drains well with no strapping.

Requirements for a Ventilated Enclosure:

- Ventilation space
- Vent Openings
- Structure / Backup wall
How much Ventilation do you need

- Are you drying the cladding back?
- Are you drying the wall sheathing?
- Are you controlling inward vapor drives?
- Are materials adjoining the ventilation cavity moisture sensitive?
• Taped Foam

• Huber ZIP

New materials

DuPont™ Tyvek® Fluid Applied WB
A DURABLE, VAPOR PERMEABLE FLUID APPLIED WEATHER BARRIER
Details required at
1. Changes in plane
2. Changes in material
3. Changes in system / trade

Thus penetration, windows, rails, signs etc.
Water can build up here -- we need a waterproof barrier

Note standing water

Continuity at Corners
Saddle flashing
Exterior sealant is temporary, aesthetic, water shedding layer

Leaky windows

- Moisture sensitive substrates are a problem
Door Sills

Best Practice Patio Door Threshold

Door sill

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Surface features such as Overhangs, Drips, etc are important for mass walls.

Storage/Mass Walls

- Rubble
- Solid Masonry
- Composite/ Layered
Categorization

- Elements and joints can be different

Enclosure System

- Imperfect Barrier
- Perfect Barrier

- Mask or Storage Types
  - Less mass and more permeability
- Drained or Screened Types
- Vented
  - Ventilated
  - Pressure Sensitive
  - Face Sealed
  - Concealed Barrier

Perfect Barrier / Face Sealed

- Structural Glazing
- Steel-Clad Foam Panels
- Face-Sealed EIFS

www.BuildingScience.com
Old EIFS

Polymer-based (FR) lath
Expanded polystyrene
Exterior
Exterior gypsum sheathing
or engineered wood sheathing (GWW)
Closure scrim

Timber frame
Cavity insulation
Interior gypsum lin

Interior

Substrate + moisture = problem

- Moisture sensitive substrates are a problem

EIFS & Rain Control: Recent lessons on how to fail

Kitchener, ON
Grand Rapids, MI
Conclusions

- Drainage is the key, cladding leaks
- All penetrations need to be drained!
- Beware flashing, it needs to waterproof
- Understand older systems are different

Details required at
1. Changes in plane
2. Changes in material
3. Changes in system / trade

Thus penetration, windows, rails, signs etc.