Learning Objectives

- Understand Rain Control Risk Factors
- Assess different strategies of rain deflection
- Be able to understand the 3 rain control strategies for enclosures
- Be introduced to some details
Rain

- Rain is the largest source of wetting
- We need to reduce wetting because
  - we have better insulation and airtightness
  - the materials are often less tolerant of wetting

Rain Penetration Control

- How much rain control do you need?
- Depends on
  - Climate
  - Site
  - Building height and massing
  - Surface features
  - Chosen enclosure wall strategy

Risk Factors

<table>
<thead>
<tr>
<th>Risk</th>
<th>Relationship to Rain-Penetration Problems</th>
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</thead>
<tbody>
<tr>
<td>Rainfall</td>
<td>As the amount of rainfall increases, the risk increases</td>
</tr>
<tr>
<td>Exposure</td>
<td>As the exposure to rainfall increases, the risk increases</td>
</tr>
<tr>
<td>Shape and Surface</td>
<td>As shape and surface features increase rain deflection and shedding respectively, the risk decreases</td>
</tr>
<tr>
<td>Water Penetration Resistance</td>
<td>As the water penetration resistance of the assembly increases, the risk decreases</td>
</tr>
<tr>
<td>Moisture Tolerance of Assembly</td>
<td>As the moisture tolerance of the materials that comprise the assembly increases (e.g., masonry and concrete vs. wood and steel) the risk decreases</td>
</tr>
<tr>
<td>Drying Potential</td>
<td>As the ability of an assembly to dry increases due to the climate, design, or both, the risk decreases</td>
</tr>
<tr>
<td>Workmanship</td>
<td>As craftsmanship, inspection, &amp; testing of the construction quality increases, risk decreases</td>
</tr>
</tbody>
</table>
3D’s of Controlling Rain Leaks

- **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 by diffusion & ventilation

**DEFLECTION**

- Site
  - (trees, buildings etc)
- Building massing
- Overhangs
- Surface features
- Base/site

**Exposure Matters**

- High-rise bldgs exposed to much higher wind & rain
Roof shape helps deflect rain around building.

Overhangs do more than “shadow” rain.

Overhangs help, esp. on low-rise.

- Old Building- multi-story, old windows
- Control Rain on the Surface
- Multiple shedding, drips, etc
- Reduced rain load on joints and openings
Surface Features:
Protect Wall Openings

Modern Buildings often do not respect need for surface drainage
Surface Water and Splashback

Modern concrete sill with generous jamb extensions and groove cut to form a lower drip edge

Exposure Matters!

Drainage / Exclusion / Storage

ENCLOSURE STRATEGIES
Enclosure Wall Strategies

- As some rainwater is likely on the wall
- Water can penetrate in many ways

*Once rain is on the wall ...*

- Drainage
- Exclusion
- Storage

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Rain Control

- Three possible approaches
  - Mass
  - Drained
  - Perfect Barriers

- Element and joint can be different approaches

- Perfect Barriers are risky

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Storage/Mass Walls

- Rubble
- Solid Masonry
- Composite/layered
Renovating / Change

Perfect Barrier
- Highly dependent on workmanship
- Field joints tend to leak (if exposed sealant)

Categorization

Perfect Barrier

- More mass and more permeability
- Less mass and lower permeability

Wall System
- Joints
- Elements
- Imperfect Barrier
- Perfect Barrier

Mass or Storage Types
- Drained or Screened Types
- Perfect Barrier Types
- Pressure moderated
- Ventilated
- Unvented

Cavity
- No Cavity
- Face Sealed
- Concealed Barrier

Ventilated and pressure moderated

EIFS & Rain Control: Recent lessons on how to fail

Kitchener, ON

Grand Rapids, MI
Drained Walls

- Drained systems preferred
- Account for joints and penetrations as well as installation defects and material failure

Claddings that leak

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

Requirements Drained Walls

- Drainage plane
  - Water repellent, continuous
- Drainage gap
  - Even 1 mm (<1/16") is enough!
- Flashing
  - Waterproof to direct water outward
- Weep holes
  - Above grade
Lapped Housewrap, paper

Traditional Drainage Plane

Laps are the most reliable

Note: Small local tape failure is not catastrophic.
• Taped Foam

• Huber ZIP OSB with built-in water control layer + special tape

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”
Rain, Rain Go Away

March 7, 2012

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14 of 22
Drained gap behind brick

Thin strips behind wood

Enclosure Design: Details
- Details demand the same approach as the enclosure.
- Scaled drawings required at [insert location].
Base Flashing

Rainwater can flow downward through openings, cracks and cavities driven by gravity.

Flashing and drainage plane direct gravity flow back towards the exterior.

Base Flashing: Waterproof

Upturned leg
Base sloped to exterior
Drip edge

Water can build up here -- we need a waterproof barrier

Note standing water
Building Science University of Waterloo

Rain, Rain Go Away
March 7, 2012

Ventilation helps drying. Not always needed.

Ventilation space

Structure / Backup wall

Vent Openings

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Building Science 2008

Door Sills

Door sill

Subsill
Drying

- Complex and involved subject
- Drying capacity depends on
  - Climate (inside and outside)
  - Enclosure design (insulation, ventilation, permeance)
- Extra drying capacity is always good
- Extra drying is not always needed
  - Analysis and judgement required
Conclusions

- Rain Penetration Control is complex
- Should approach it holistically
  – Assess Exposure Risk

Thank you for your time!
Any Questions?

This concludes The American Institute of Architects
Continuing Education Systems Program