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Rain Control for Walls: Venting, Ventilation and Drainage

Overview
• Rain Control basics review
• Role of ventilation and drainage
• What makes them work?
• When do we need them?

Controlling Rain Penetration
• Deflection
  – reduce water on building
  – redirect water away
  – slope surfaces, use flashing
• Drainage / Exclusion / Storage
  – enclosure design choice
  – provide drainage, barrier or storage
• Drying
  – allow any remaining water to dry
Deflection

- Surface & site features are also important

Overhang

Drips at Opening Heads & Sills

Splash Height

Deflection

Rain penetration test
Many claddings leak

- Brick
- Wood, vinyl, fiber-cement siding
- Stucco
- Metal panels

- Joints leak: window, precast, curtainwall

Drained Walls

Requirements for a Drained Enclosure

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

Structure / Backup wall
DRAINAGE PLANE

Drainage Plane

Lapped Housewrap, paper, membrane

Laps are the most reliable
High-performance: thick, self-sealing adhered

Laps

DRAINAGE GAP
Drainage Gaps

• We have long built gaps in walls/roofs
• Why?
  Both drainage and ventilation use gaps
• What is the proper gap size for:
  – Drainage?
  – Ventilation?
• When do I need drainage? Ventilation?

Drainage Gaps

• Gap avoids hydrostatic pressure
  – drains away water
• Reduces time of wetness on housewrap, membrane, cladding
• Requires only small gap, e.g. <1/16”

Leaks

• If obstruction, head builds up and small nail/staple holes leak
• Some housewraps come with pre-manufactured holes

Drained gap behind brick
• Vinyl drains well with no strapping

Lap Siding
• Water ran out the front of wall
  – Good design for drainage

“Adhered Veneer”
Stucco sticks to paper/housewraps

FLASHING + WEEPHOLES

Water drained astonishingly well between sheets of building paper
Flashing

- Need to direct water outward

Leaky windows

- Leaks around windows occur
- Collect and dump onto drainage plane w/ flashing

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

Note standing water
VENTILATION

Ventilation Drying

• Ventilation: design to allow some exterior air to flow between cladding and sheathing in an air gap
• Usually driven by solar heating, sometimes by wind

How much Ventilation do you need

• Are materials adjoining the gap moisture sensitive, e.g.?
  – Are you drying the cladding back?
    • Wood siding, fiber-cement
  – Are you drying the wall sheathing?
    • OSB exposed to wet cladding like stucco, brick, etc
• Are you controlling inward vapor drives?
  – Moisture storing claddings, with vapor permeable sheathing
Previous Ventilation Research

- Fraunhofer Institut
  - Cladding on wet AAC
  - Test hut
  - Ventilation allowed faster drying
  - Initially dry test hut
  - No effect of ventilation found
  - No wetter/drier

Lab test: Drying vs flow

Ventilation Research: ASHRAE 1091

Ventilation drying study
Wood frame walls
Example Field Results: ASHRAE RP1091

- Induced wetting event
- Brick w/Tyvek non-ventilated
- Brick w/Tyvek ventilated
- Brick w/#15 felt ventilated
- Vinyl w/#15 Felt
- Vinyl w/Tyvek

Specified 1" gap
Actual ....

Drained gap behind wood

Taped Foam
Summary

• We need gaps to provide drainage
  – flashing, esp at penetrations, critical
• The required size of the drainage gap is
  very small (in the 1/16”+)
• Larger gaps can be useful for ventilation
  drying (1/4”- ¾” clear)
  – We don’t always need ventilation drying