Joseph Lstiburek, Ph.D., P.Eng, ASHRAE Fellow

Building Science

Adventures In Building Science

www.buildingscience.com
Back to Barrier and Face Seal....
Can Barrier or Face Seal Work?
Sealant backer rod

Inner seal

Wind pressurizes chamber between inner and outer seal

Sealant backer rod

Outer seal

Vent tube
Outer sealant on backer rod drained at vertical joints

Inner sealant on backer rod continuous for water and air control continuity

**Note:** Precast concrete is the water and air control layer

Line of outer sealant at panel joints

Line of inner sealant at panel joints

Structural columns and walls should be held back from slab edge to allow for installation of air and thermal control layers

Precast panel (installed first)

Corrosion-resistant metal pin to connect panels without penetrating air and water layers

Gypsum board

Steel stud

Cast in place anchor
Latex paint

Stucco rendering

Concrete block

Rigid insulation (vapor semi-permeable) — unfaced extruded polystyrene, unfaced expanded polystyrene, glass fiber-faced isocyanurate

Uninsulated steel frame wall

Non-paper faced gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Vapor permeable coating — greater than 10 perms ("latex paint")

Polymer modified (PM) or standard Portland cement stucco

Masonry wall

Seat in concrete slab

Weep screed

Ground slopes away from wall at 5% (6 in. per 10 ft.)

Concrete slab

Granular capillary break and drainage pad (no fines)

Concrete grade beam

Polyethylene vapor barrier extended under grade beam where it also acts as a capillary break

Vapor semi-permeable rigid insulation — expanded polystyrene, extruded polystyrene, fiber-faced isocyanurate

2x2 wood furring

Non-paper faced gypsum board

Latex paint or other permeable or vapor semi-permeable interior finish

Hold gypsum board up from slab 4”

Wide baseboard

Concrete slab
Stucco (cladding)

Masonry wall

Concrete slab

Weep Screed Flashing
(provides drainage at stucco - masonry connection)

"Seat" in slab acting as a flashing for masonry - slab connection
Reminder…
Don’t Do Stupid Things
1. Evaporation

Water with salt in solution travels in porous material via capillary flow to surface where evaporation occurs.

2. 

Salt is left behind as water evaporates; process leads to an ever-increasing concentration of salt as evaporation continues.

3. 

Water rushes to dilute concentration of salt leading to potentially huge hydrostatic pressures.

4. “Spalling”

Surface breaks apart and flakes when hydrostatic pressure due to “osmosis” exceeds cohesive strength of material.
Diffusion + Capillarity + Osmosis = Problem

- Diffusion Vapor Pressure: 3 to 5 psi
- Capillary Pressure: 300 to 500 psi
- Osmosis Pressure: 3,000 to 5,000 psi
Mortar “eaten” away as drying happens from within the mortar matrix

Salts left behind on surface in the form of crystals ("efflorescence")

Evaporation from surface film of water

Capillary flow of salts in solution
Lime mortar “eaten” away over time “sacrificing” itself to protect brick and masonry units.

Evaporation from thick lime-based mortar rendering.

Capillary flow of salts in solution.
Vapor semi-permeable rigid insulation — extruded polystyrene
Wood furring
Polymer modified (PM) or standard Portland cement stucco
Masonry block wall
Gypsum board
Latex paint or other permeable interior finish

Drying to interior and exterior
Surface Tension

- "non-wetable" surface
- water repellent surface
- hygrophobic surface
- water more attracted to itself than to surface
- surface energy of water greater than surface energy of surface
- water "beads up"
- "greasy" surface
- high contact angle $\theta$

- "wetable" surface
- non-water repellent surface
- hygroscopic surface
- water more attracted to surface than itself
- surface energy of surface greater than surface energy of water
- water "spreads out"
- "non-greasy" surface
- low contact angle $\theta$
Premier House Wrap by CS Fabric Int'l

- Air and Moisture Barrier
- Tear Resistant
- Easy Installation

Meets all national building codes

National ES Report No. NER-655
Premier HouseWrap by CS Fabric Int'l

- Air and Moisture Barrier
- Tear Resistant
- Easy Installation

Meets all national building codes
See National ES Report No. NER-655
Premier HouseWrap by CS Fabric

- Air and Moisture Barrier
- Tear Resistant
- Easy Installation
Premier HouseWrap by CS Fabric Int'l

- Air and Moisture Barrier
- Tear Resistant
- Easy Installation

Meets all national building codes
See National ES Report No. NER – 655