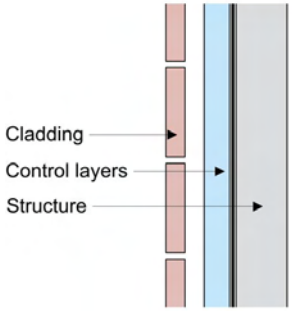


Rain Control Layer
Air Control Layer
Vapor Control Layer
Thermal Control Layer

Building Science

Rain Control

presented by www.buildingscience.com

Rain

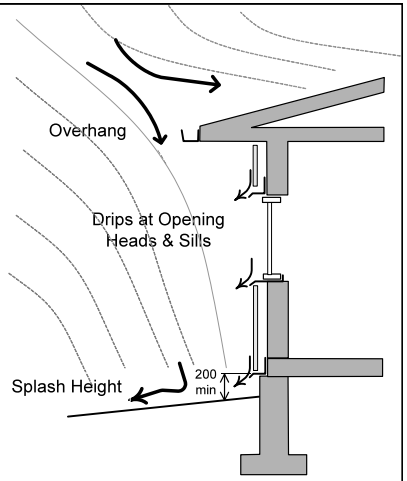
- Rain is the largest source of moisture
- We need better control for better insulation and airtightness
- Rain penetration control
  - Site and massing
  - Surface features
  - Enclosure wall strategy

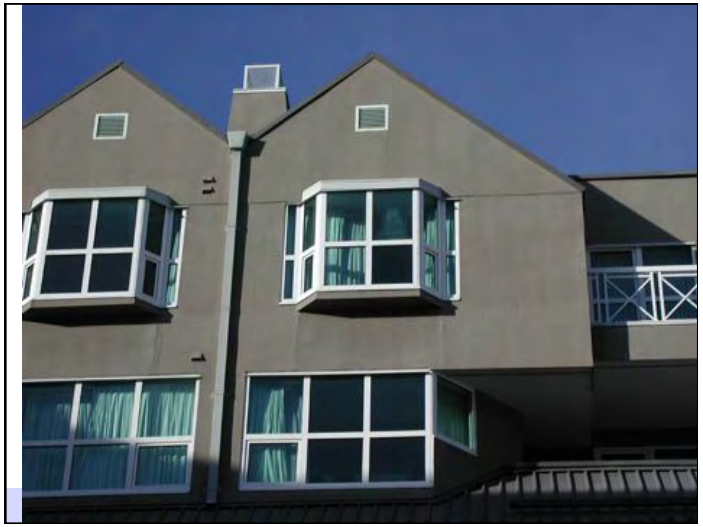
Controlling Rain Penetration

- *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

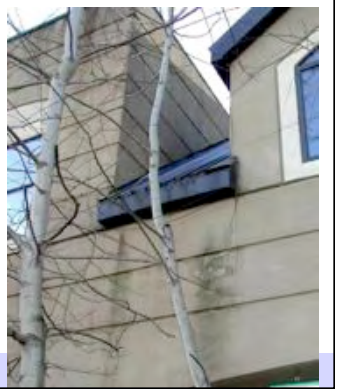
Deflection

- **Surface & site features are also important**



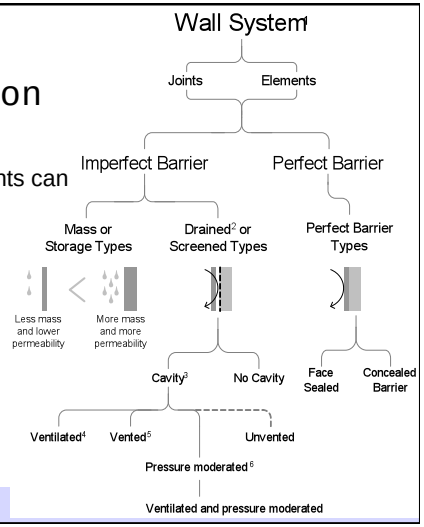


Don't concentrate water!

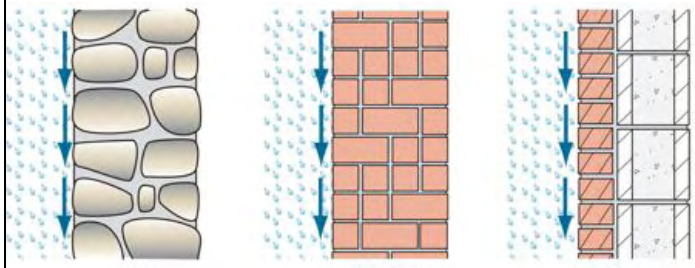


Categorization

- Elements and joints can be different



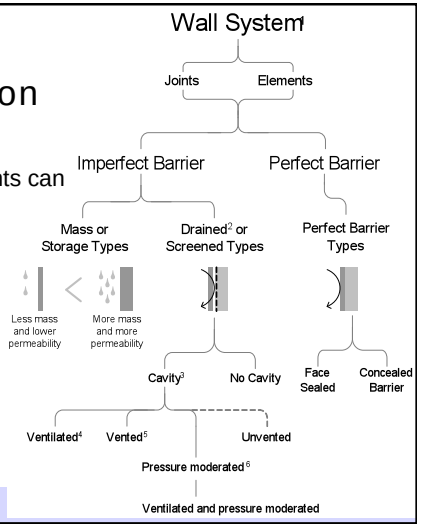
Mass/Storage/Reservoir Walls



John Straube

Categorization

- Elements and joints can be different

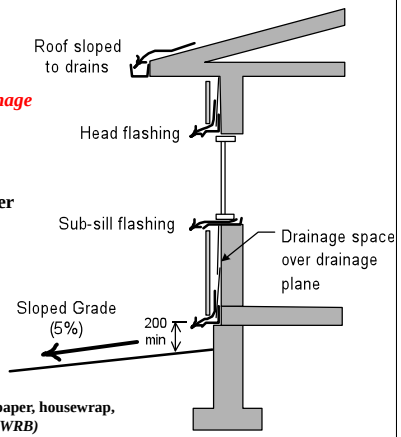


Claddings that leak

- 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***



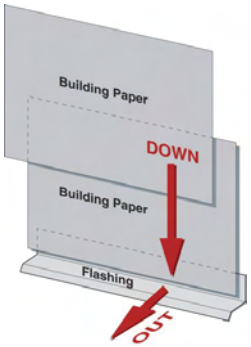
Terms: sheathing membrane, building paper, housewrap,
Stupid terms: *weather resistant barrier (WRB)*

Requirements Drained Walls

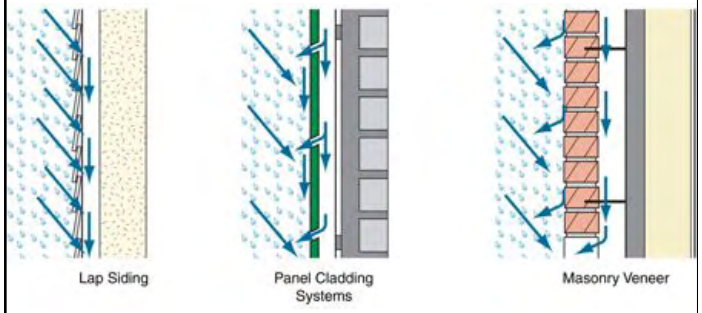
- Drainage plane
  - Water repellent, continuous
- Drainage gap
  - 1/16" is enough!
- Flashing
  - Waterproof to direct water outward
- Weep holes
  - Above grade

Drainage Plane

Lapped Housewrap, paper



Drained Walls



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Rain Control 27

Drained gap behind brick

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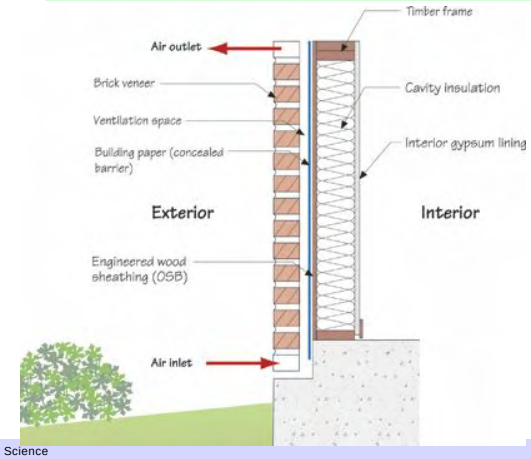
Rain Control 28

Beware: These are vapor barriers!!!

Ventilation helps drying. Not always needed.



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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”

34


Weep holes


JJAC Test house 2001

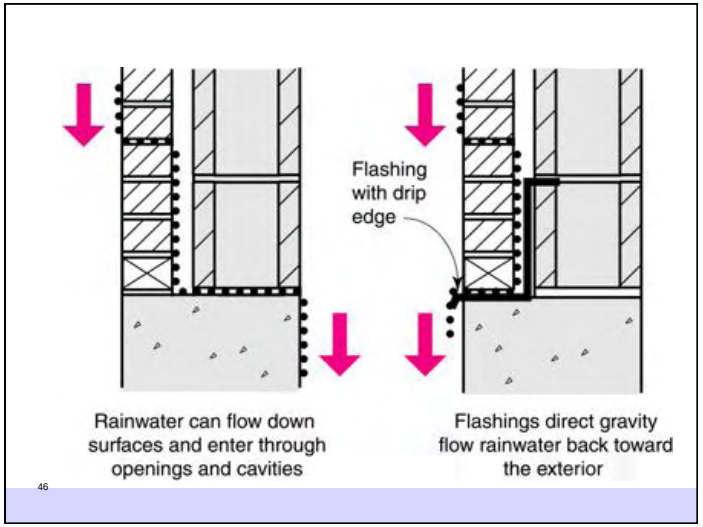
Stucco sticks to paper/ housewraps

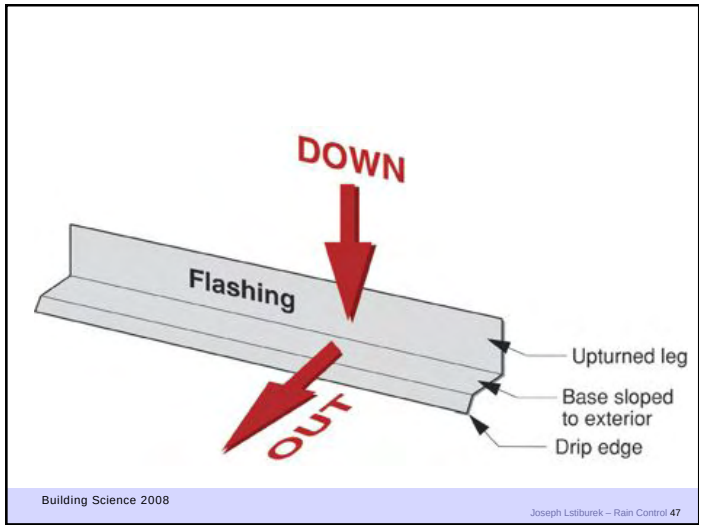
Water drained astonishingly well between sheets of building paper

- Vinyl drains well with no strapping

44


Drained gap
behind wood
Tyvek
COMMERCIALWRAP


Flashing
with drip
edge
Rainwater can flow down surfaces and enter through openings and cavities
Flashings direct gravity flow rainwater back toward the exterior
46


DOWN
Flashing
OUT
Upturned leg
Base sloped to exterior
Drip edge
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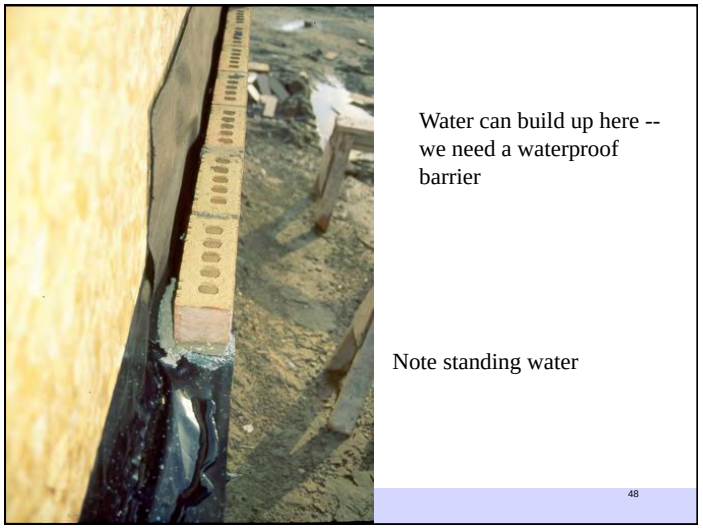
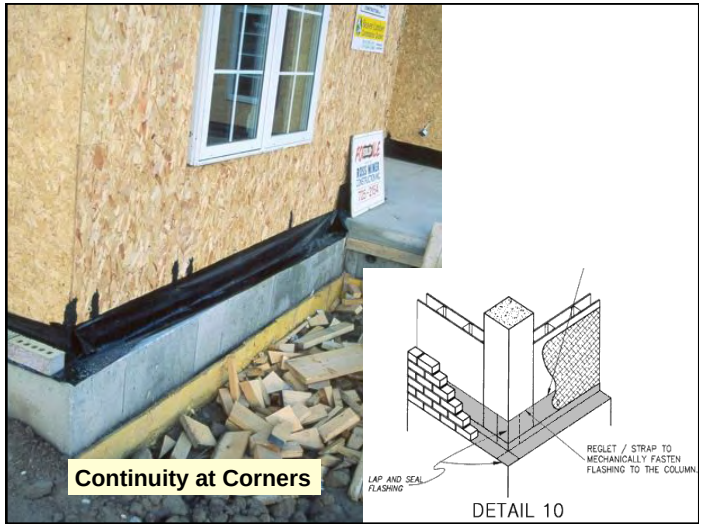
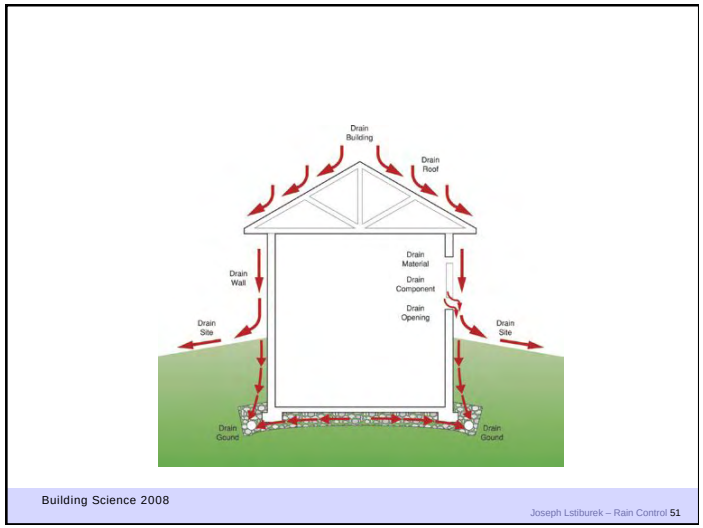

Water can build up here -- we need a waterproof barrier
Note standing water
48


Continuity at Corners
REGLET / STRAP TO MECHANICALLY FASTEN FLASHING TO THE COLUMN.
LAP AND SEAL FLASHING
DETAIL 10


Blueskin
Blueskin
Base Flashing


Drain Building
Drain Roof
Drain Material
Drain Component
Drain Opening
Drain Wall
Drain Site
Drain Site
Drain Ground
Drain Ground
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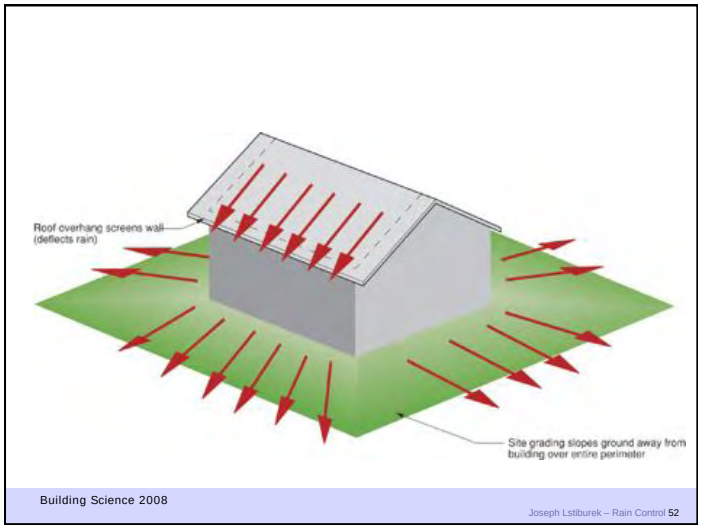
Roof overhang screens wall (deflects rain)
Site grading slopes ground away from building over entire perimeter
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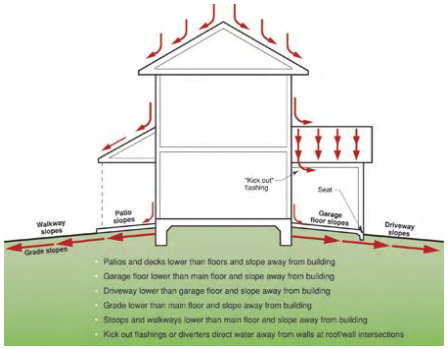

New materials

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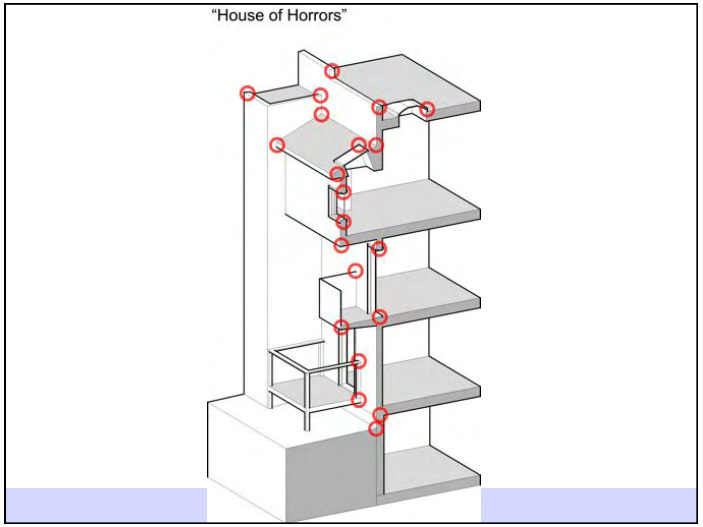

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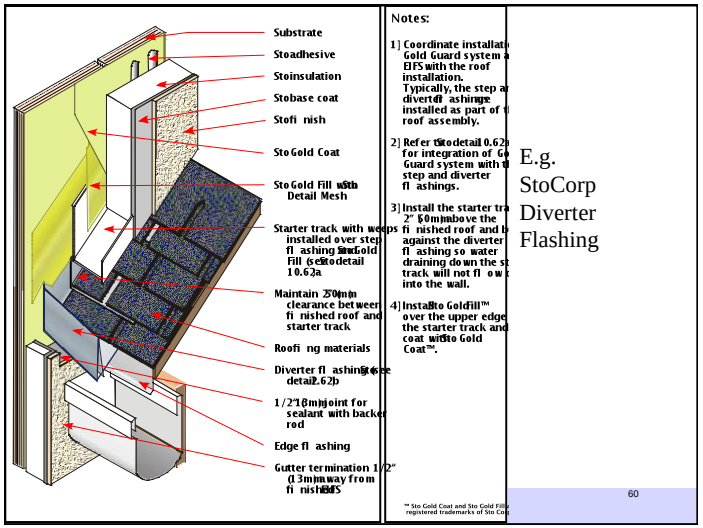
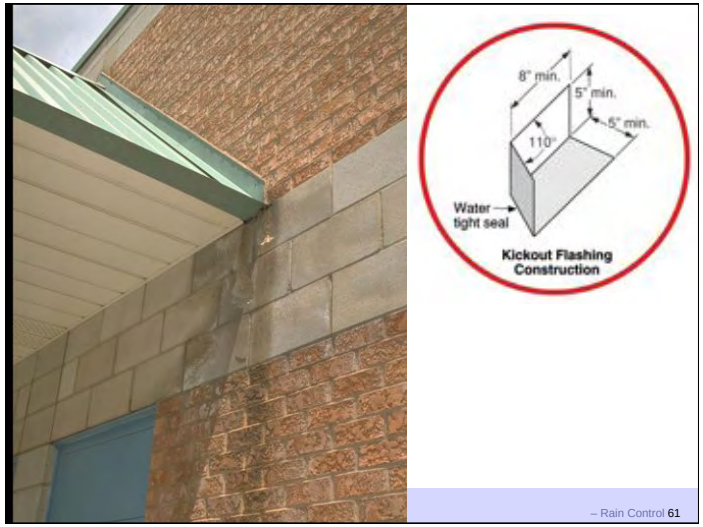
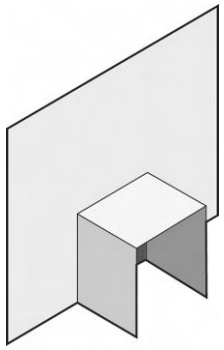


E.g. StoCorp Diverter Flashing



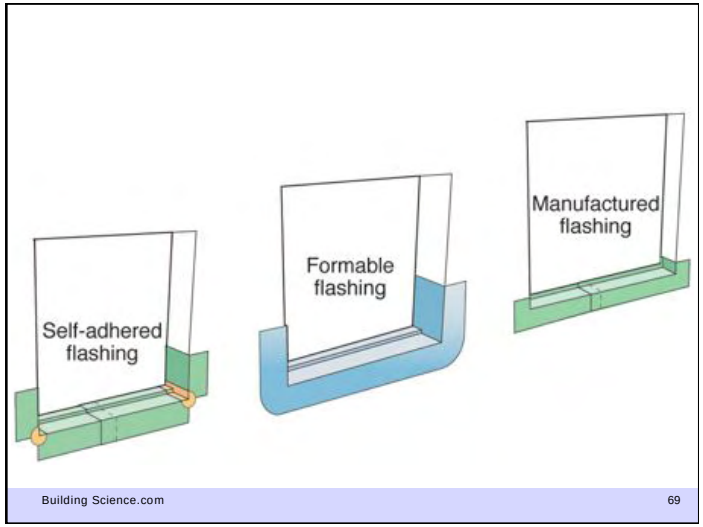
Saddle flashing



Exterior sealant is temporary, aesthetic, water shedding layer

Leaky windows

- Moisture sensitive substrates are a problem


Self-adhered flashing
Formable flashing
Manufactured flashing
Building Science.com
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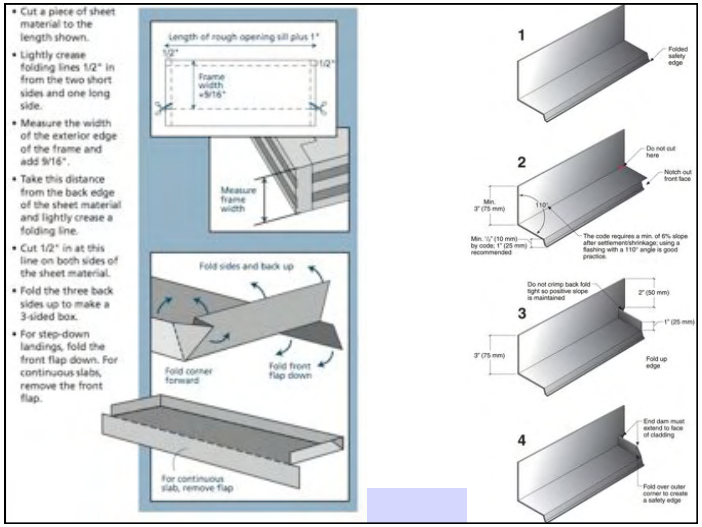
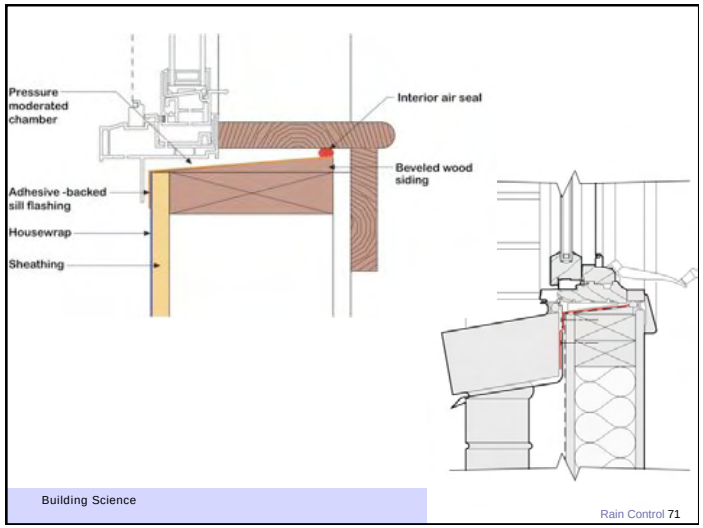
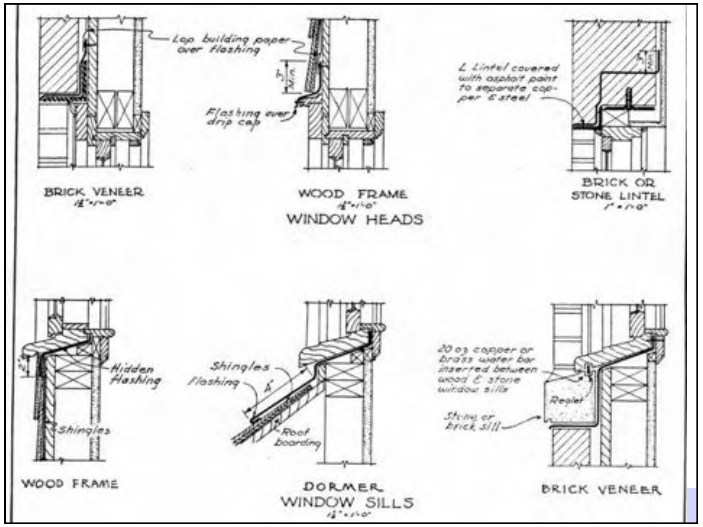
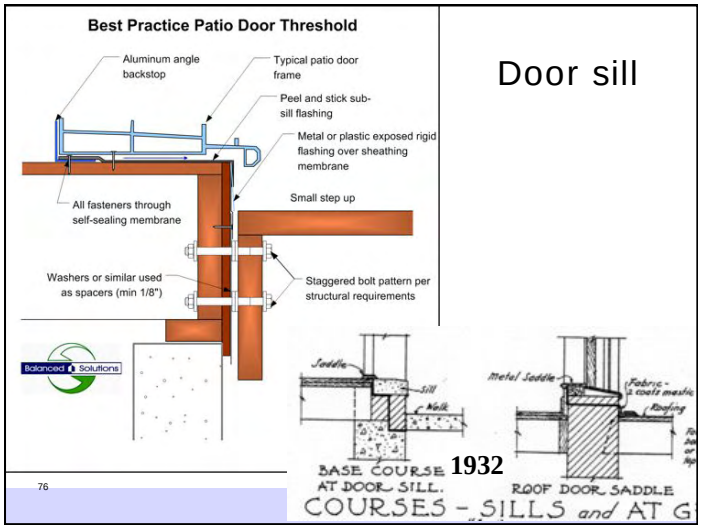

Cut a piece of sheet material to the length shown.
Lightly crease folding lines 1/2" in from the two short sides and one long side.
Measure the width of the exterior edge of the frame and add 9/16".
Take this distance from the back edge of the sheet material and lightly crease a folding line.
Cut 1/2" in at this line on both sides of the sheet material.
Fold the three back sides up to make a 3-sided box.
For step-down landings, fold the front flap down. For continuous slabs, remove the front flap.
Length of rough opening sill plus 1"
Frame width +9/16"
Measure frame width
Fold sides and back up
Fold corner forward
Fold front flap down
For continuous slab, remove flap
1
2
3
4

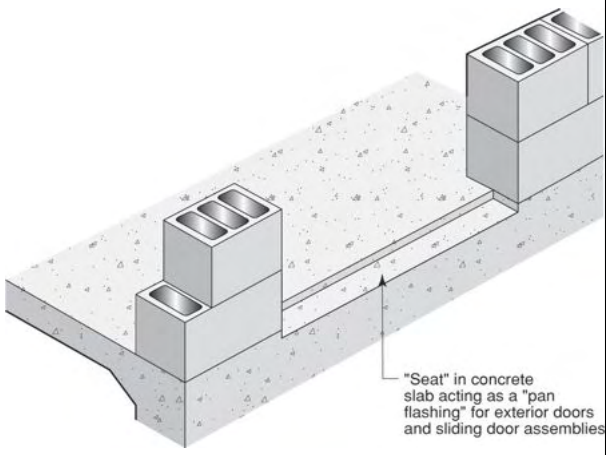

Pressure moderated chamber
Interior air seal
Beveled wood siding
Adhesive -backed sill flashing
Housewrap
Sheathing
Building Science
Rain Control 71

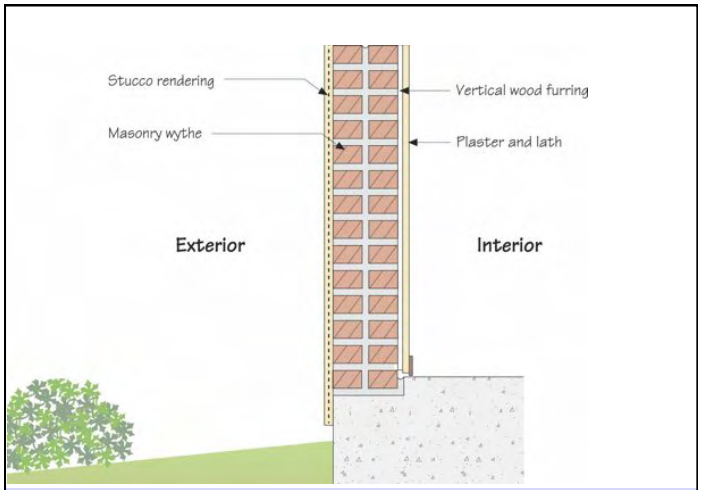

PARR LUMBER
DUPONT
Tyvek
Moistop
E-Z Seal
Rain Control 72


Lap building paper over flashing
Flashing over drip cap
BRICK VENEER
WOOD FRAME
WINDOW HEADS
L Lintel covered with asphalt paint to separate copper & steel
BRICK OR STONE LINTEL
Hidden Flashing
Shingles
WOOD FRAME
Shingles
Flashing
Roof boarding
DORMER WINDOW SILLS
20 oz copper or brass water bar inserted between wood & stone window sills
Reglet
Stone or Brick sill
BRICK VENEER

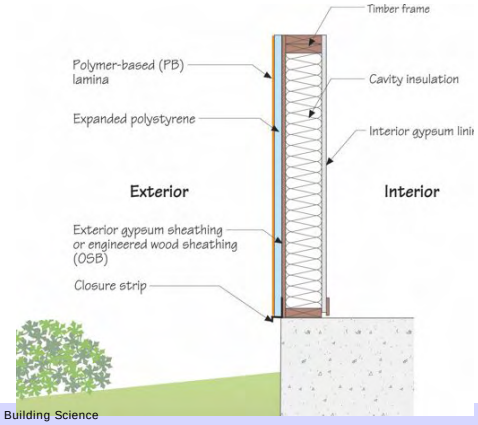

Door Sills
75


Best Practice Patio Door Threshold
Aluminum angle backstop
Typical patio door frame
Peel and stick sub-sill flashing
Metal or plastic exposed rigid flashing over sheathing membrane
Small step up
All fasteners through self-sealing membrane
Washers or similar used as spacers (min 1/8")
Staggered bolt pattern per structural requirements
Balanced Solutions
Saddle
Sill
Walk
Metal Saddle
Roofing
BASE COURSE AT DOOR SILL.
ROOF DOOR SADDLE
Door sill
1932
COURSES - SILLS and AT G
76


"Seat" in concrete
slab acting as a "pan
flashing" for exterior doors
and sliding door assemblies


Stucco rendering
Masonry wythe
Vertical wood furring
Plaster and lath
Exterior
Interior

Old EIFS



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Substrate + moisture = problem

- Moisture sensitive substrates are a problem

EIFS

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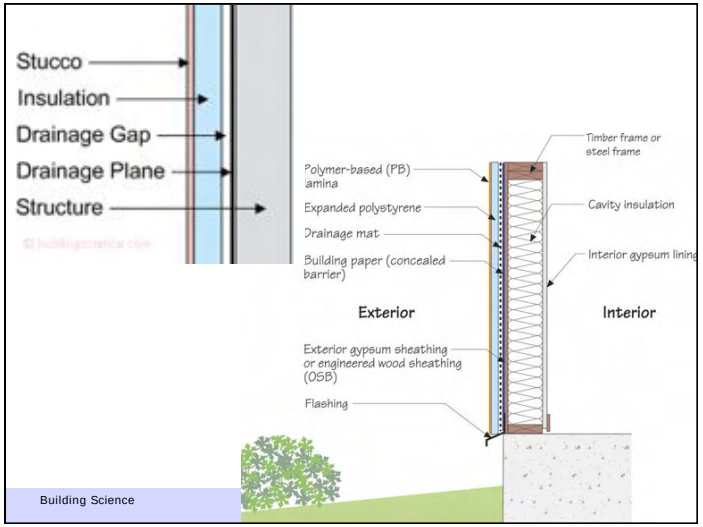

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Conclusions

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