Details for Mold-Free Homes

PACNY Annual Environmental Conference
April 15, 2005

April 14, 2005

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Ideal Enclosure Construction

- Build with dry materials
- Allow no water to get into the assemblies during construction
- Dry any assemblies or elements that get wet prior to closing up

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Enclosure Design Theory

- Prevent assemblies from getting wet from the outside
- Prevent assemblies from getting wet from the inside
- Should assemblies get wet or start out wet, allow them to dry to the interior, exterior, or both

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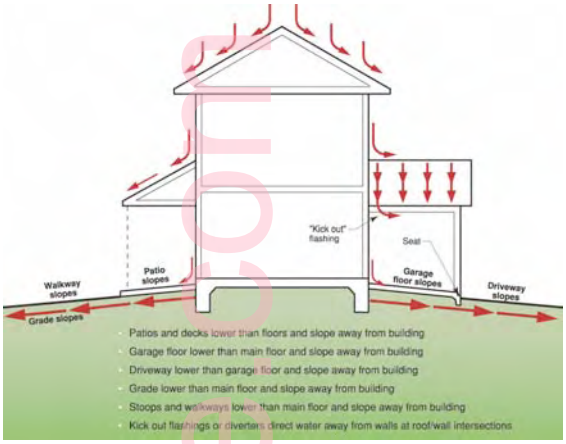
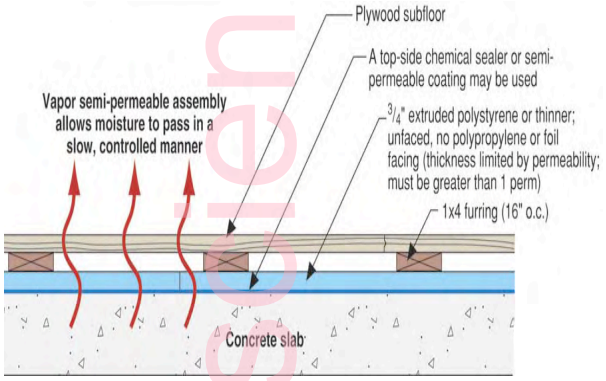
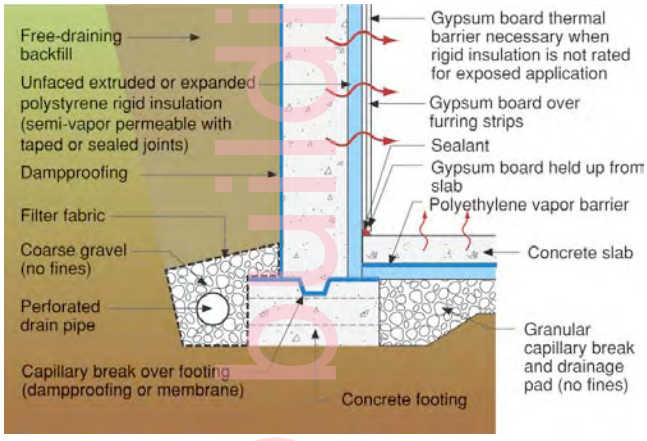
Hygric Balance

- How Buildings Get Wet
  - From the outside
  - From the inside
  - Start out wet





- How Buildings Dry
  - Dry to the Outside
  - Dry to the Inside



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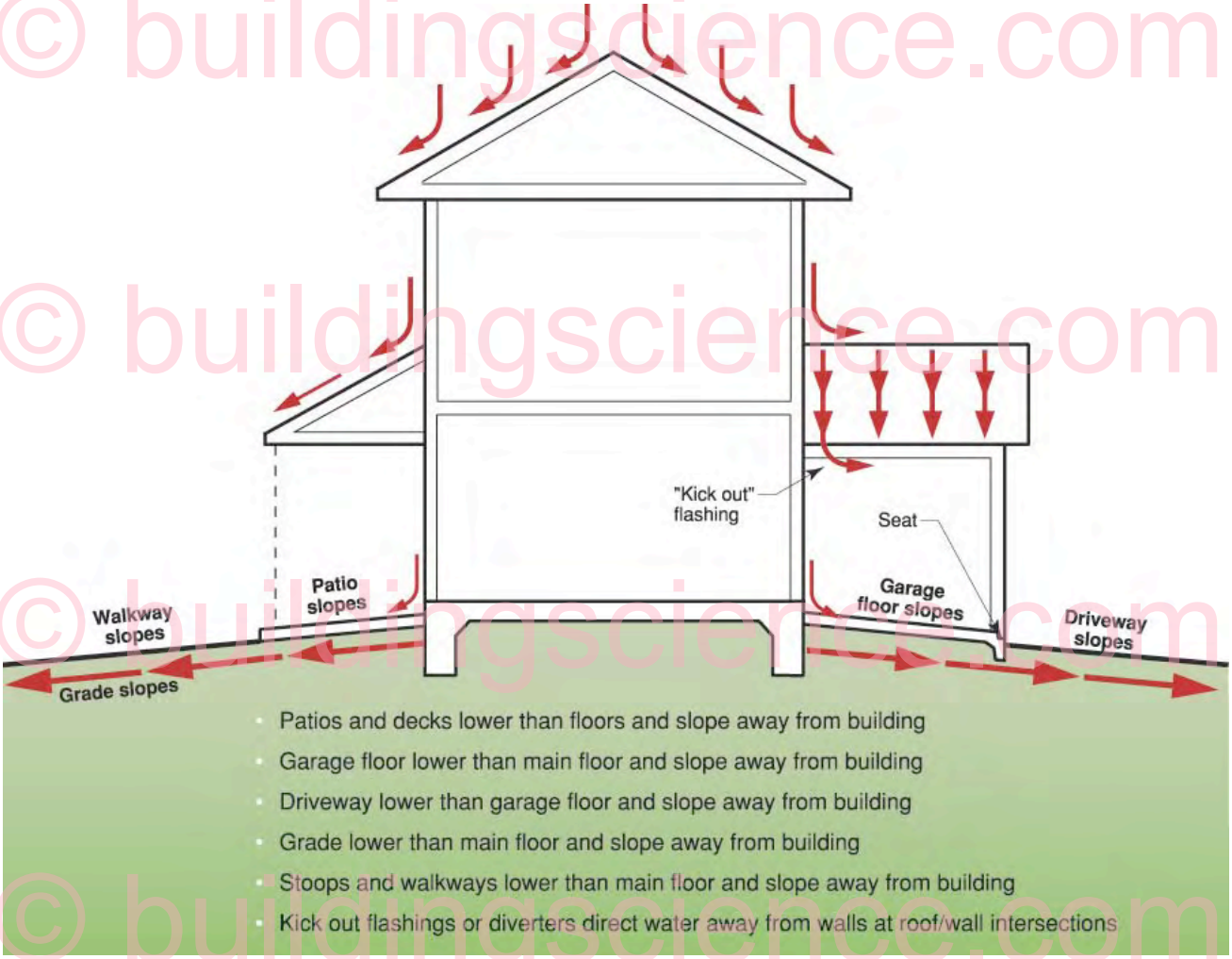
Definition of a Moisture Problem

- It's a rate issue, that is, when the rate of wetting is greater than the rate of drying accumulation occurs.

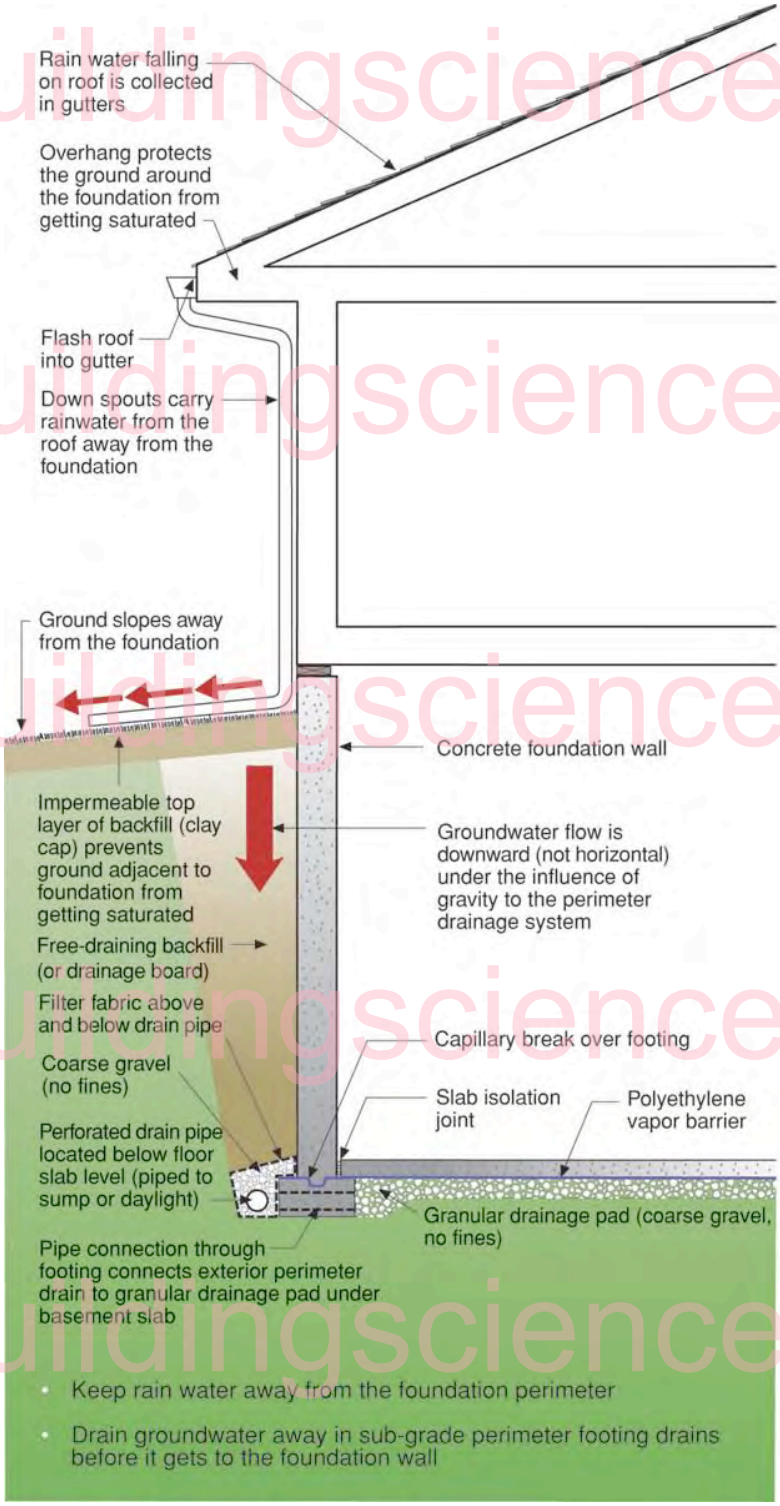
- Problems don't occur until the quantity of accumulated moisture exceeds the moisture storage capacity of the material, system or assembly.

- The moisture storage capacity is specific
  - time
  - temperature
  - material

Shed the water from the face of the building



Keep the groundwater from entering the building at the foundation



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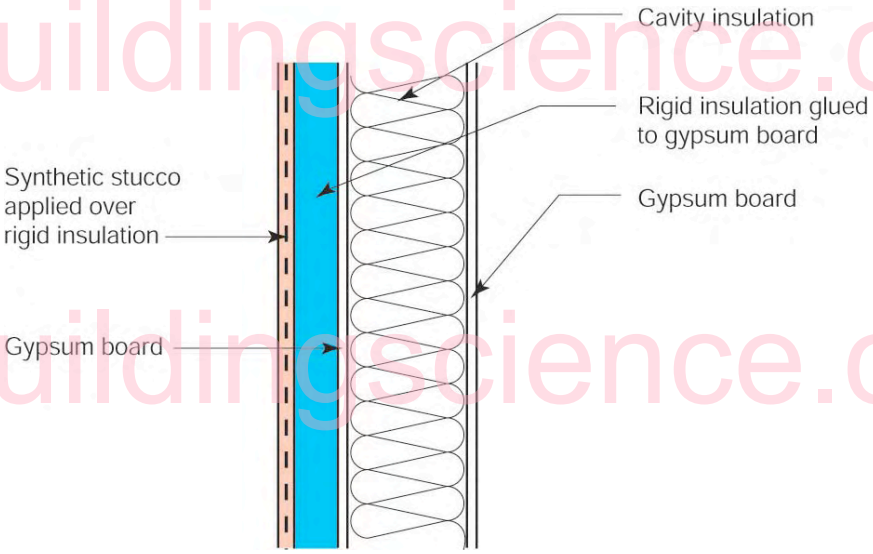
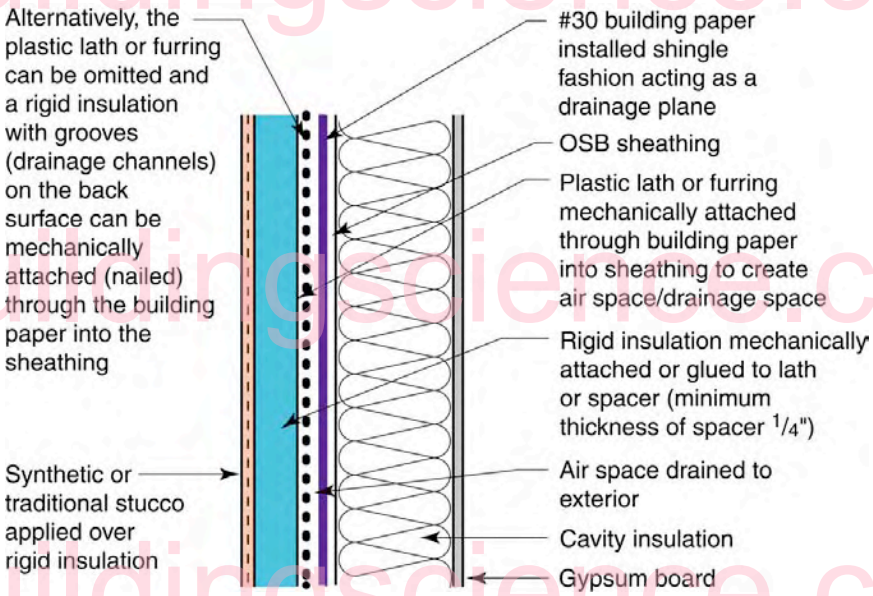
What can go wrong?

Drainage Planes are Required Where it Rains



Bad - no drainage plane



Good - drainage plane provided

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What can go wrong with a well built house?

- 1/2 GWB over poly
- R-13 unfaced batts
- 1/2” Insulating Sheathing as drainage plane
- Brick veneer

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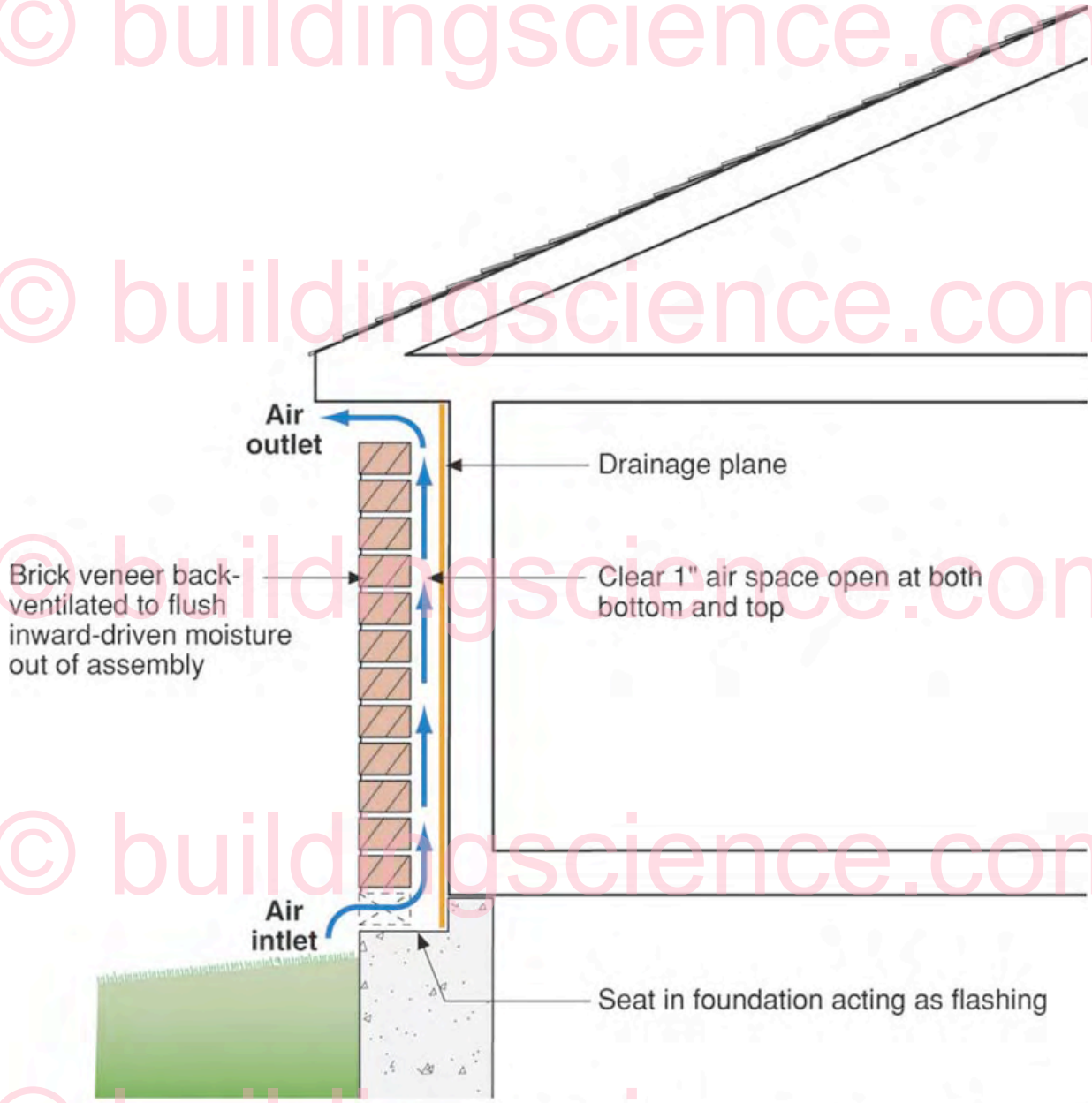
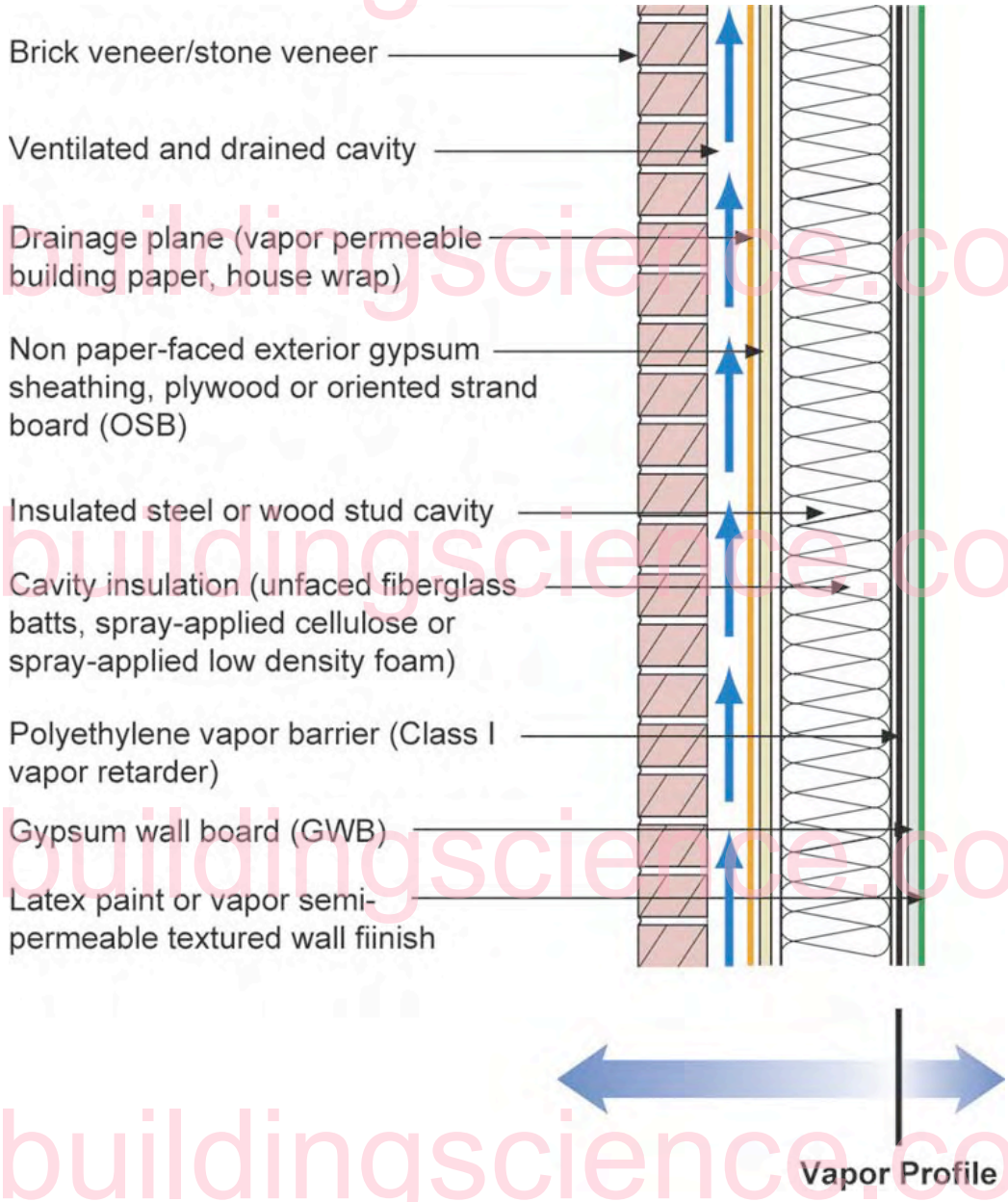
Keep cavities clear for drainage



- To effectively uncouple a brick veneer from a wall system by using back ventilation, a clear cavity must be provided along with both air inlets at the bottom and air outlets at the top

Keep cavities clear for drainage

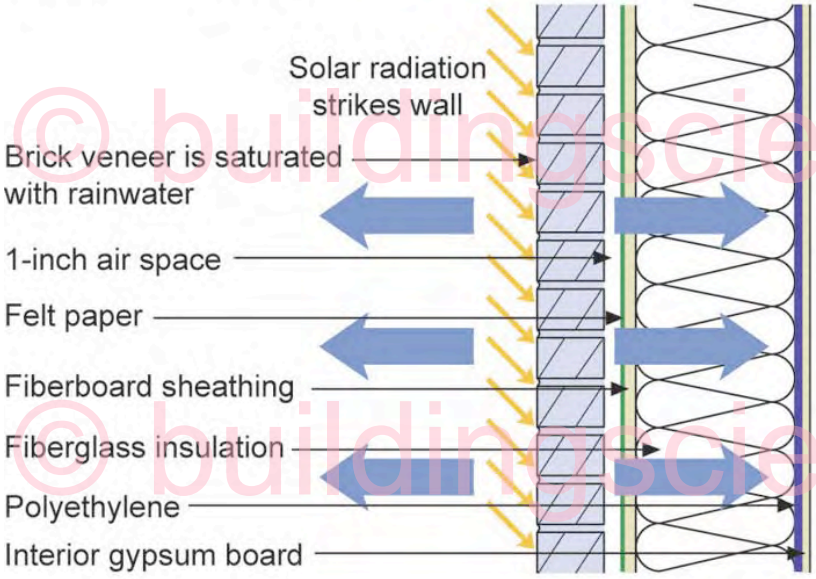


Plastic Vapor Barriers Often Keep Assemblies Wet Rather than Prevent Them From Getting Wet

Exterior Conditions
Temperature: 80°F
Relative humidity: 75%
Vapor pressure: 2.49 kPa

Conditions within Cavity:
Temperature: 100°F
Relative humidity: 100%
Vapor pressure: 6.45 kPa

Interior Conditions
Temperature: 75°F
Relative humidity: 60%
Vapor pressure: 1.82 kPa



Vapor is driven both inward and outward by a high vapor pressure differential between the brick and the interior and the brick and the exterior.

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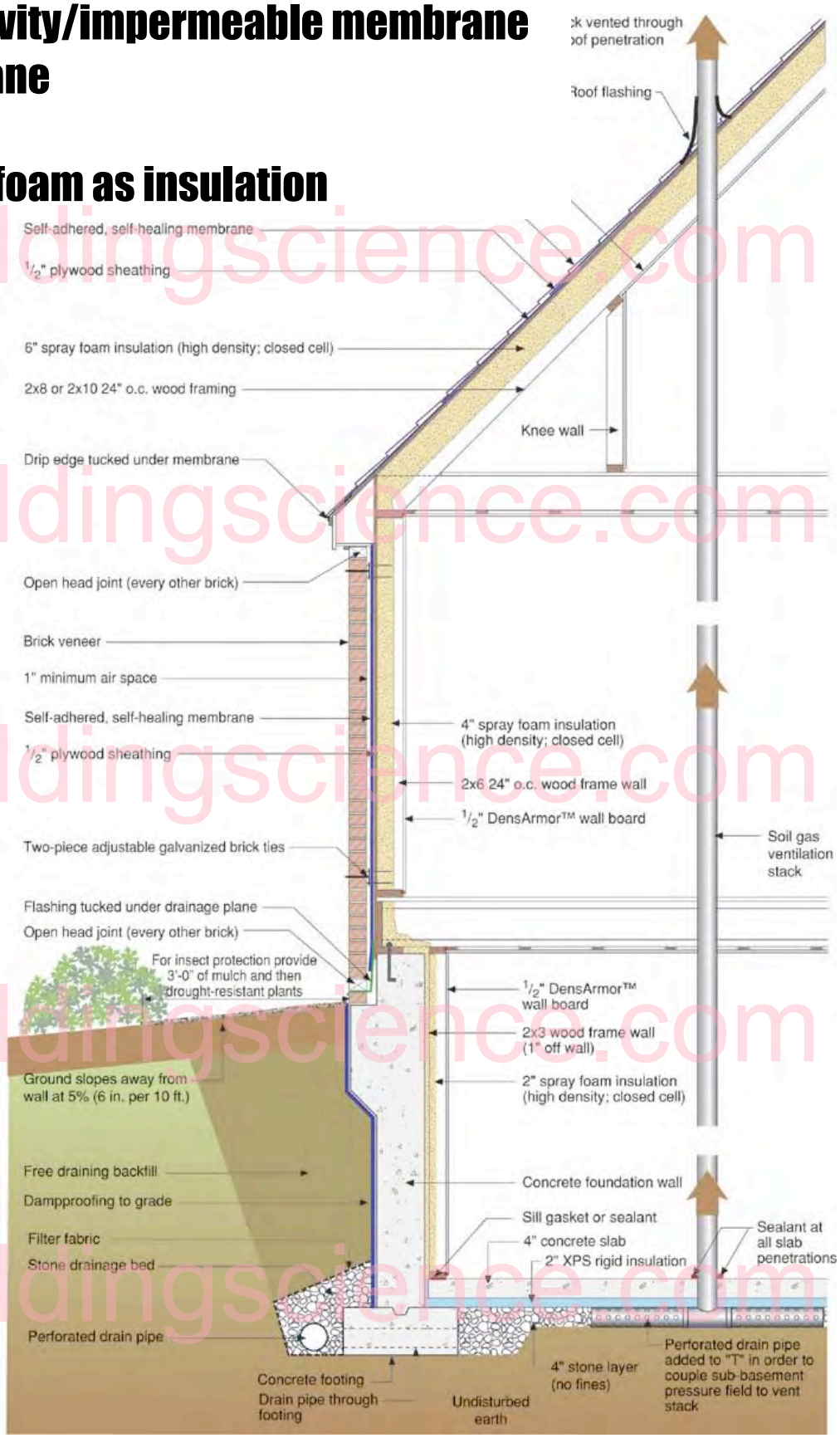
- **Brick Face/ cavity/impermeable membrane as drainage plane**

- **Impermeable foam as insulation**



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What can go wrong with a well built house?

- 1/2 GWB over poly
- R-13 unfaced batts
- Housewrap
- Cedar Clapboards

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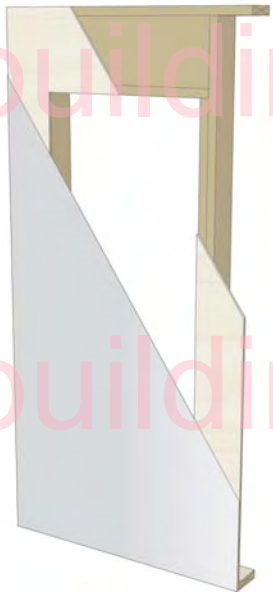
What went wrong?

Back vent siding to uncouple it from the wall

What went wrong?

Wrap window openings



Provide Flashing Around Intentional Openings

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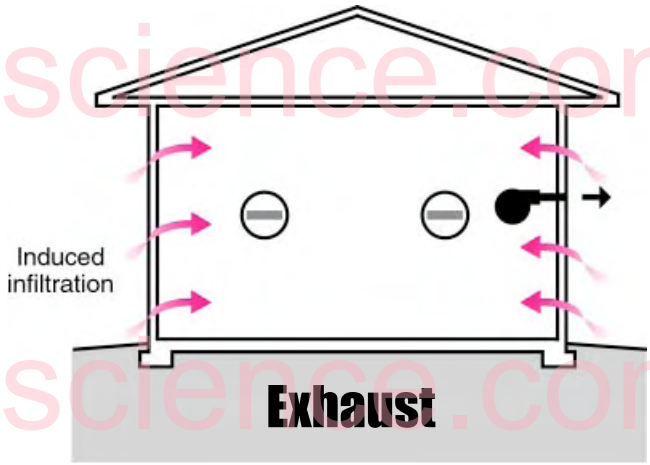
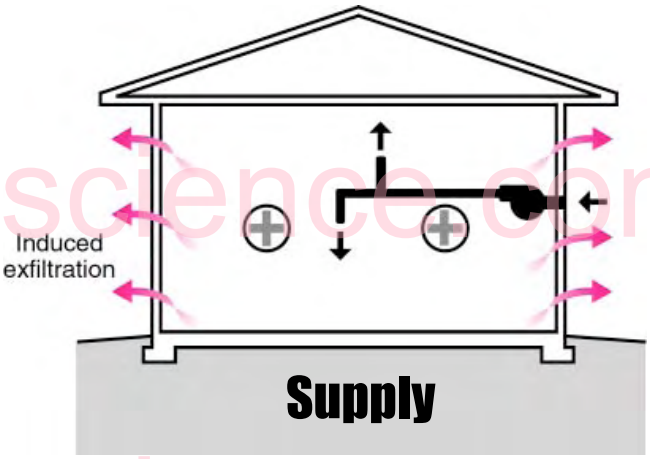
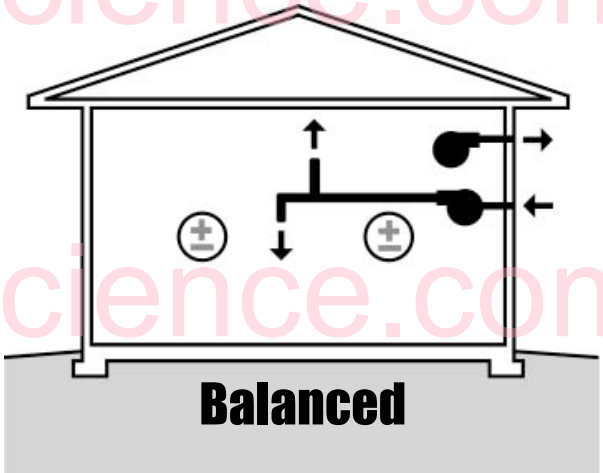
Dilute Interior Moisture Load with a Ventilation System

- **Exhaust ventilation**
  single- or multi-point
- **Supply ventilation**
  single- or multi-point
  integrated with central system fan
- **Balanced ventilation**
  single- or multi-point
  integrated with central system fan
  with or without heat or energy recovery







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Six Steps to Mold-Free Homes

1. Keep the groundwater from entering the building at the foundation

2. Keep the rain off the face of the building

3. Uncouple the cladding from the sheathing

4. Provide good flashing systems to keep the water out of the wall
   - This includes windows and doors and other penetrations such as vents, electrical connections, and plumbing.

5. Allow the wall to dry to the interior by not installing polyethylene or other impermeable materials
   - Vapor barriers should never be installed on the inside of air conditioned buildings

6. Dilute the interior moisture load by providing controlled mechanical ventilation

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