



U.S. Department of Energy
**Energy Efficiency
and Renewable Energy**
Bringing you a prosperous future where energy
is clean, abundant, reliable, and affordable
Building Technologies Program



**Building
AMERICA** 
U.S. Department of Energy
Research Leading to Zero Energy Homes

Building America Technical Assistance to Habitat for Humanity Janet McIlvaine – BA Liaison to HFH

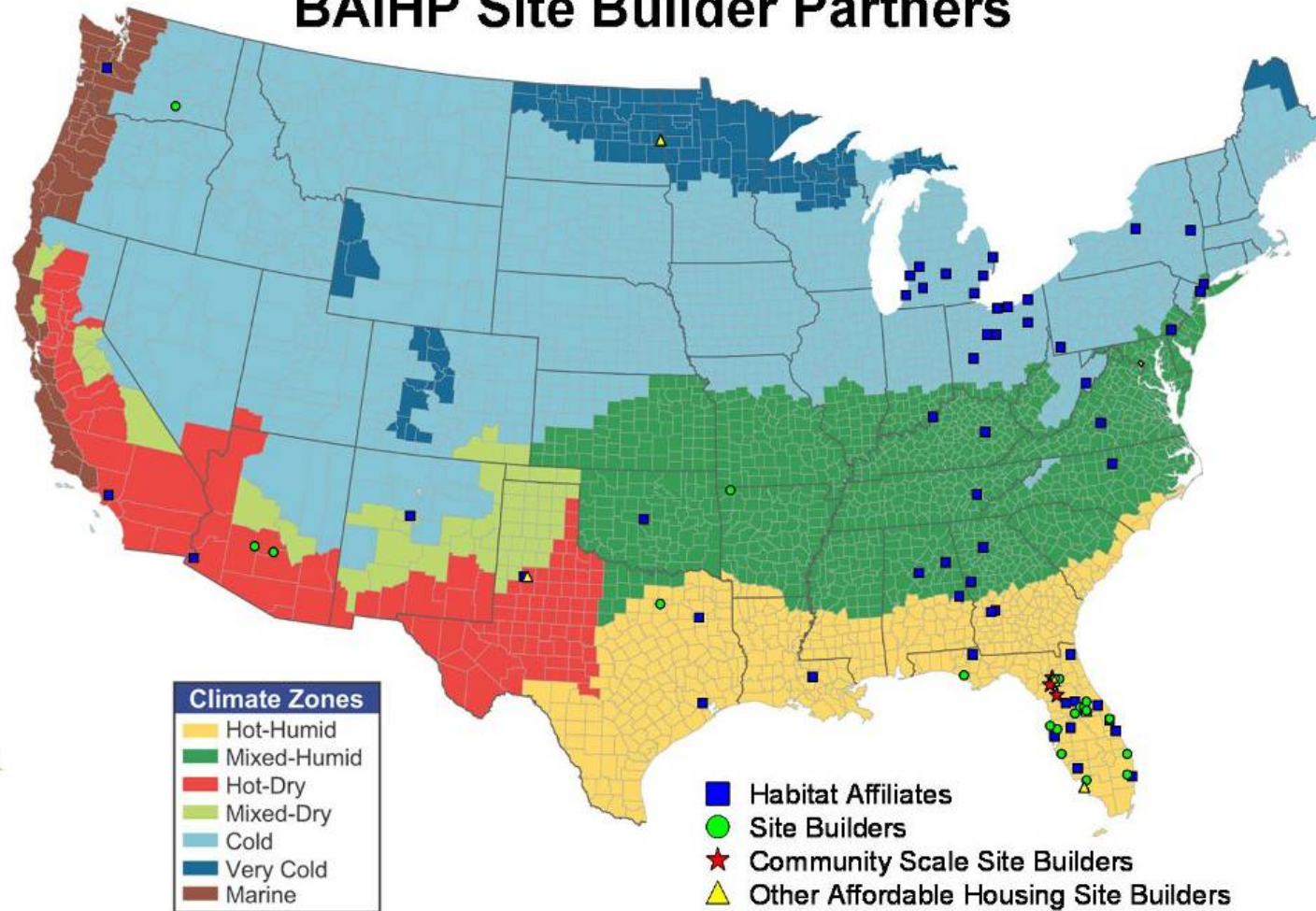
February 23, 2007





BAIHP Technical Assistance to Affiliates

BAIHP Site Builder Partners





DOE Building America and Habitat for Humanity Shared Goals

- **Affordability**
 - Affordable to Build.
 - Affordable to Buy.
 - Affordable to Live In.
- **Decent Homes**
 - Safe and Healthy
- **Overcome Poverty**
 - Durable Houses That Last For Generations
- *All Embodied in the new HFHI Construction Standards*
 - 2006 – Gulf Coast (Hot-Humid zone)
 - Coming to your climate zone in 2007



BA Recommendations to HFH Affiliates

Franklin, West Virginia



- Health/Safety (combustion)
- IAQ
- Durability
- Energy efficiency
- Comfort

- All works together
- Improves Quality
- Extends Life of House



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Franklin, West Virginia





Keep our NEW houses habitable for longer

Franklin, West Virginia

- Poverty Level Housing
 - Decay/rot
 - Poor IAQ
 - Combustion byproducts
 - High infiltration
 - Poor pest control
(allergen/asthma triggers)
 - Energy intense
 - Expensive
 - Uncomfortable





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Affordable, Healthy, Durable, and Comfortable Homes





Energy, IAQ, Durability, Comfort



See anything related to Energy, IAQ, Durability, or Comfort?

See anything related to Controlling Water, Air, and Heat?



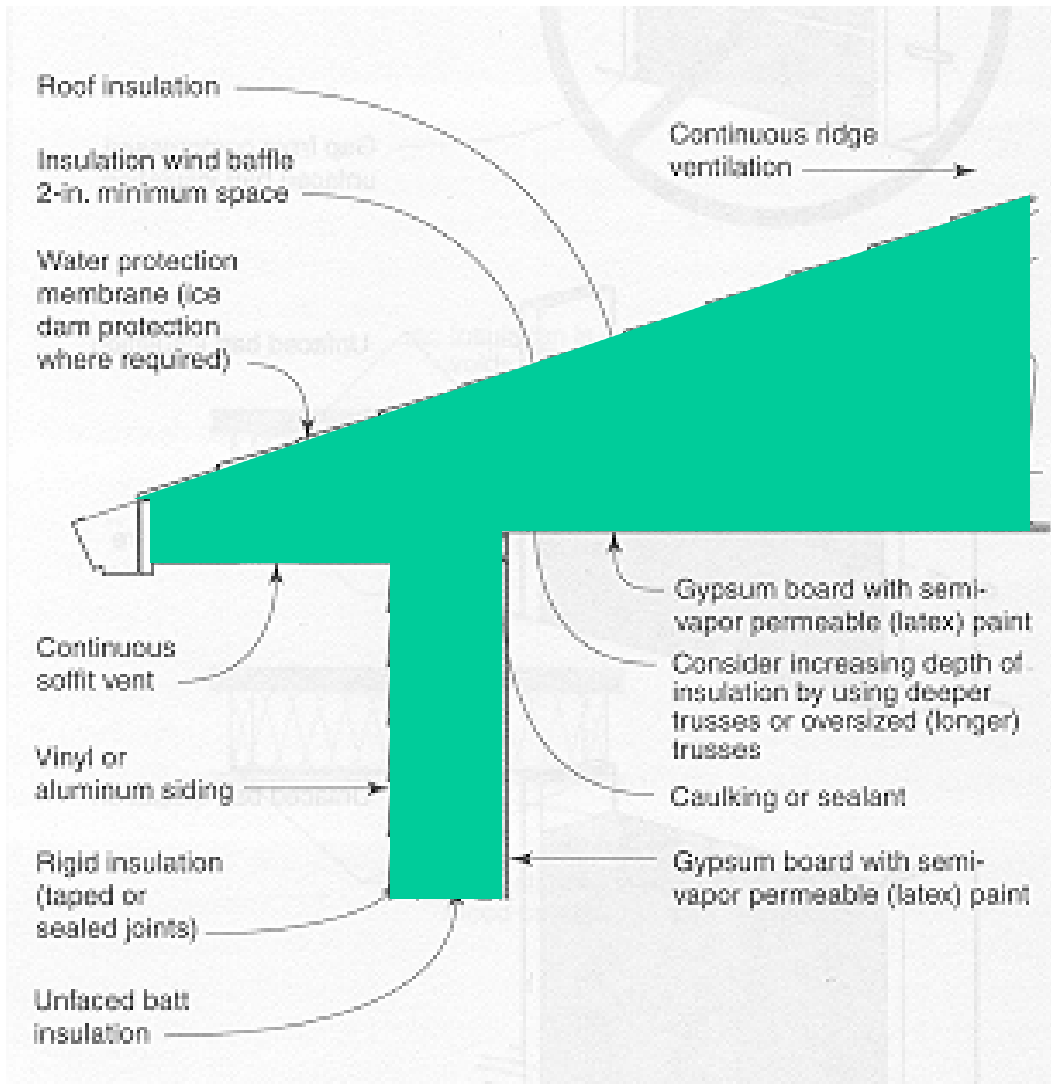
Movement of Water, Air, and Heat



**Building
Enclosure &
Mechanical
Systems
Control...
Movement of
Water, Air,
and Heat**



Controlling Water, Air, and Heat

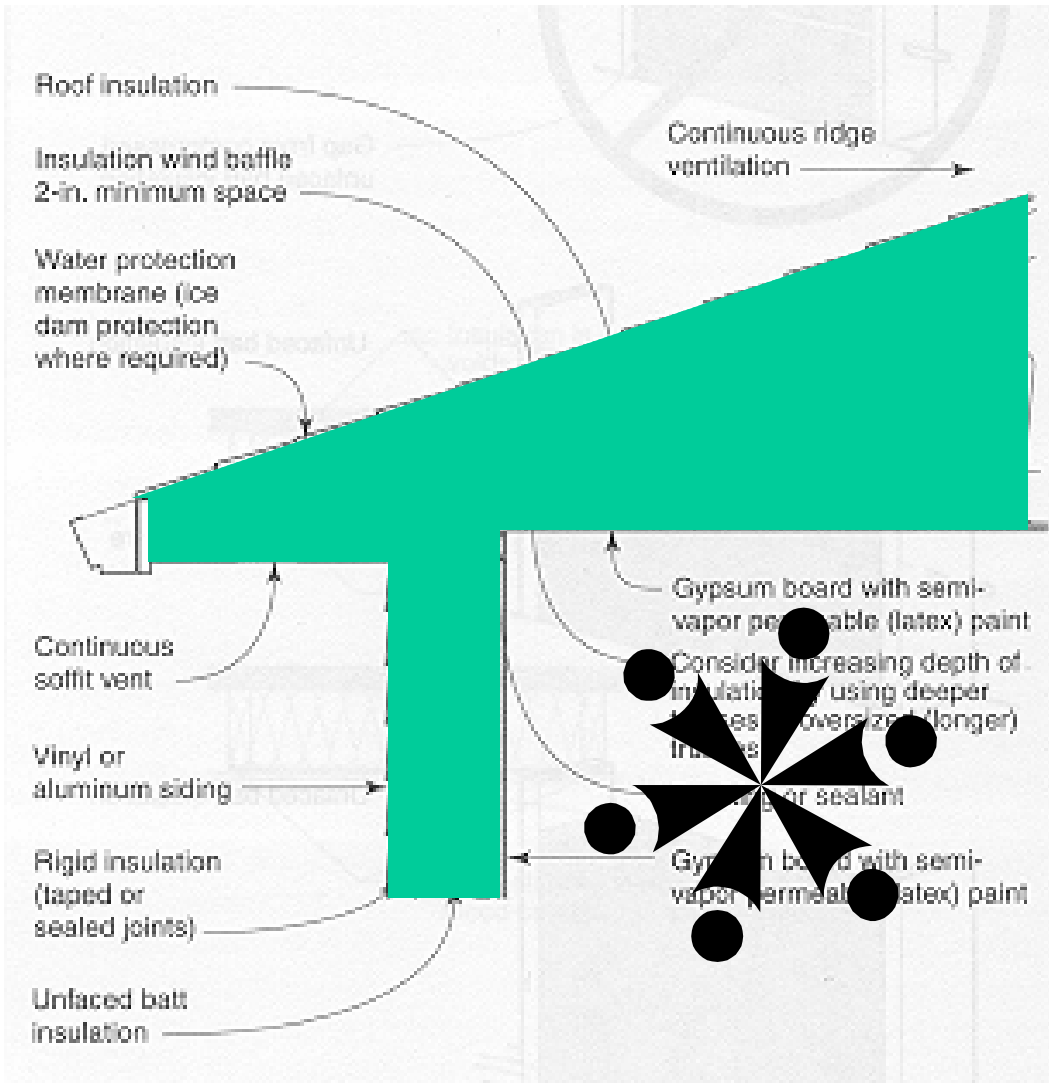


Building Enclosure

Boundary between INDOOR
Climate and the
OUTDOOR Climate



Controlling Water, Air, and Heat



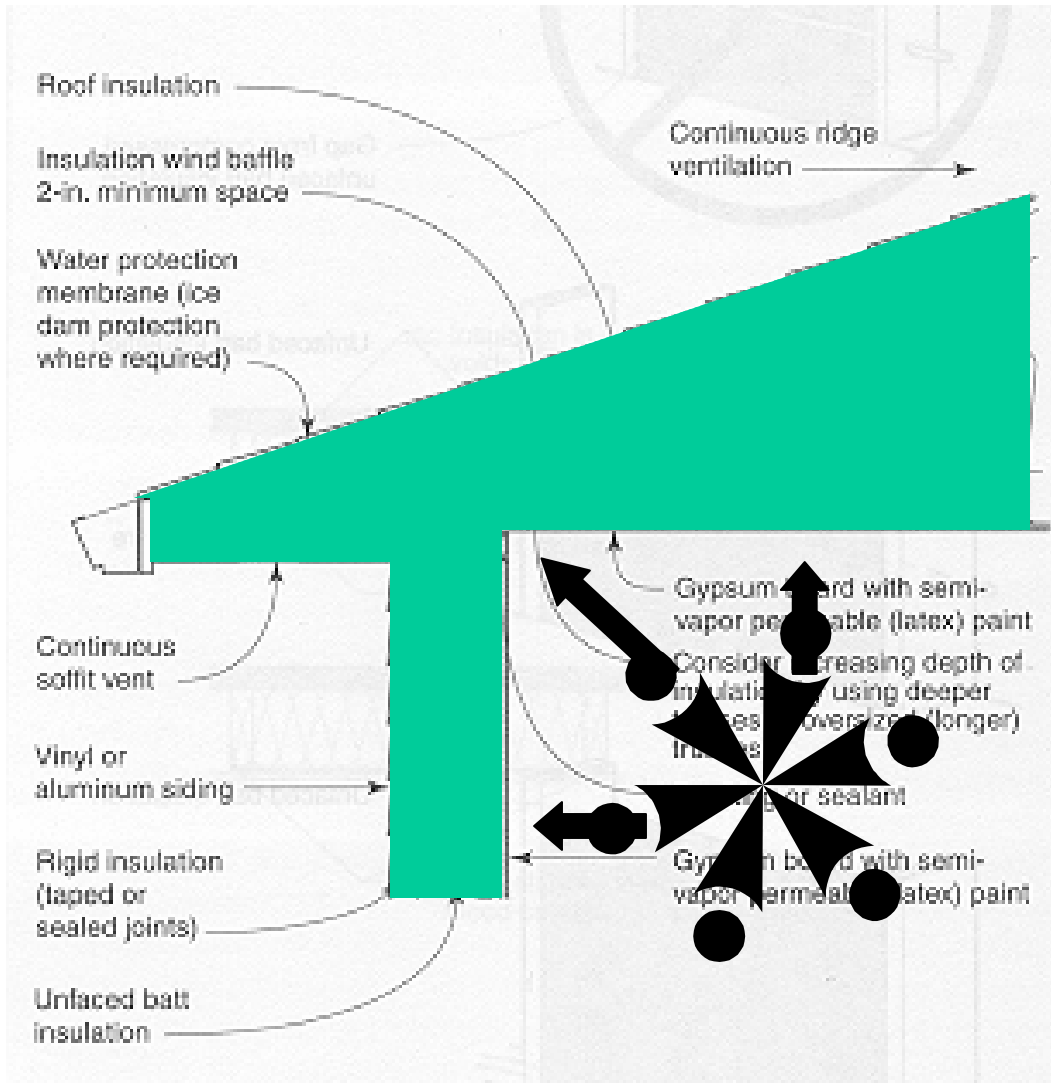
Building Enclosure

Boundary between INDOOR Climate and the OUTDOOR Climate

Allows for INDOOR Climate



Controlling Water, Air, and Heat



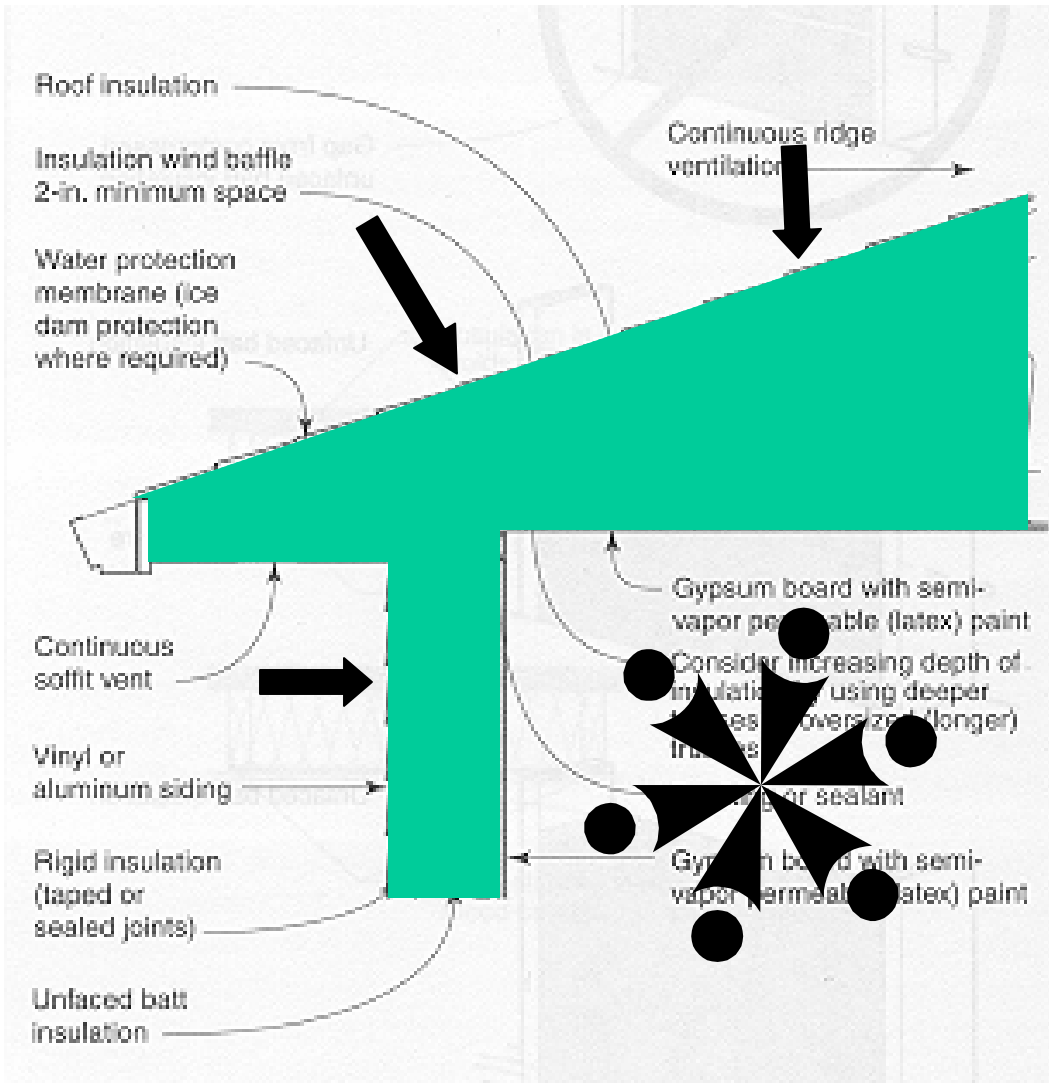
Building Enclosure

Boundary between INDOOR Climate and the OUTDOOR Climate

Allows for INDOOR Climate



Controlling Water, Air, and Heat



Building Enclosure

Boundary between INDOOR Climate and the OUTDOOR Climate

Allows for INDOOR Climate



Movement of Water, Air, and Heat



Water:

- Dry Materials
- Continuous Drainage Plane
- Flashing
- Assemblies that Dry
- Exhaust wet air

Air:

- Continuous Air Barrier &
- Sealed Duct System

Heat:

- As Continuous As Possible
- Layer of Insulation



Controlling Water, Air, and Heat

Siding and Shingles are the primary drainage plane – it is wise to include a secondary
Tar Paper (Felt) House Wrap Rigid Insulation





All these materials are drainage planes. Which are also air barriers?

Tar Paper (Felt)



Is NOT an Air Barrier

House Wrap



IS an Air Barrier

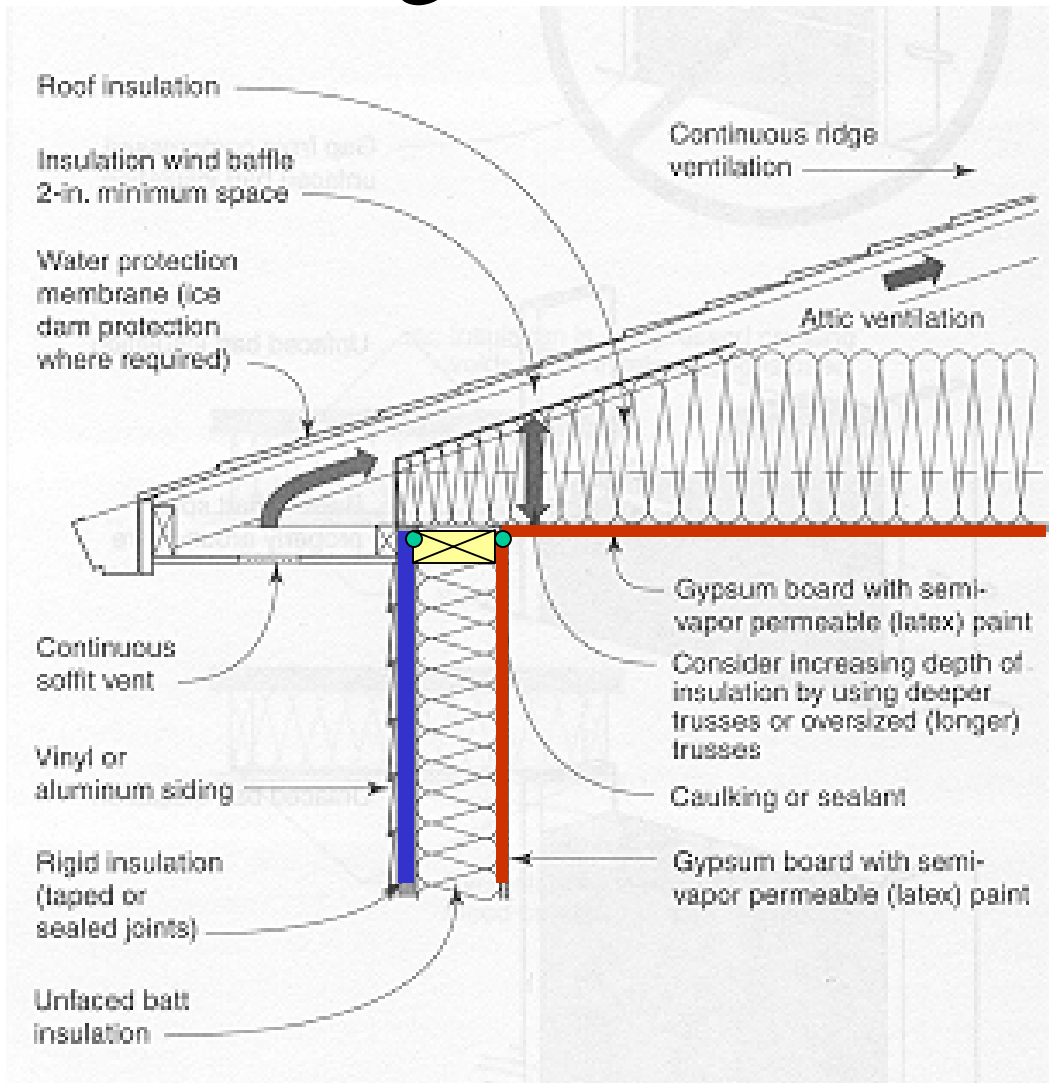
Rigid Insulation



IS an Air Barrier



Controlling Water, Air, and Heat



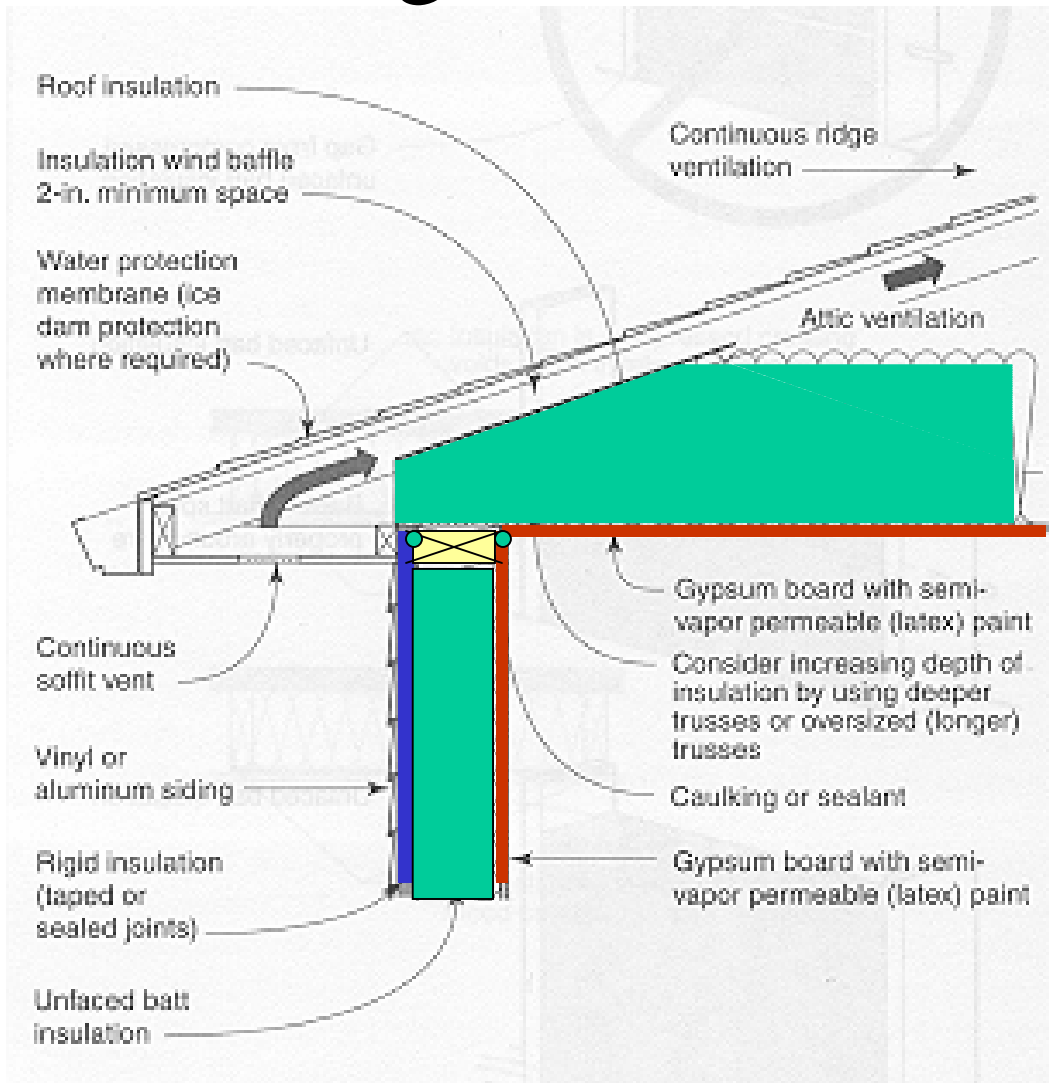
Air Barrier:

- **Continuous Air Barrier** around the conditioned space and air distribution system (sealed duct system)

- Interior or Exterior or both as long as one is permeable (drywall, tar paper, house wrap)



Controlling Water, Air, and Heat



Water:

- Dry Materials
- Continuous Drainage Plane
- Flashing
- Assemblies that Dry (vapor permeable on one side)

Air:

- Continuous Air Barrier (OK to have double) &
- Sealed Duct System

Heat:

- As Continuous As Possible Layer of Insulation



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Photo: Gregg Pachkowski





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BAIHP Habitat Partner

- Lakeland (FL) Habitat
- 30% BA Benchmark savings
- Outside Air Ventilation
- Mastic Sealed and Tested *Interior* Ducts
- High efficiency AC
- Energy Star Windows
- Homeowner reports 75% utility savings over *previous* home
- 7-10 homes/year





BAIHP Habitat Partner

- Houston (TX) Habitat
- 10% over Energy Star
- Outside Air Ventilation
- High Efficiency H/AC
- Energy Star Windows
- Multiple building systems
- Energy Star Builder and FSEC Partner since '96
- 20-30 homes/year





BAIHP Habitat Partner

- Broward County (FL)
- All Energy Star homes
- High Efficiency H/AC
- Low-E Windows
- Sealed and tested *interior* duct system
- ~\$500 utility rebate on each home
- 20-30 homes/year

