



SOLAR DECATHLON

2009

Spray Foam

The Answer to
Our Energy Challenge



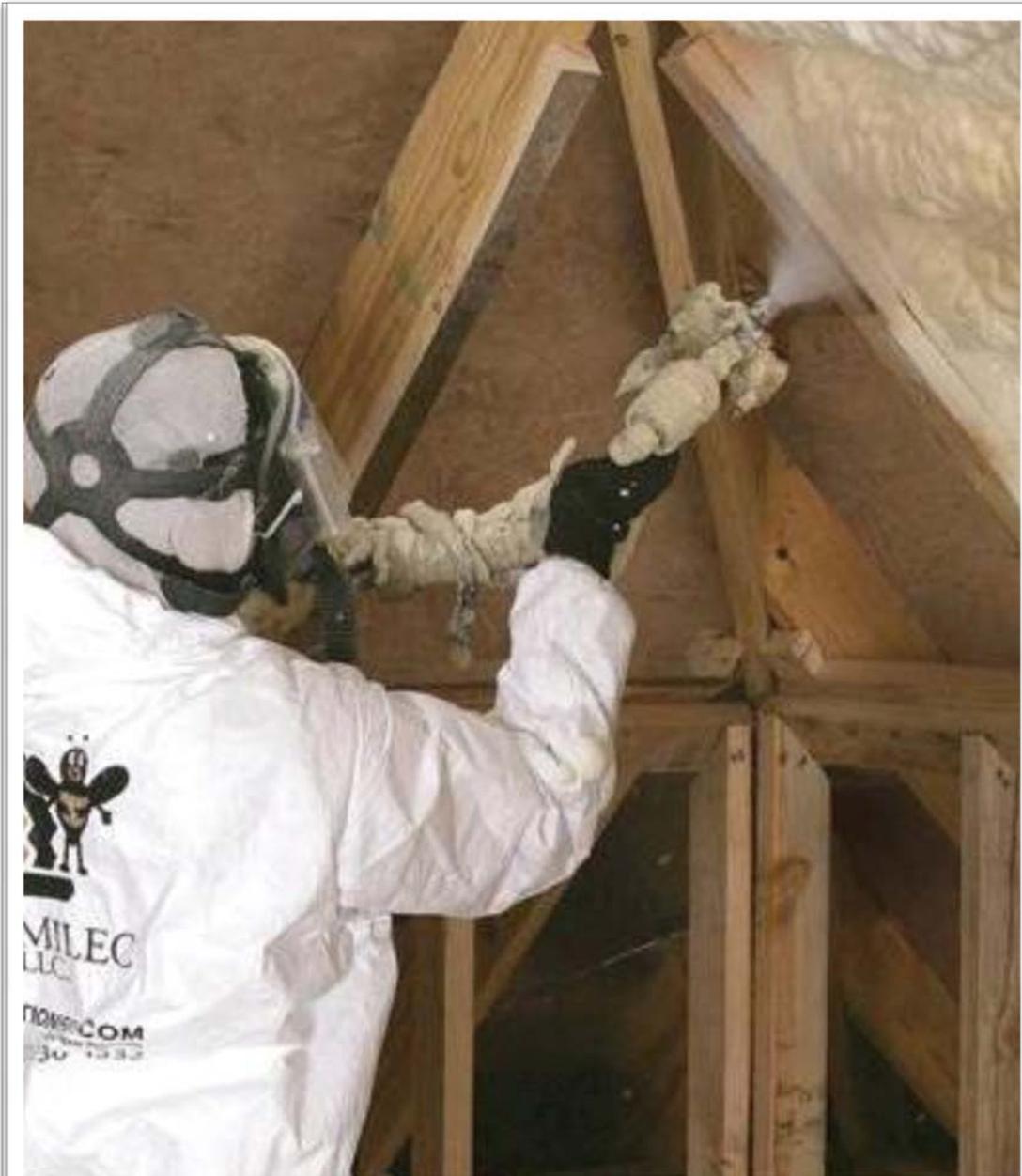
Mac Sheldon
Demilec USA, LLC
www.DemilecUSA.com



U.S. DEPARTMENT OF ENERGY

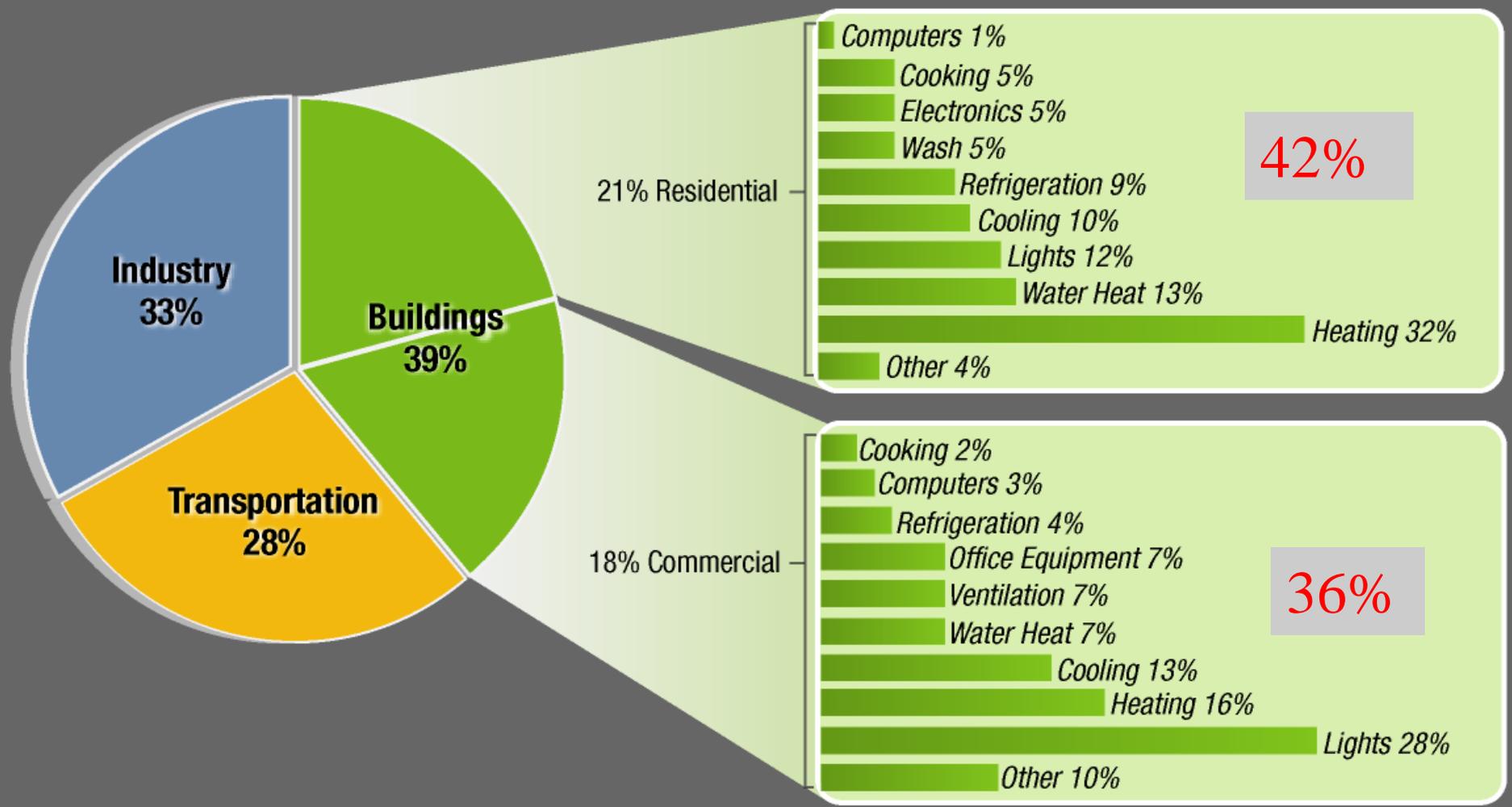
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US Energy Consumption

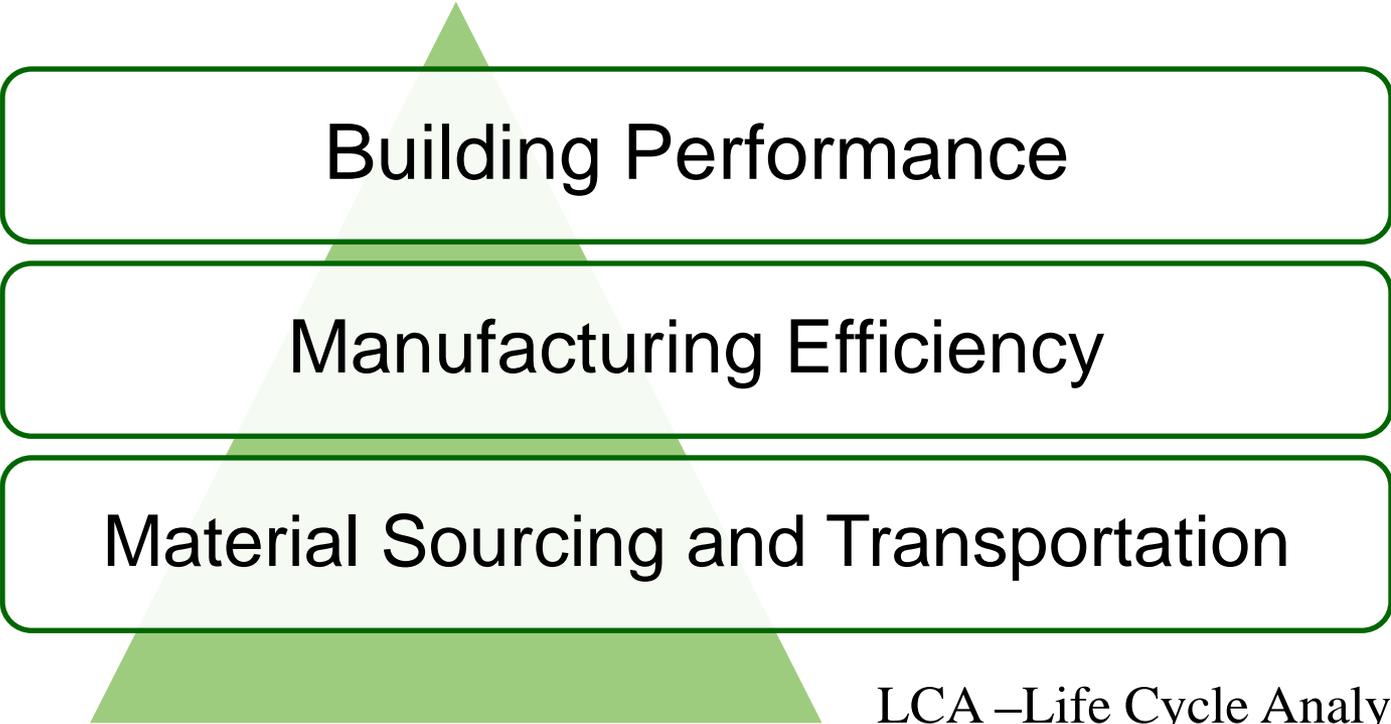




Green Building Drivers

“Work on demand side before supply side”

Dr. Mark Bomberg, Building Energy and Environmental System laboratory
Syracuse University



Building Performance

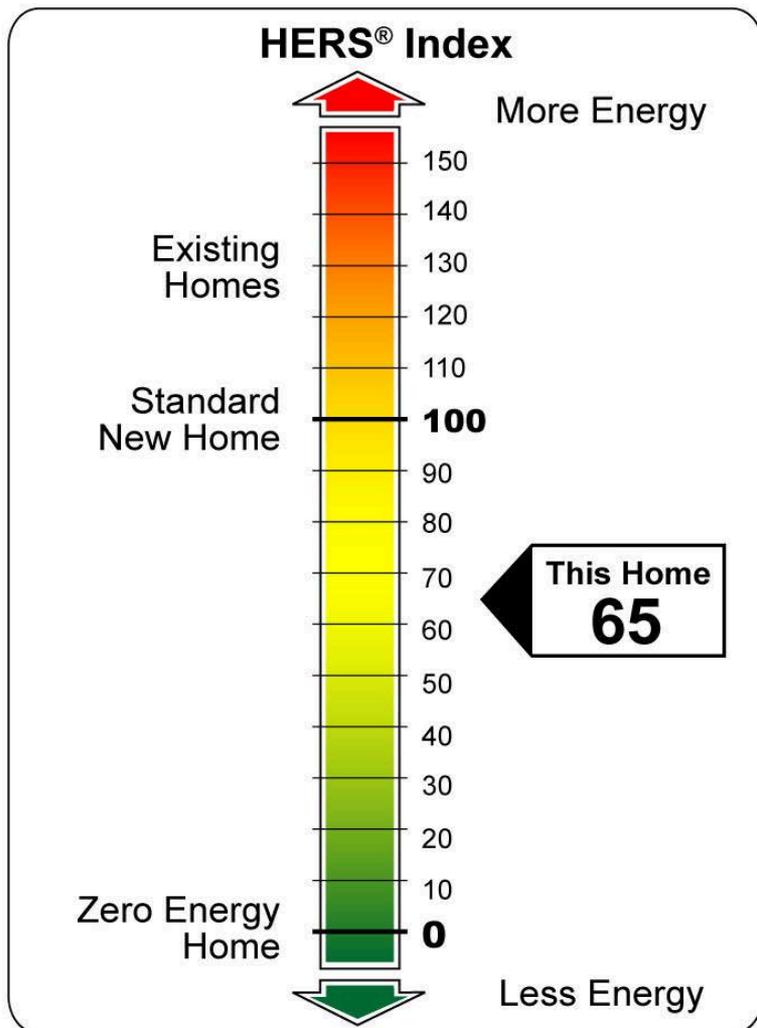
Manufacturing Efficiency

Material Sourcing and Transportation

LCA –Life Cycle Analysis



Home Performance





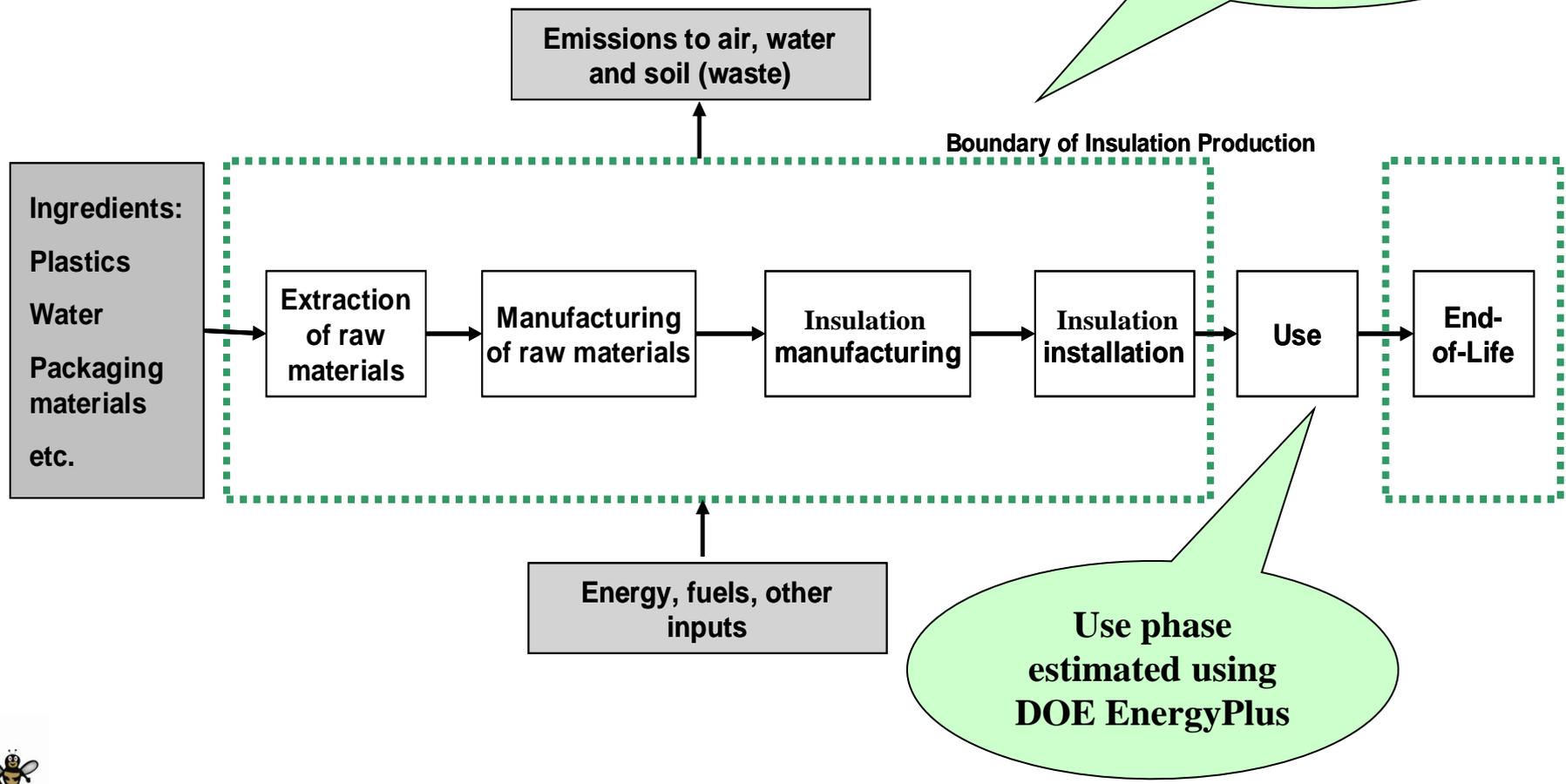
Spray Foam LCA

- Increased building efficiency
 - High R-value + Low Air Leakage =
Reduced Energy Consumption ($\pm 40\%$ lower)
- Reduced Transportation
 - ccSPF 1 truck load = 1,040,000 R's **3-4 T/L FG**
 - ocSPF 1 truck load = 2,280,000 R's **7-8 T/L FG**
- Less Embodied Energy
 - Recycled and Renewable Materials



Entire Life Cycle included

Embodied energy & GWP estimated using ISO 14040



Use phase estimated using DOE EnergyPlus

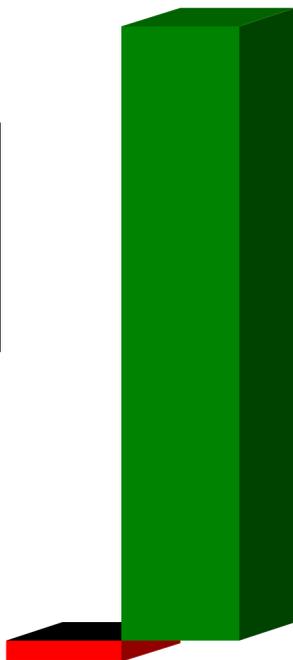


Lifetime Source Energy Savings

ASHRAE 90.1-2010P VS ASHRAE 90.1-2004

Roofs

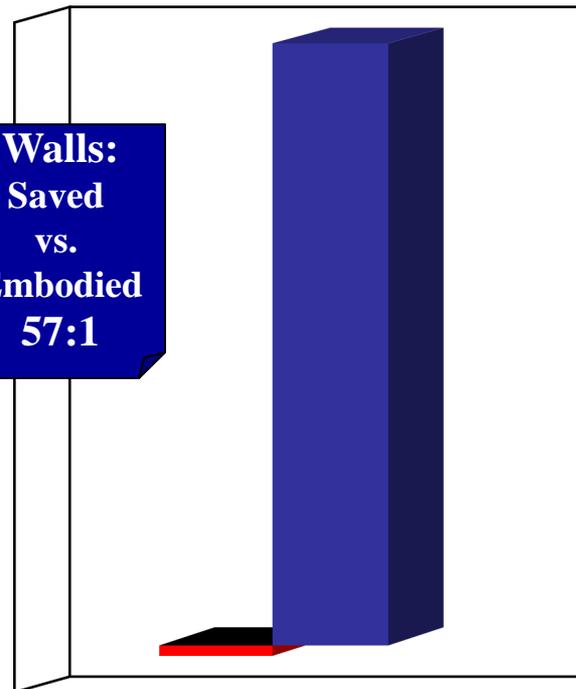
**Roofs:
Saved
vs.
Embodied
29:1**



Energy Saved: 633 Trillion Btu
Embodied Energy: 22 Trillion Btu

Walls

**Walls:
Saved
vs.
Embodied
57:1**



Energy Saved: 629 Trillion Btu
Embodied Energy: 11 Trillion Btu

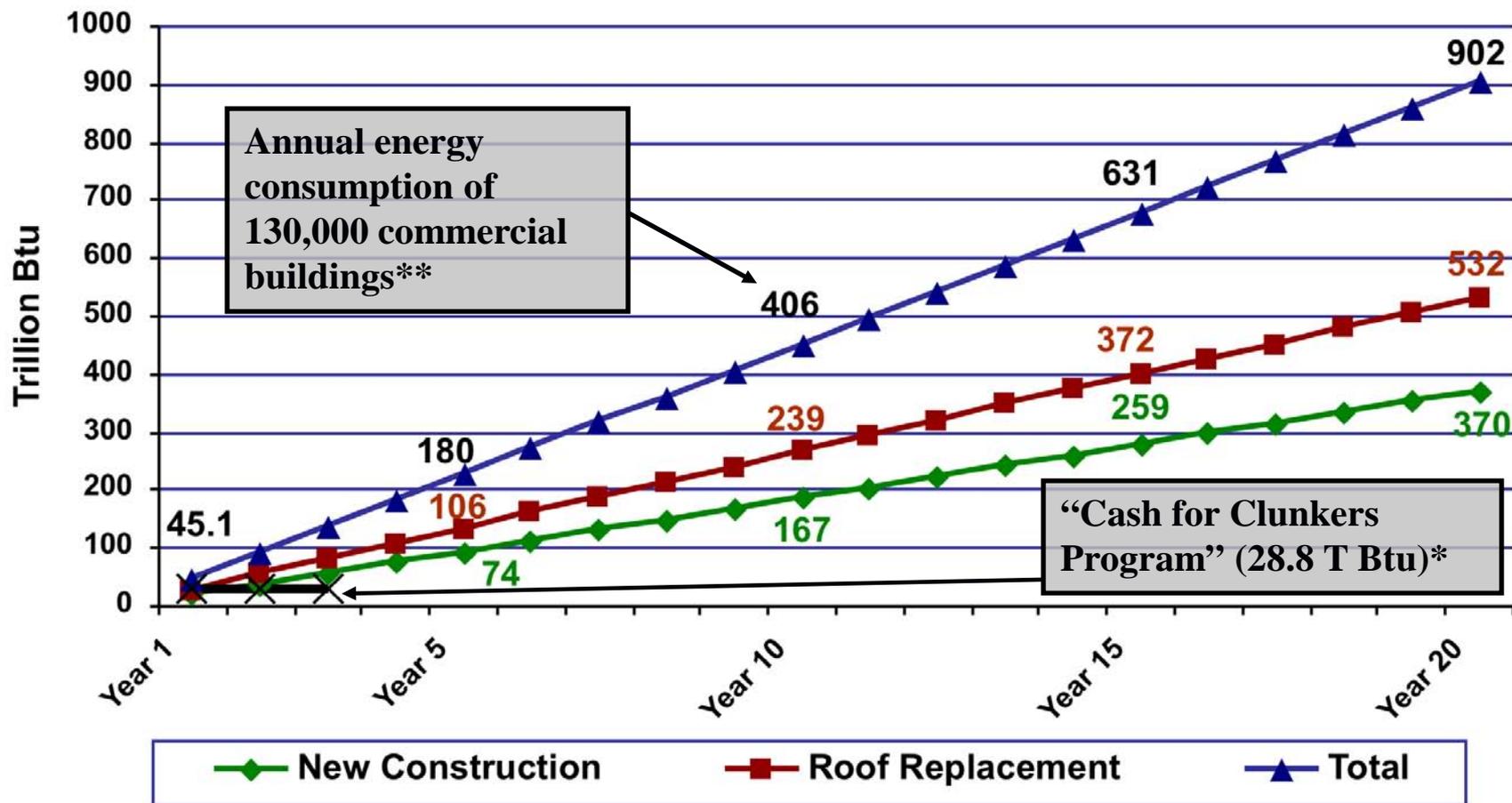


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Annual Source Energy Savings

ASHRAE 90.1-2010P VS ASHRAE 90.1-2004



*Source: NYT and Fox News 8/5/09 reports

**CBECS 2003

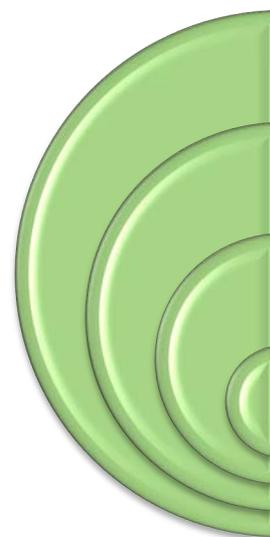




Low & Medium Density Spray Foam Insulation



Low Density
Open Cell
½ - Pound
Water Blown
Semi Rigid



Medium Density
Closed Cell
2 - Pound
Rigid Foam



What is Low Density Spray Foam Insulation?

- Low Density uses water as the blowing agent
- Environmentally friendly and recognized as a “Green Product”
 - zero ODP
 - Does not contain CFCs, HCFCs, fibers, formaldehyde, or asbestos





History of Low Density Spray Foam Insulation

- Narrow lots = bonus rooms over garages
 - Problem was cold floors in bonus rooms
 - > 80% of claims were coming from cold floors
 - Open cell spray foam technology = solution
 - Now specified in new construction

This is where it all started!





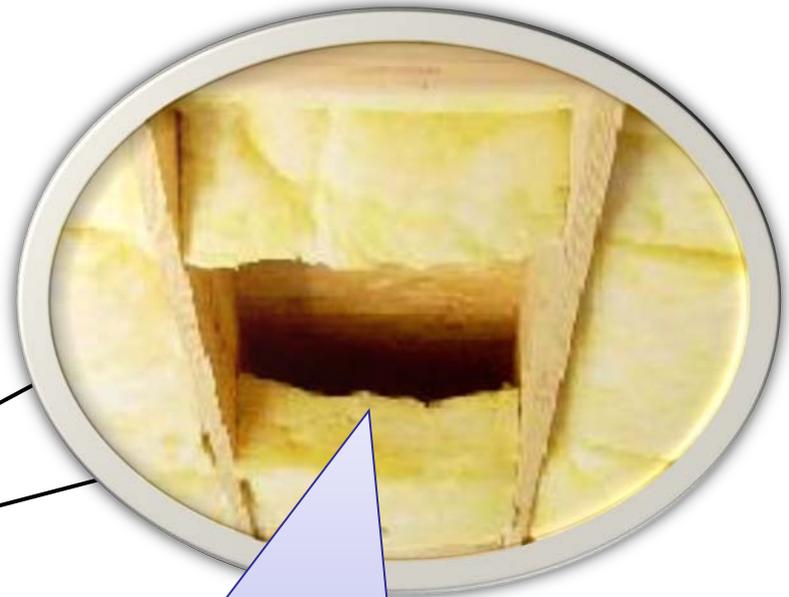
Improper Installation of Fiberglass



Gap



**Insulation has fallen out,
voids can be seen**



The existence of this void is what started the ½ lb spray foam industry!!!



Fiberglass Insulation Is Not Always Installed According to Your Specification



Stapled and Compressed insulation loses R-value

Two pieces hang side by side to fill cavity

Gap between insulation and floor







Why the R-values of loose fill insulations do not work.

How do you insulate these situations?



**Gap to outside
Daylight**

Fiberglass Insulation Is Not Always Installed According To The Instructions



The Same Job Using IR Imaging

55 F*
TSPOT

1.00
EMISS

53 F
TMIN



64 F
TMAX



Insulation & Air Seal

Electrical Outlet



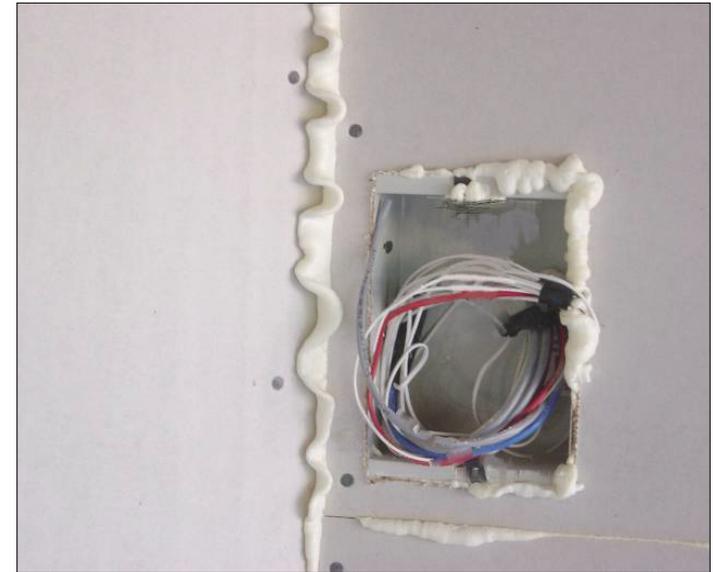
Wall with irregular size studs

- Insulates and air seals in one application
- No voids or gaps between insulation and studs
- Excellent adhesion
Perfect fit every time
- Doesn't sag, settle or deteriorate
- Outperforms loose fill insulation



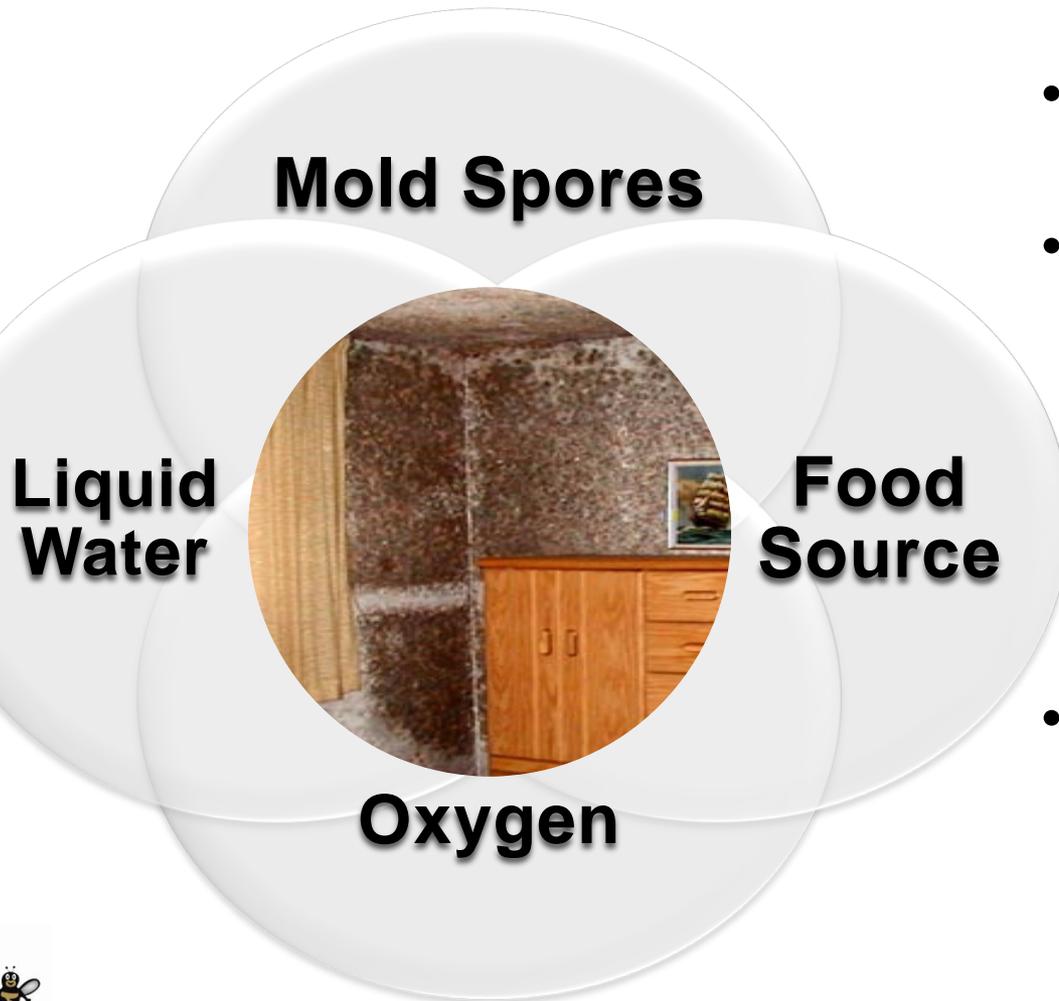
Semi-Rigid Spray Foam Insulation

- More than 40% of energy loss from a residence is due to air infiltration – DOE
- Controlling movement of warm moist air (preventing condensation) is very effective in stopping the proliferation of molds





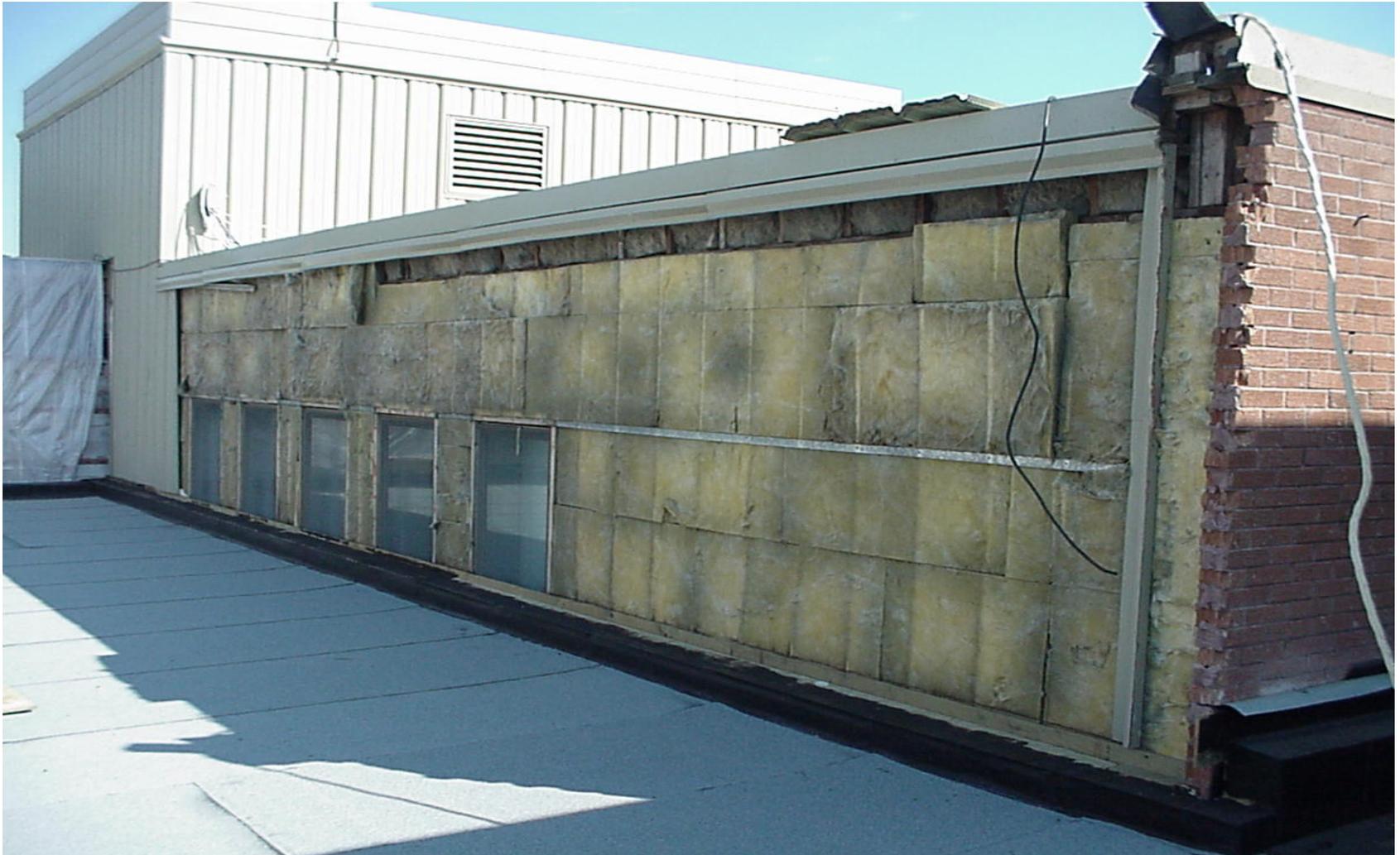
Conditions for Mold Growth



- Mold spores are always in the air
- Molds require three conditions for mold spores to proliferate
 - Food
 - Oxygen
 - Liquid Water
- Effective way to prevent mold growth is to remove one of the three conditions



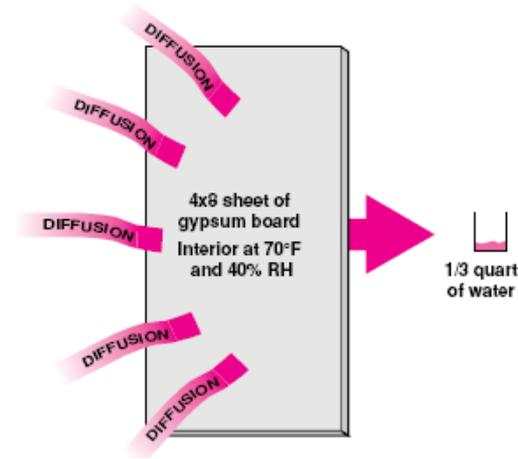
Mold & Mildew - No Air Barrier





Diffusion vs. Infiltration

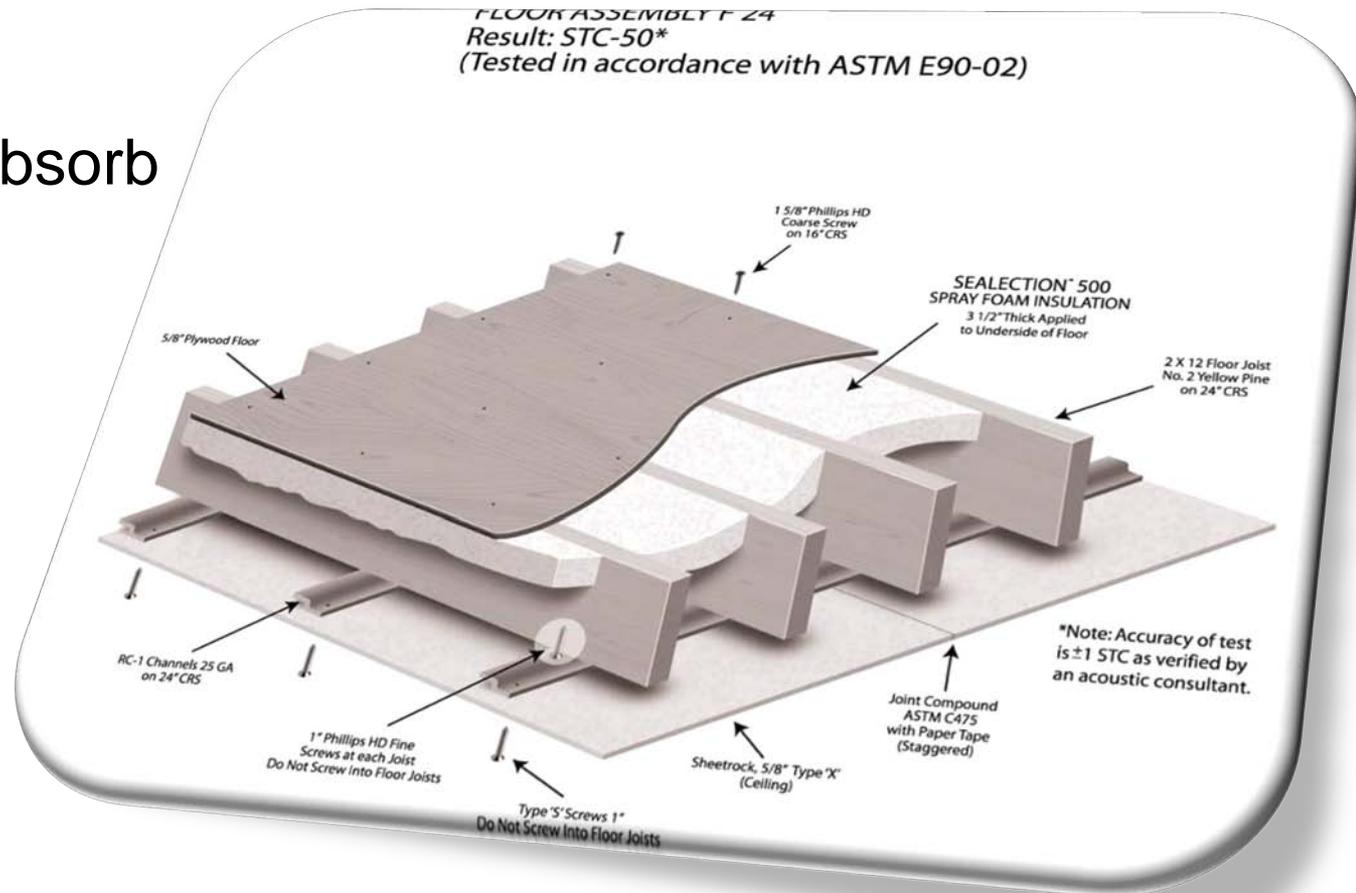
- In cold climates 1/3 quart (310ml) of water can be collected by diffusion through gypsum board without a vapor retarder
- 30 quarts (28 liters) of water can be collected through infiltration





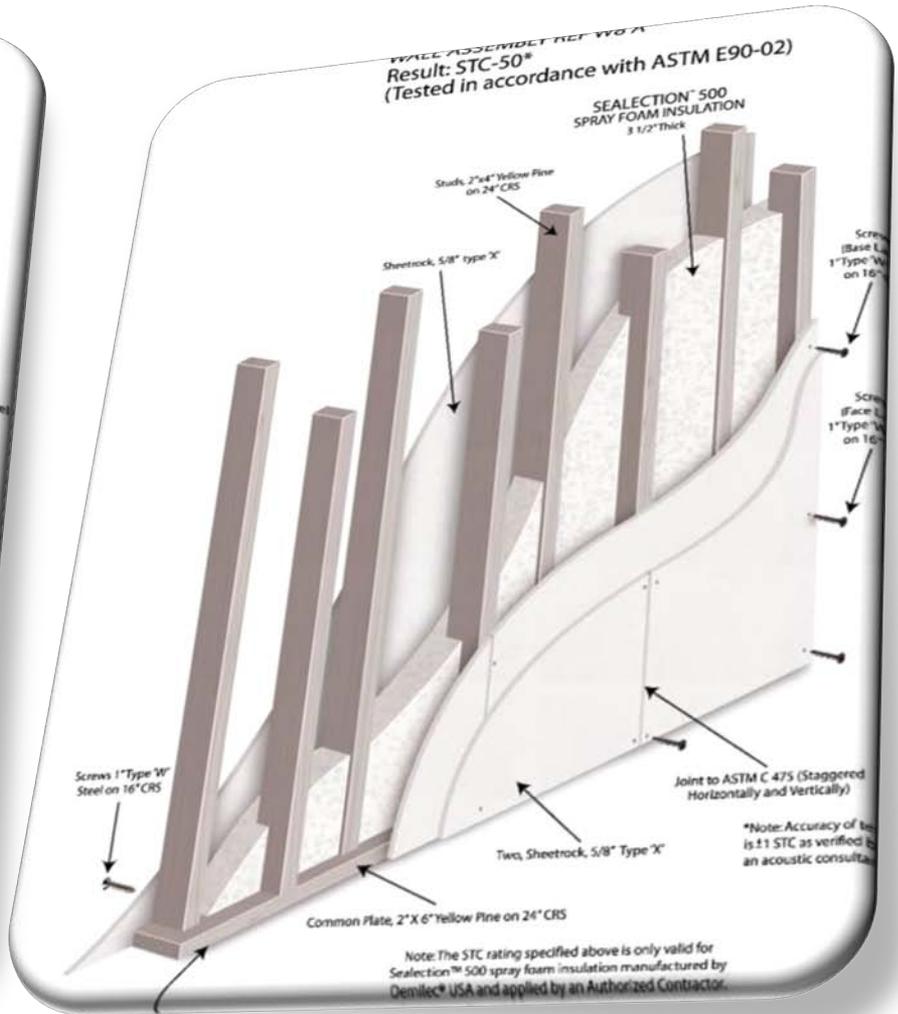
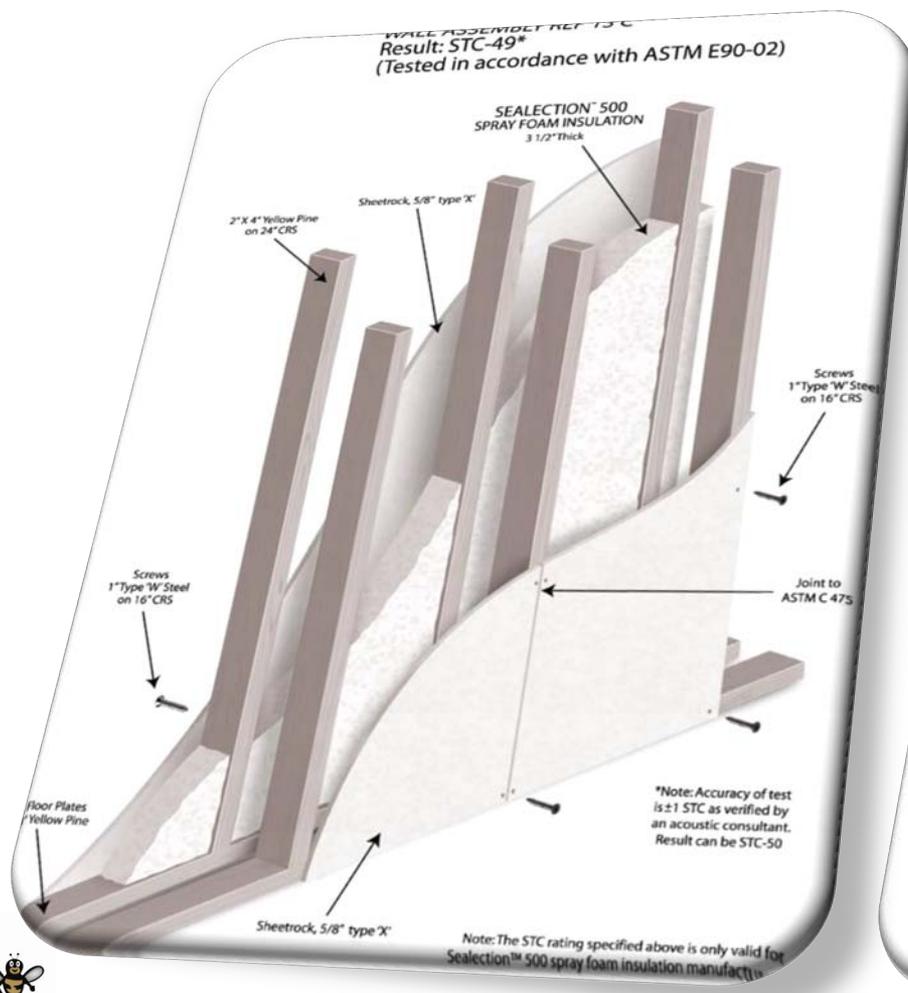
Quiet Buildings

- Sound Transmission
 - Open Cells Absorb Noise
 - STC: 35-50





Quiet Buildings





Applications

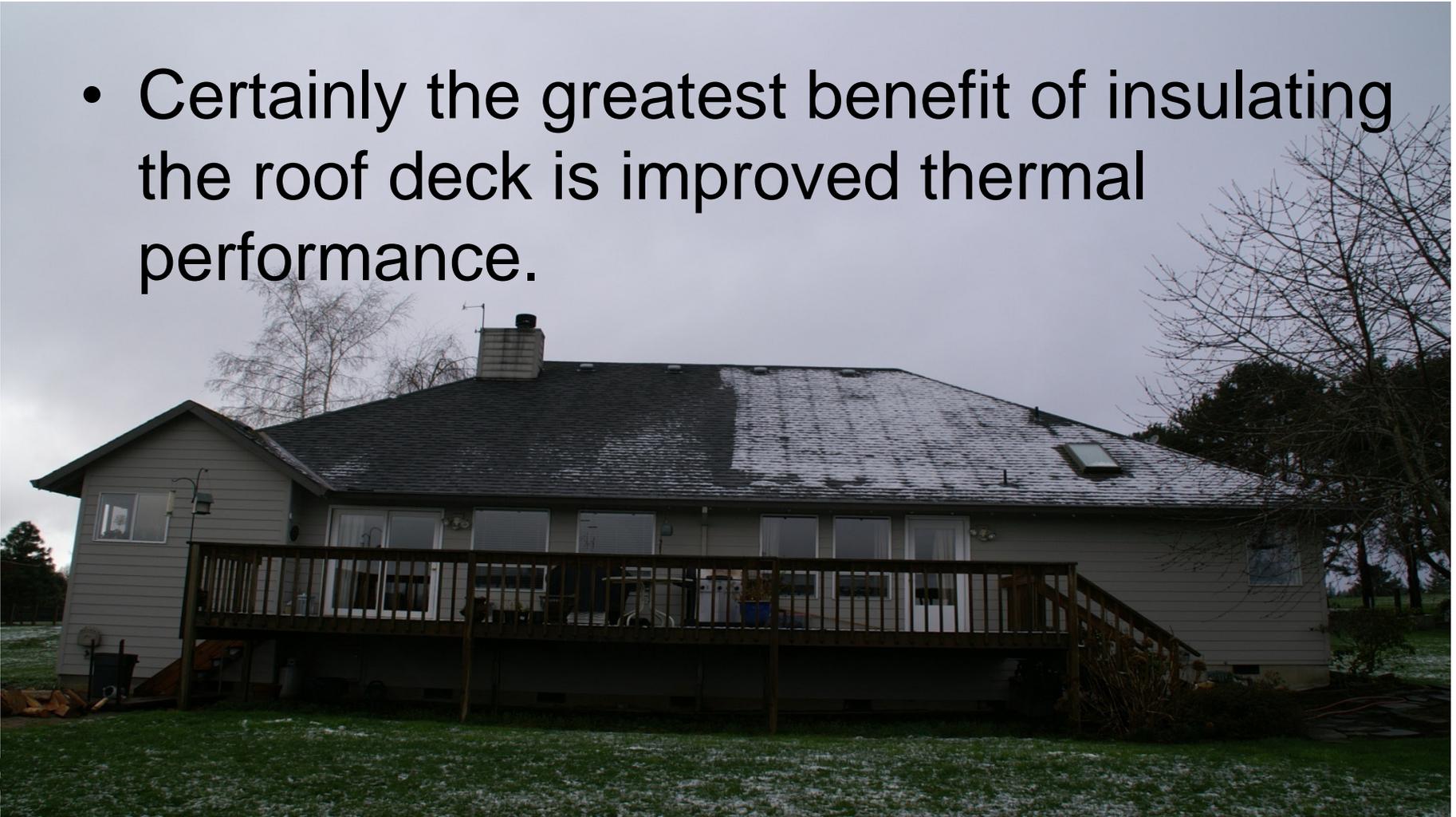
- ✓ Rim joists
- ✓ Attics
- ✓ Crawl Spaces
- ✓ Walls





Spray Foam Works!

- Certainly the greatest benefit of insulating the roof deck is improved thermal performance.





Ductwork in conventional attics is subject to the most extreme temperatures yet they have the least insulation.



Installing the ductwork in a closed attic assembly reduces the duct losses dramatically



Insulation and Air Seal

- R Value 3.6 – 4.5 per inch
- No thermal performance drift over time
- 100% self adhesive = 100% R-value in the field
 - No settling or compacting
 - No degradation of thermal performance with time
- Follows all shapes or volumes

















































NOT FOR PRESSURE | 101101 | 011111 | 052102 | 14.10.011
CHARLOTTE PIPE S/W 412 142195

VELUX

FCM 2222



Proper Sizing of the HVAC System

- By properly sizing HVAC equipment rather than using rules of thumb, smaller systems can often be specified and, hence, initial cost is reduced.
- Proper HVAC sizing can reduce short-cycling of equipment, resulting in longer equipment life and better control over indoor environmental conditions.





Limitations of Use

Low Density Spray Foam should not be used:

- On wet substrate (frost, oils, etc.)
- Around recessed lights (even if IC cans are used)
 - Leave at least 3” of free air space
 - Overheating is a fire hazard
- Inside electrical boxes
- In contact with water



Limitations of Use

Low Density Spray Foam should **not** be used as:

- As structural material
- As flotation foam
- As a vapor barrier
- Covering flex ducts





MEDIUM DENSITY FOAM

Interior or Exterior of Building

1. Thermal Control Layer

(Thermal Insulation)

2. Air Control Layer

(Air Barrier)

3. Water Control Layer (Drainage Plane)

4. Vapor Control Layer

(Vapor Retarder)



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Insulating Buildings from the Exterior

- **Medium Density Spray Foam**
 - Rigid Foam
- **Four-In-One Barrier**
 1. Weather Resistant Barrier
 2. Insulation
 3. Air Barrier
 4. Vapor Retarder
- **Applications**
 - Commercial
 - Residential
 - Industrial
 - Institutional





Bethke Elementary School – First US LEED For Schools Building



Leadership in Energy and Environmental Design





Rentals









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1,000,000 Square Foot Airplane Factory







Why Insulate Outside?

- Excellent Hygrothermal Capacitance
 - Heat and Moisture absorption and redistribution
- No Thermal Bridging
- Perfect Air Seal







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Multi-Family Residential





Commercial Office Space



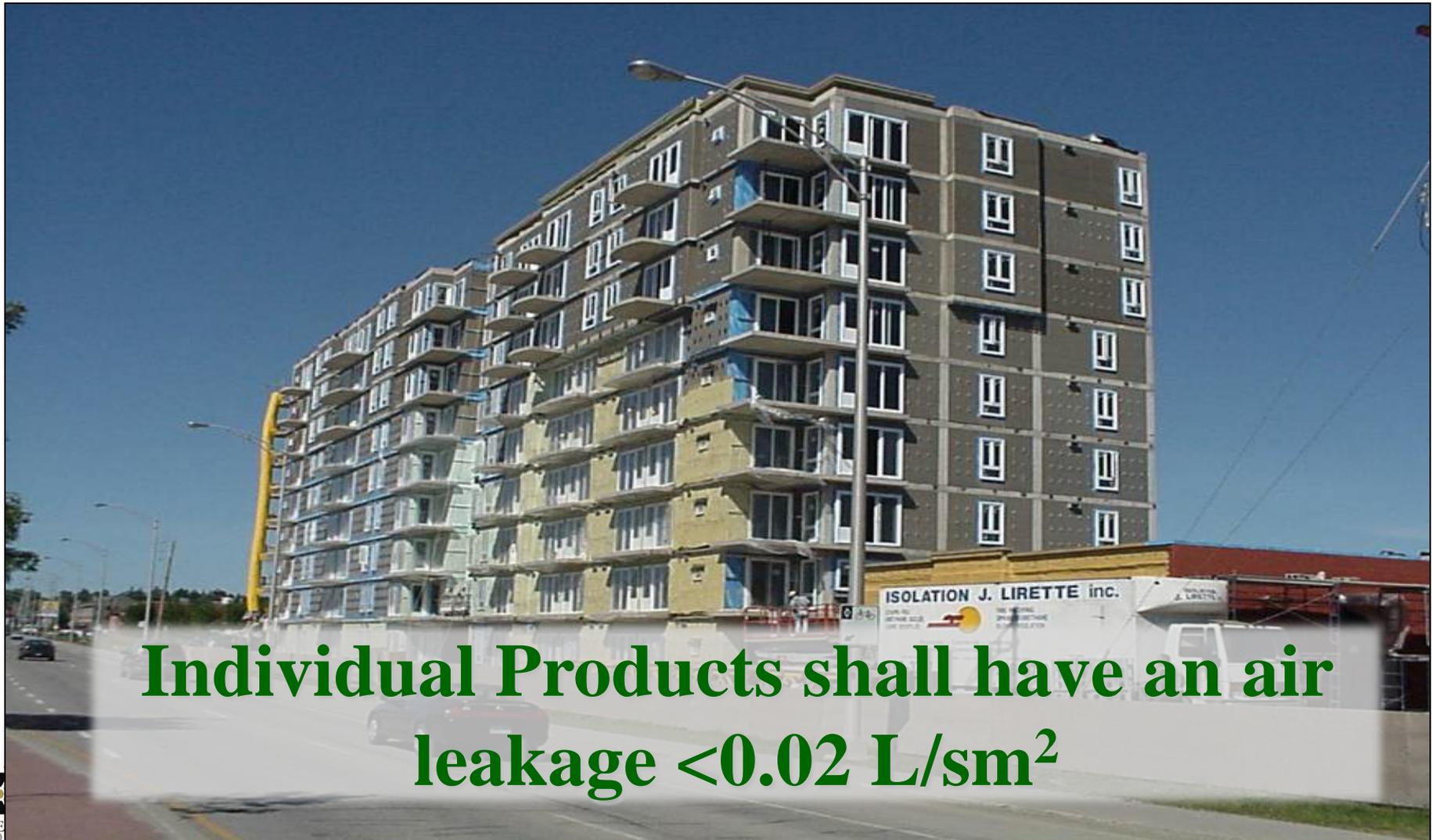


Exterior Insulation

- Continuous insulating envelope system
- 100% self adhesive = 100% R-Value in the field



Air Barrier



Individual Products shall have an air leakage <0.02 L/sm²



Retail Space



- Air barrier
 - Continuous, Durable, Rigid
 - Spray foam is a complete system



Retrofit Office Space

- Monolithic water, air, rain and vapor control system





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University Dormitory



DEMILEC
(USA) LLC



Moldy School

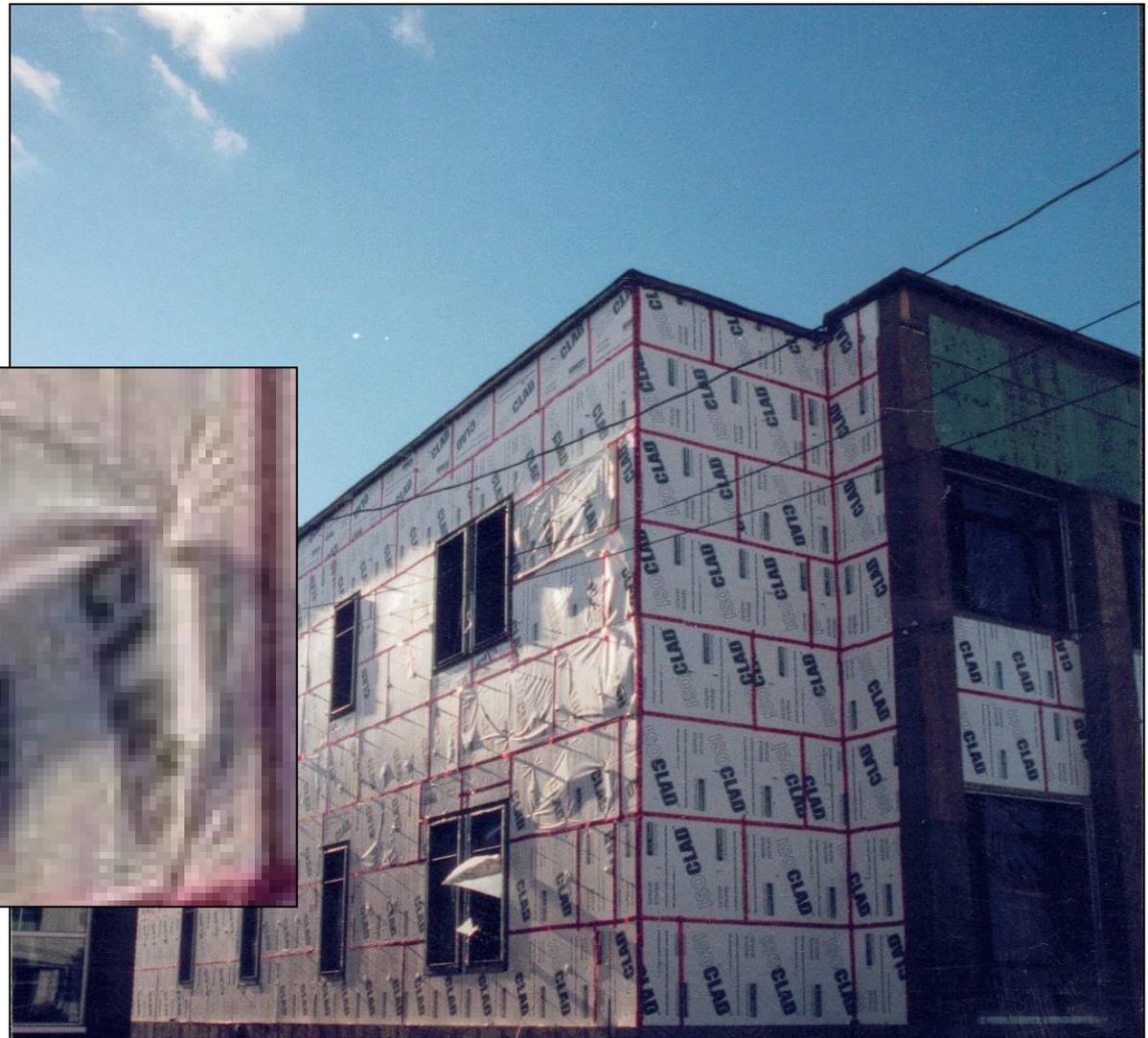


- No Air Barrier
 - Infiltration Leads to Mold and Mildew growth



Conventional Air Barrier Membrane

- Brick Ties Through Air Barrier





Spray Applications



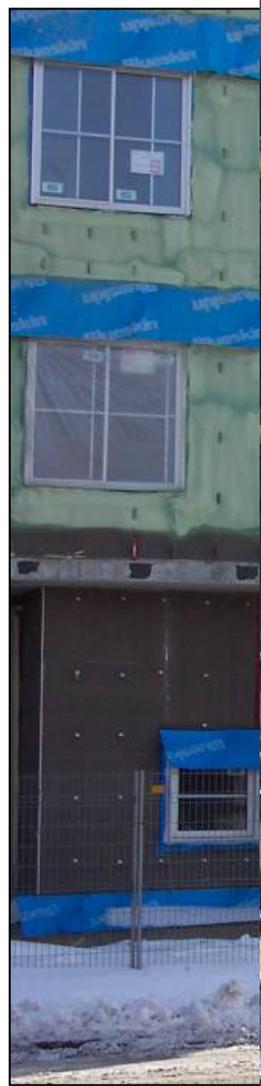
- Cold Weather Applications
- Full Coverage Applications
- Commercial Applications
 - Schools
 - Hospitals
- Metal Application
- Block Application
- Foundation
- Renovation Projects
- Single Family dwellings
- Multi-family dwellings



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on



03/2003





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Full-coverage application





Large Commercial Applications



Shopping Center



Airplane Factory



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SOLAR DECATHLON Schools

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Hospitals





Metal Buildings

Metal buildings sprayed on the exterior then covered by metal siding





Concrete Block Application





Foundation Application

Can this
product be
Used below
ground?





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Renovation Projects





Single Family Dwelling



- Works very effectively on Single family dwellings
 - Eliminates thermal Bridging
 - Windows are installed before the insulation



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Multi-family Dwellings





Frequently Asked Questions

- How do you control overspray?
- Is this a seasonal process?
 - Rigid Foam can be processed from 0°F to 104°F.





Frequently Asked Questions

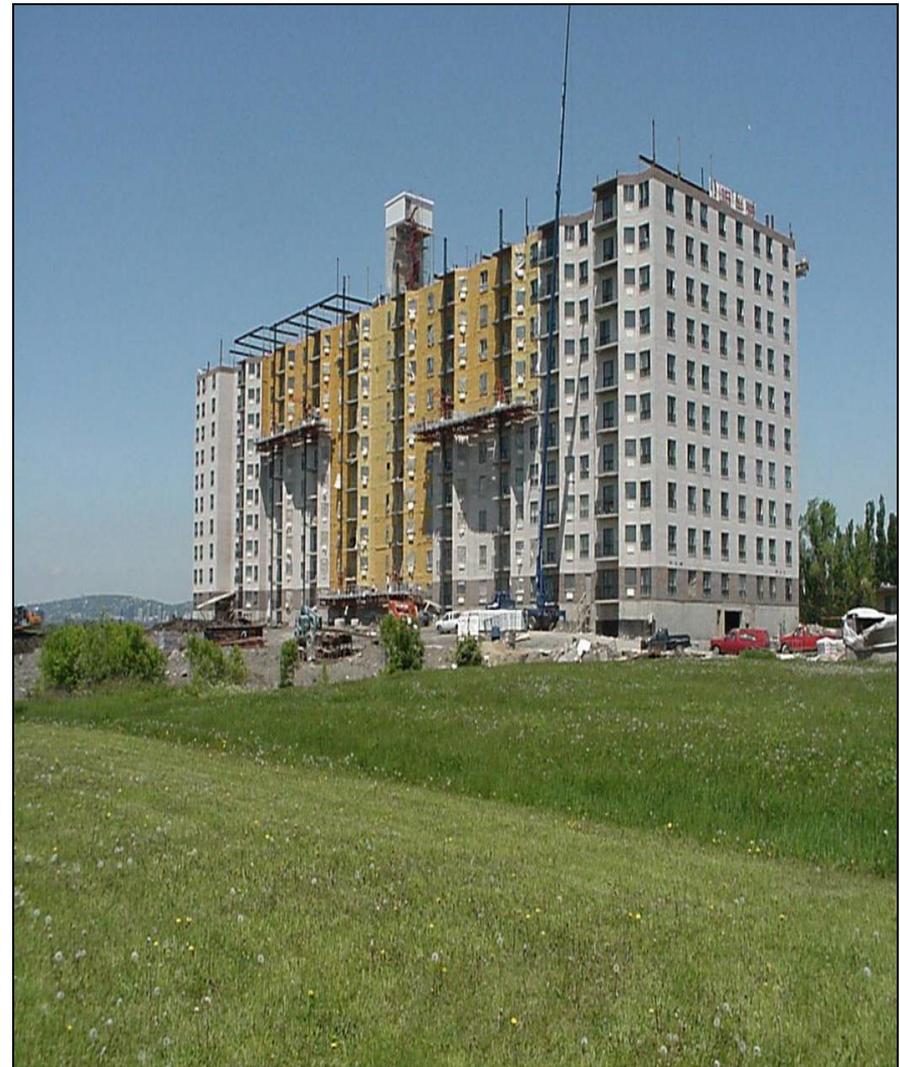
- Will the foam crack or delaminate if the building moves?
 - Significant building failure will occur long before the foam will crack or “fall off”





Frequently Asked Questions

- Is Access a problem?
 - Man Lift
 - Elevator Staging





Frequently Asked Questions

Does it take longer to install?

- Typically the answer is no. The masons often use the same staging
- Weather may impact the project schedule if there is rain, as with any trade working on the outside.



Processing

- Field-processed and field-applied
- Quality assurance can be performed at any time during the installation



True Performance of *Spray Foam Insulation*





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