LOUISVILLE SPRAY FOAM INSULATION

LouisvilleInsulation.com

Building Science 101

1403 Rowan St. Louisville KY 40203
Admin@LouisvilleInsulation.com
502 - 377 - 0078

Three Methods of Heat Transfer

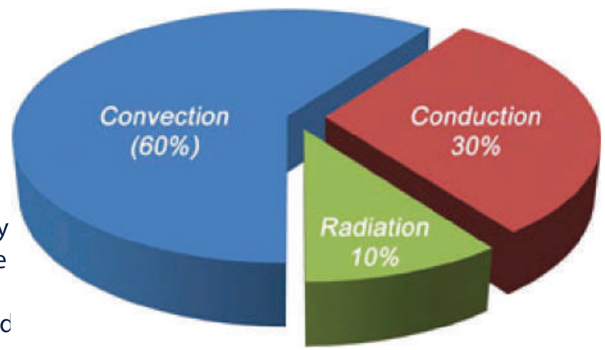
In over 1000 blower door tests conducted over a period of eight years, Midwest-based HERS rating and energy consulting firm Cenergy LLC found that houses insulated with traditional fibrous insulation materials had an average of 150 sq. in. more leakeage comapred to foam insulated houses. This is the equivalent of the leaving a window open about 10 inches year-round. Imagine how high your utility bills would be if you left a window open for the next 12 months! Just imagine the unwanted drafts, humidity, allergens, noise, dirt and pollutants that would invade your house. An effective insulation strategy in any building MUST include an air-sealing measure in addition to insulation. An air-permeable insulation product like fiberglass will not create an energy efficient building envelope no matter how high the R-value.

Convection

The transfer of heat by heating a fluid media such as air or water and then moving the media to a new location.

Example: A forced-air furnance adds Btu's of heat to air, then distributes the air throughout a building through a system of ducts and vents that carry the warm air to the desired location.

According to the EPA and the department of Energy, convection (air-infiltration) accounts for approximately 60% of the total heat loss/gain in a typical home in the U.S. Convection is occuring 24/7 due to air pressure, temperature differences between the inside and outsic of a building. As these differences seek to equalize, air moves through the building envelope through every crack and passage way. A product's ability to resist convective heat loss/gain is measured by permeability. A product with a low air or vapor perm rating will reduce convection.



Conduction

The transfer of heat through two objects touching. Example: Touching a hot stove with your hand.

Conduction occurs through building materials as heat is absorbed either from the sun's rays or from the air inside the house and then transferred from one object to another object through direct contact. R-value is a measurement of a product s ability to resist conductive heat movement. R-value does not measure heat ioss/gain via convection or radiation and therefore is not in itself adequate to describe a products over-all energy efficiency performance. Factors such as permeability and reflectivity must also be known in order to assess how a product will perform against convective & radiant heat loss/gain.

Radiation

The transfer of heal in the form of electromagnetic waves.

Example: The transmission of electromagnetic waves from a source such as a fire or the sun to an object in the path of the waves such as a person or the earth.

Radiant heat loss/gain only accounts for about 10% of the total heat loss/gain in a building dire to the relatively short amount of time that it occurs in any given 24 hour period. The only consistent source of radiant heal energy that effects buildings is the sun. For the sun to transfer radiant heat energy into a building it must be in the direct path of the rays the sun is emitting. During a typical day this kind of transfer occurs for about 4-6 hours when the sun is most directly over-head. Clouds or trees may obstruct the sun's rays which can minimize or eliminate this kind of heat transfer from occurring all together.

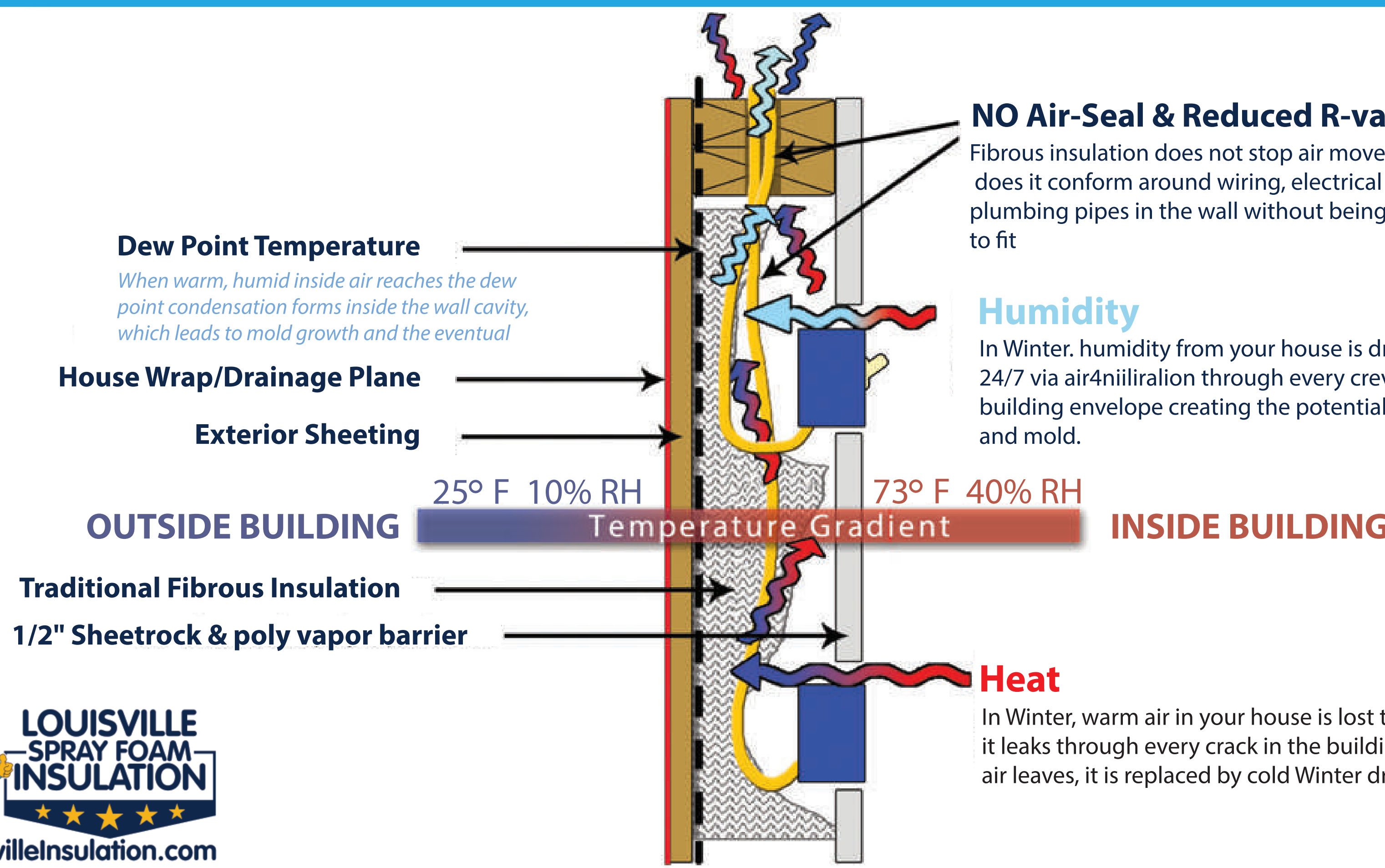
Air & Moisture Movement In The Building Envelope

Winter Heating Scenario with Traditional Fibrous Insulation Materials

- Traditional insulation materials struggle to meet the demands of today's high performance homes.

- A study done by the California Energy Commission in 2032 showed that 100% of the sample homes had improperly installed ("commonly installed") fibeglass. The primary orcolems cited were gaos at the tops, bottoms, and edges of the wall cavities and compression of baits when squeezed into cavities behind wiring and plumbing.

- To effectively install fiberglass without compress on, gaos, and voids would significantly increase the amount of labor cost & time typically budgeted for an average home built in tie US, to say rothing of caulking or can-foaming wiring & plumbing penetrations through plates, which may or may not get done at all. In light of that reality, spray foam is. in fact, a cost effective answer "for those who want to insulate AND seal their home to reduce energy consumption and prevent potential condensation & mold growth/ - Bob Brice, Founder. Cenergy LLC - Energy Consulting & HERS Rating Firm



NO Air-Seal & Reduced R-value

Fibrous insulation does not stop air movement, nor does it conform around wiring, electrical boxes, or plumbing pipes in the wall without being compressed to fit

Humidity

In Winter. humidity from your house is driven into your walls 24/7 via air4niiliralion through every crevice and crack in the building envelope creating the potential for condensation and mold.

Heat

In Winter, warm air in your house is lost to the outside 24/7 as it leaks through every crack in the building envelope. As warm air leaves, it is replaced by cold Winter drafts.

LOUISVILLE SPRAY FOAM INSULATION

LouisvilleInsulation.com

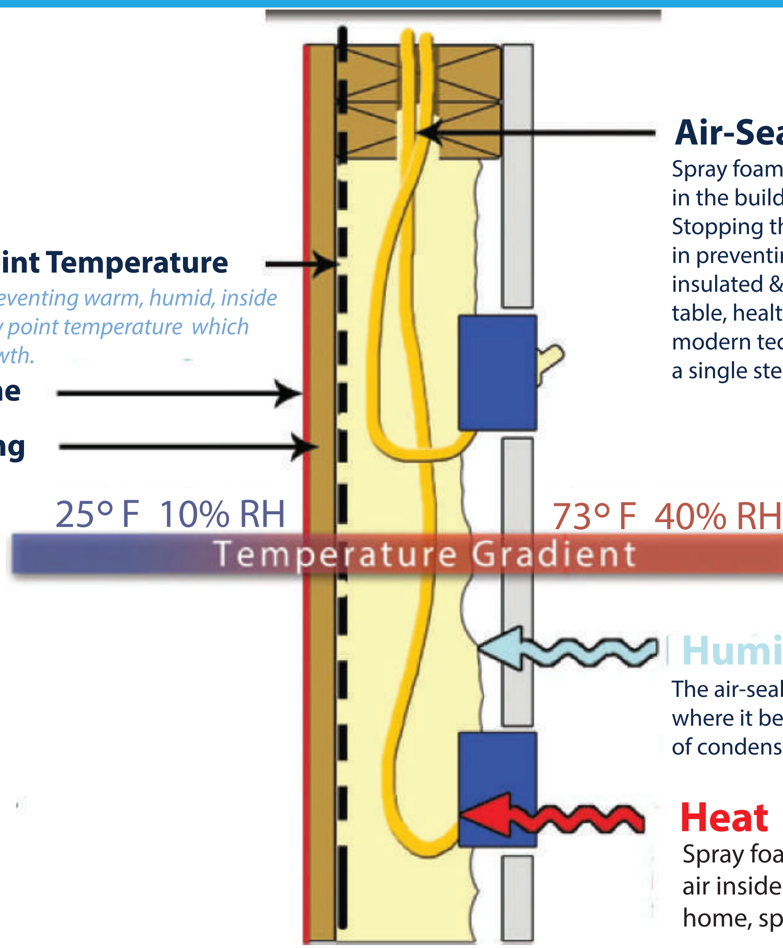
Air & Moisture Movement In The Building Envelope

Winter Heating Scenario with Modern Spray Foam Insulation Materials

UP TO 50% MORE ENERGY EFFICIENT: *Spray foam insulation air-seals your home by filling every nook and crack with an expanding, air-impermeable insulation virtually eliminating drafts and convective heat loss/gain.*

MOLD & MOISTURE PROTECTION: *Spray foam insulation is not a food source for mold. In addition, spray foam prevents warm, humid air from coming into contact with the dew point preventing condensation inside the wall cavity.*

MORE HEALTHY, COMFORTABLE & QUIET: *Spray foam insulation completely seals the building envelope increasing indoor air quality and comfort by locking out unwanted pollutants, allergens, dust, drafts and noise.*



Dew Point Temperature

Spray foam insulation creates a barrier preventing warm, humid, inside air from coming into contact with the dew point temperature which prevents condensation, rot and mo/d growth.

House Wrap/Drainage Plane

Exterior Sheeting

OUTSIDE BUILDING

INSIDE BUILDING

Air-Seal

Spray foam insulation expands to fill and seal every crack and gap in the building envelope including wiring and plumbing penetrations. Stopping the free-flow of air in your wall cavities is a critical first step in preventing condensation, mold growth and structural rot. A properly insulated & air-sealed building envelope is necessary to create a comfortable, healthy, and energy efficient home. Spray foam insulation is a modern technology that cost-effectively insulates & seals your home in a single step

Humidity

The air-seal created by spray foam insulation keeps indoor humidity inside where it belongs maintaining indoor comfort, and eliminating the possibility of condensation inside the wall cavity.

Heat

Spray foam insulation seals the cracks and crevices that allow warm air inside to be lost to the outside. By sealing and insulating your home, spray foam insulation can reduce energy costs by up to 50%.

LOUISVILLE SPRAY FOAM INSULATION

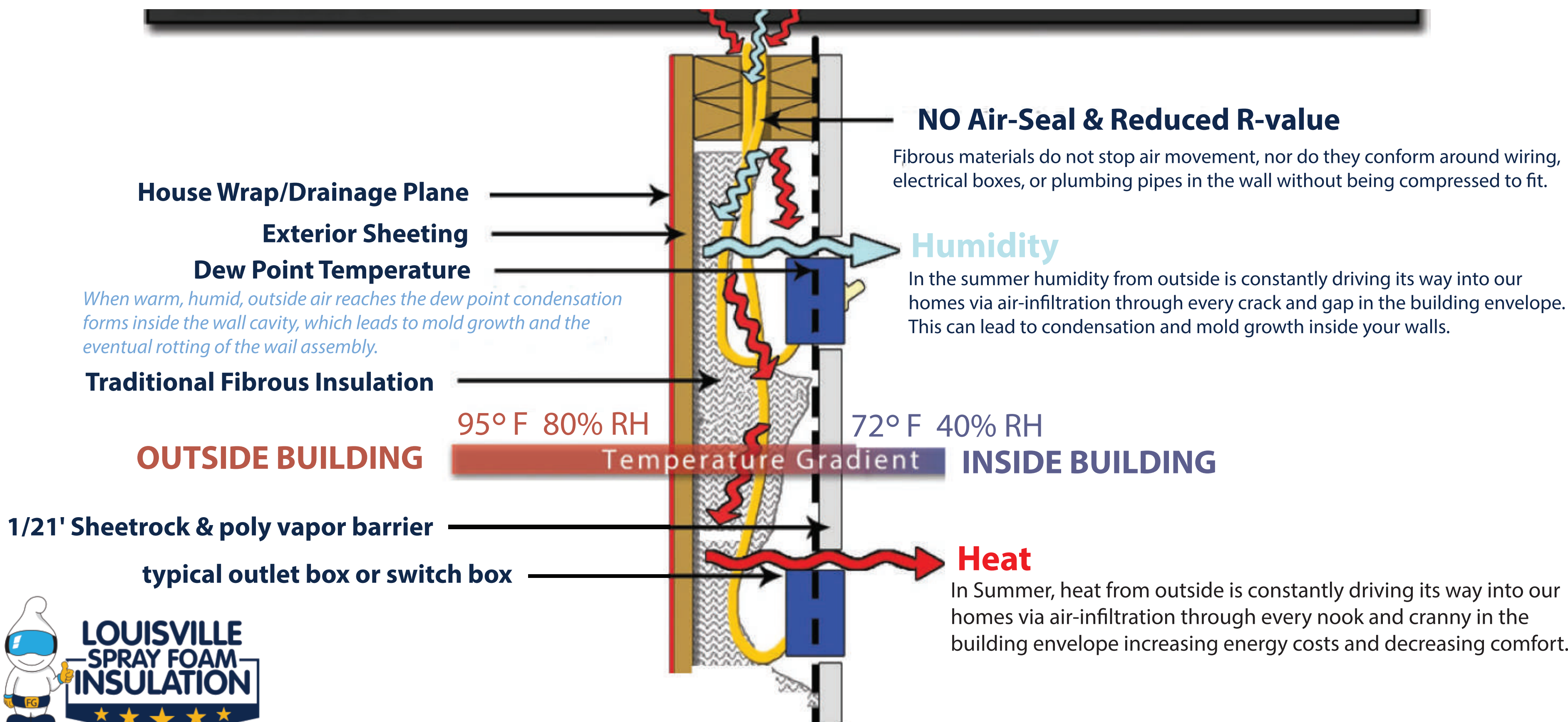
LouisvilleInsulation.com

Air & Moisture Movement In The Building Envelope

Summer Cooling Scenario with Traditional Fibrous Insulation Materials

Traditional insulation materials struggle to meet the demands of today's high performance homes.

- *Fibrous insulation materials act as a filter that captures dust, dirt and pollutants as air freely moves through it.*
- *The R-value of fiberglass drops by more than 40% when compressed: or when ambient temperatures rise above 85° F, or drop below 45° F - Oak Ridge National Laboratories*
- *Air-infiltration through the building envelope accounts for up to 60% of the total energy loss in homes in the US - EPA*



LOUISVILLE SPRAY FOAM INSULATION

LouisvilleInsulation.com

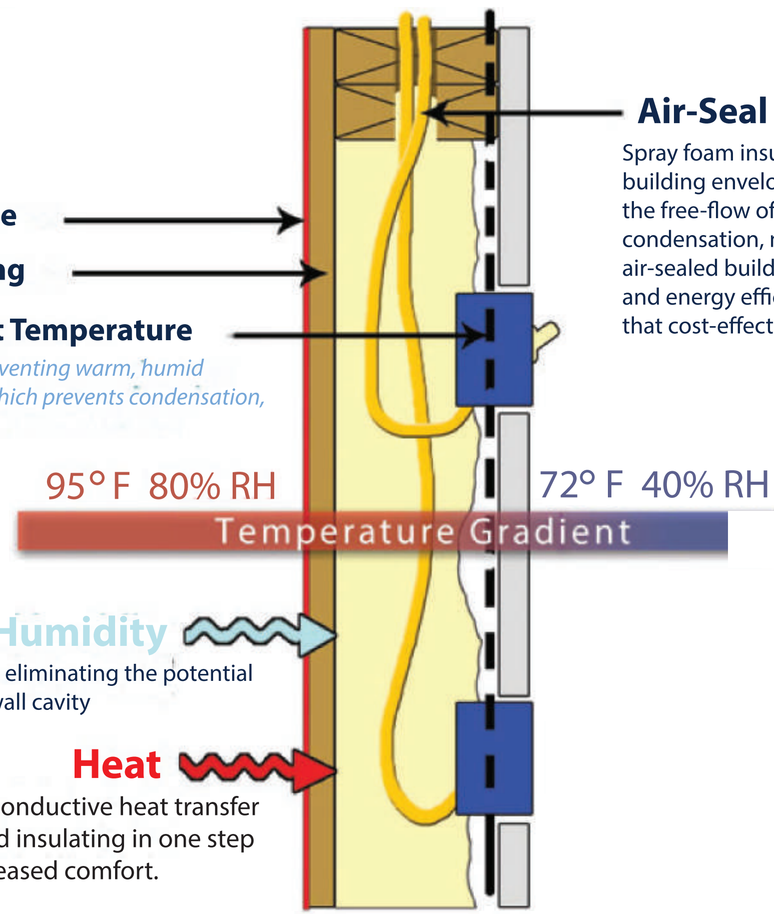
Air & Moisture Movement In The Building Envelope

Summer Cooling Scenario with Modern Spray Foam Insulation Materials

UP TO 50% MORE ENERGY EFFICIENT: *Spray foam insulation a r-seals your home by filling every nook and crack with an expanding, air-impermeable insulation virtually eliminating drafts and convective heat loss/gain.*

MOLD & MOISTURE PROTECTION: *Spray foam insulation is not a food source for mold. In addition, spray foam prevents warm, humid air from coming into contact with the dew point preventing condensation inside the wall cavity.*

MORE HEALTHY, COMFORTABLE & QUIET: *Spray foam insulation completely seals the building envelope increasing indoor air quality and comfort by locking out unwanted pollutants, allergens, dust drafts and noise.*



Air-Seal

Spray foam insulation expands to fill and seal every crack and gap in the building envelope including wiring and plumbing penetrations. Stopping the free-flow of air in your wall cavities is a critical first step in preventing condensation, mold growth and structural rot. A properly insulated & air-sealed building envelope is necessary to create a comfortable, healthy, and energy efficient home. Spray foam insulation is a modern technology that cost-effectively insulates & seals your home in a single step.

House Wrap/Drainage Plane

Exterior Sheeting

Dew Point Temperature

Spray foam insulation creates a barrier preventing warm, humid outside air from entering the wall cavity, which prevents condensation, rot, and mold growth.

Traditional Fibrous Insulation

OUTSIDE BUILDING

INSIDE BUILDING

Humidity

Spray foam insulation locks out humidify eliminating the potential for condensation & mold growth in the wall cavity

Heat

Spray foam insulation reduces convective & conductive heat transfer through the building envelope by sealing and insulating in one step Resulting in decreased energy costs and increased comfort.

LOUISVILLE SPRAY FOAM INSULATION

LouisvilleInsulation.com

Moisture Transfer

Part II: Air Infiltration

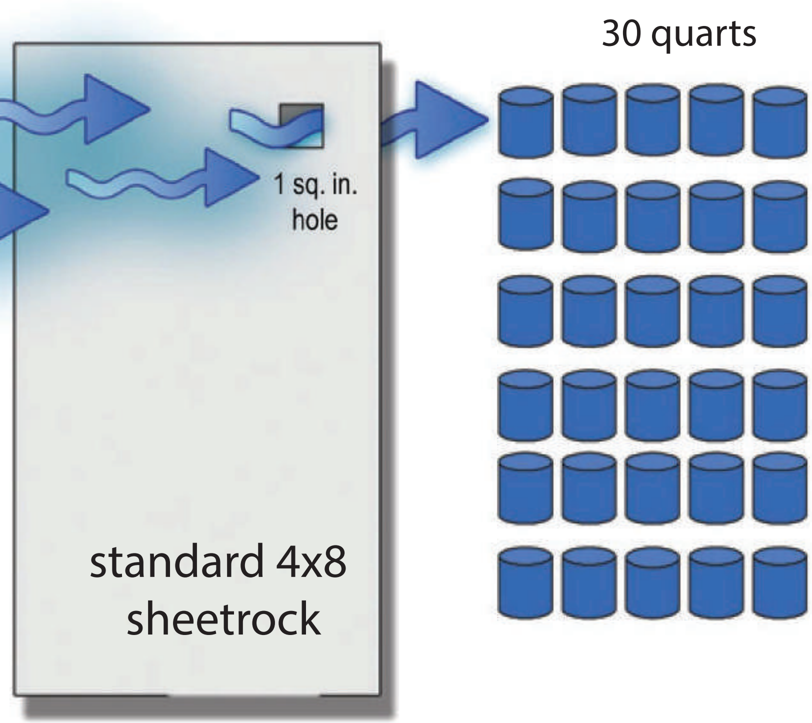
"Of al! the environmental conditions,, moisture poses the biggest threat to structural integrity and durability, accounting for up to 89% of damage in building envelopes"

- Bomberg, M. and W. Brown, Construction Canada

The Experiment

In Part II scientists created identical interior/exterior conditions to Part I, however, this time they then cut a 1 sq. inch hole in the drywall to simulate the amount of leakage that would be created by an average outlet or switch box.

- Courtesy of Joseph Lsfburek - Building Science Corporation, Research Report 0412 - November 2604 - Insulations, Sheathings and Vapor Retarders



The Result

Under normal winter conditions 30 quarts of water passes through a 1 sq. in. hole in a solid 4x8 sheet of gypsum board via air-infiltration.

The Conclusion

Air infiltration is the overwhelming cause of the majority of moisture migration into wall cavities making it the single greatest cause of a wide array of moisture-related building failure including structural damage, rot, mold, mildew and poor indoor air quality.

Thirty quarts of water provides mold spores more than adequate moisture for germination and growth. The paper backing on drywall, structural wood framing, and any dust or dirt in the wall cavity can provide an adequate food source.

Moisture Transfer

Part I: Vapor Diffusion

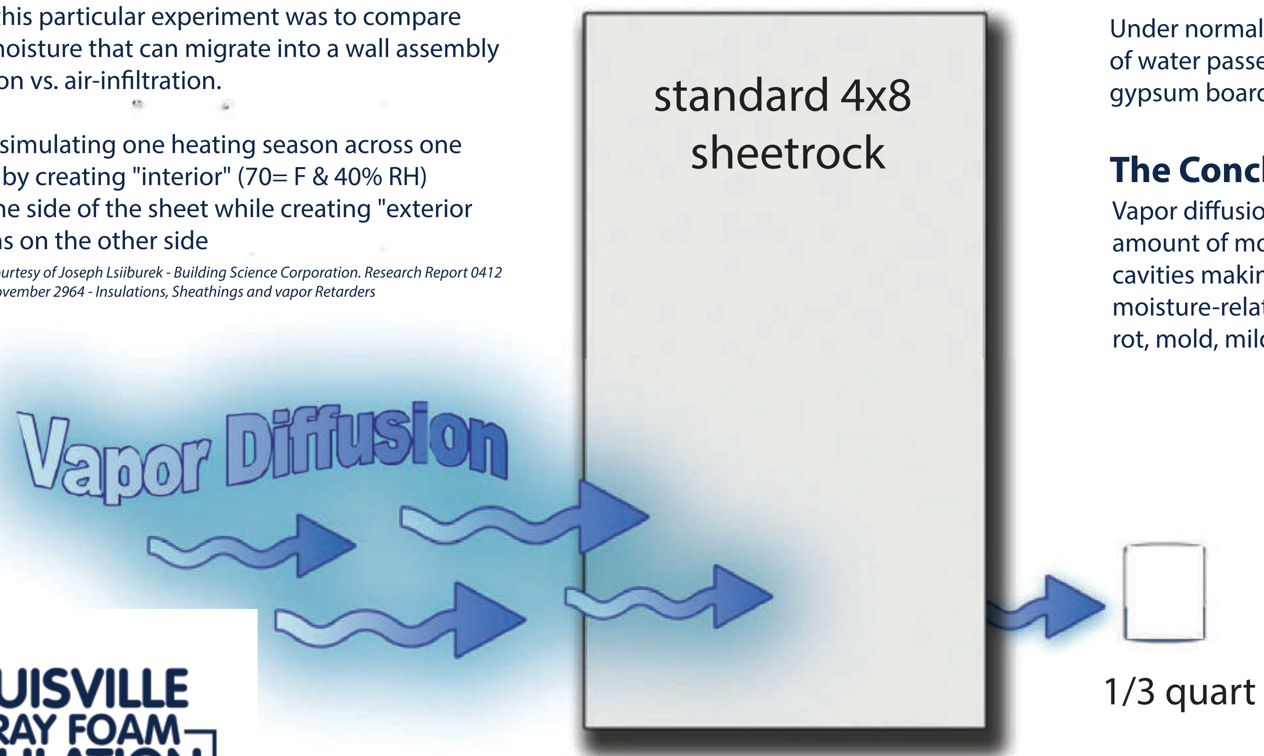
Diffusion is the migration of moisture by means of vapor drive caused by vapor pressure differential (AP). It can occur in either direction depending on season and climate of a particular geographic region. Coastal areas with higher relatively humidity will spend a greater portion of the year with vapor diffusion occurring toward the interior of the building and dryer climates will see the opposite. Vapor diffusion occurs naturally and constantly through nearly all building products year-round. According to ASHRAE the amount of water transferred through the building envelope due to vapor diffusion is insignificant and does not contribute to building failure.

The Experiment

The purpose of this particular experiment was to compare the amount of moisture that can migrate into a wall assembly via vapor diffusion vs. air-infiltration.

Part I started by simulating one heating season across one sheet of drywall by creating "interior" (70= F & 40% RH) conditions on one side of the sheet while creating "exterior winter conditions on the other side

- *Courtesy of Joseph Lsiiburek - Building Science Corporation. Research Report 0412 November 2964 - Insulations, Sheathings and vapor Retarders*



The Result

Under normal winter conditions 1/3 of a quart of water passes through a solid 4x8 sheet of gypsum board via vapor diffusion.

The Conclusion

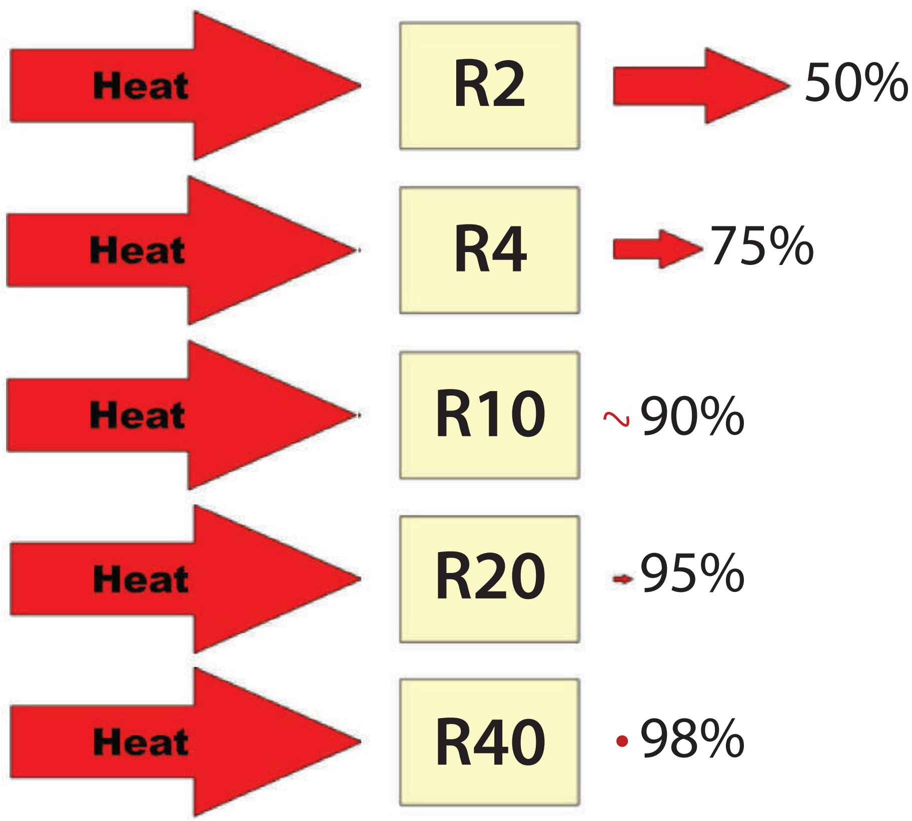
Vapor diffusion accounts for a very minimal amount of moisture migration into the wall cavities making it an insignificant factor in moisture-related building failures like structural rot, mold, mildew, or poor indoor air quality

R-value Explained

Measurement of heat flow

R-value is the measurement of heat flow. Insulating materials have higher R-values while materials that are thermally conductive have lower R-values. The R-value of an insulator does not necessarily increase proportionately with depth or thickness. R-value does not measure heat flow due to convection or radiation and as such it is not the only metric that must be considered when judging a product's overall thermal performance.

R-value reduces the conduction of heat by the following percentages:



Common building products have a wide range of R-values. Some are listed below.

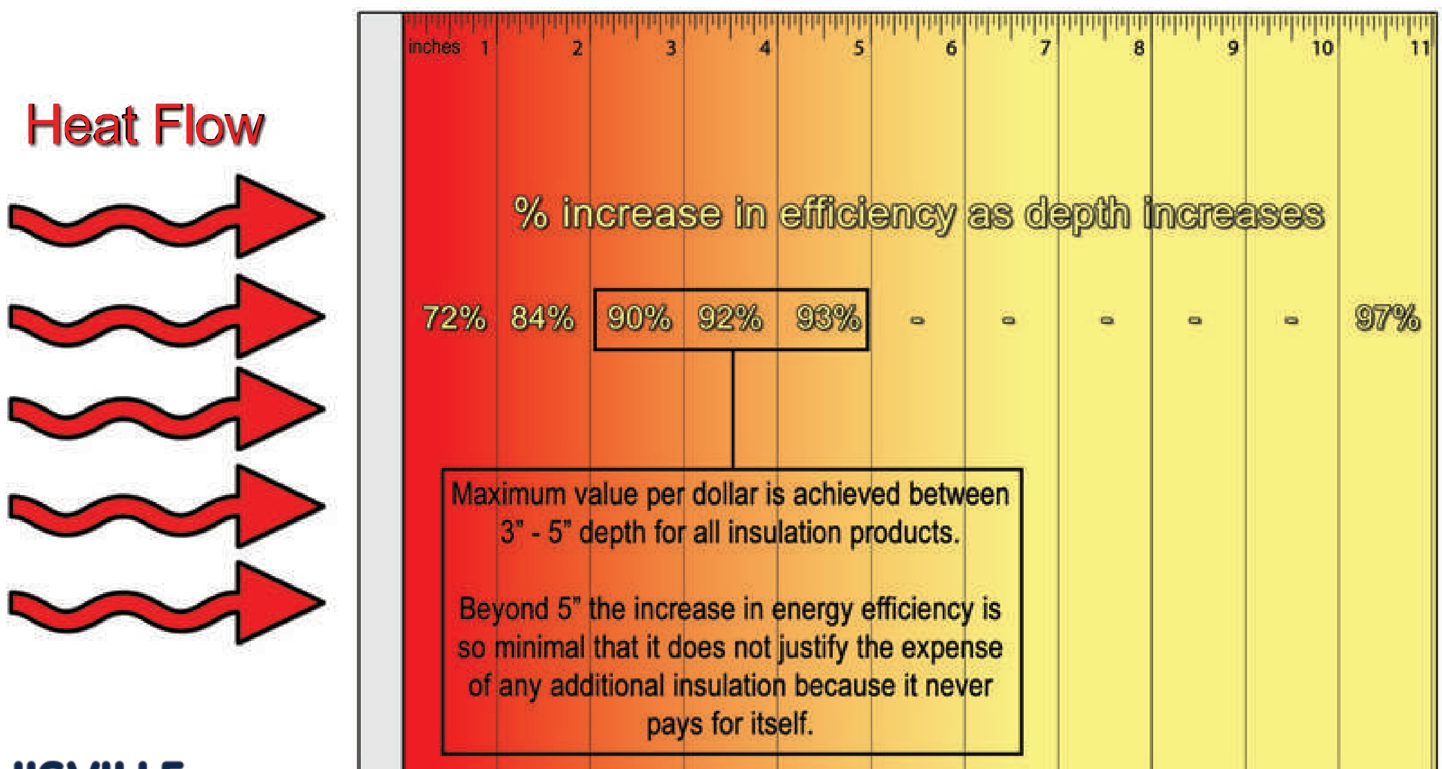
Material	R-value per inch
steel	0.004
concrete	0.1
wood	1
OC SPF	3.7-4.0
CC SPF	5.2-6.9

Diminishing Return of R-value

For all types of insulation

The Experiment

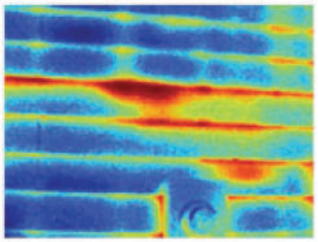
Conventional wisdom says that every additional inch of insulation installed yields a proportional increase in energy efficiency performance. While this seems intuitive, this study conducted by the NAHB Research Center proves otherwise. With every insulation product there is point of diminishing return where additional insulation provides little or no increase in energy efficiency. Surprisingly, that point for all insulation products is around 3-4 inches.



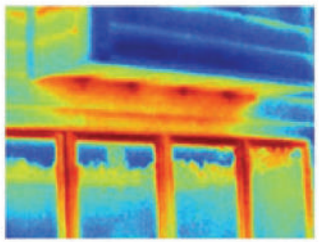
Courtesy of the NAHB Research Center

Traditional fibrous insulation materials lose insulatingvalue when you need it most.

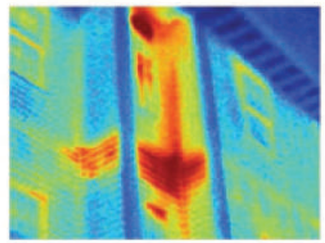
Fiberglass insulation loses 40% of its labeled R value due to compression and gapping in wall cavities due to wiring, pipes, outlet boxes, and other obstructions. In addition during periods of extreme hot/cold fiberglass loses up to 40% of its R-value. The pictures below show the effectiveness of fiberglass batt insulation during a period where the ambient temperature was 38° F and interior temperature was 70° F. Observe how the heat "pours" out while the cold "pours" in!



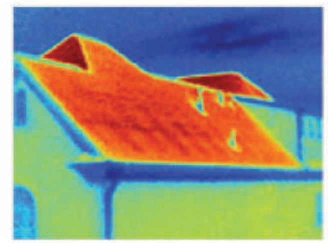
Heat from inside the house coming through the exterior siding due to air infiltration.



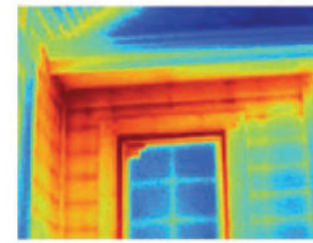
Heat pouring out a cantilevered floor insulated with fiberglass



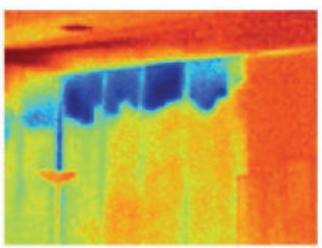
Heat escaping through one of many thermal "gaps" in the building envelope



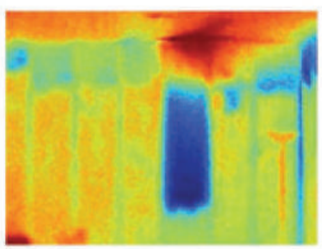
Heat from inside the house has escaped through the fiberglass insulation in the attic heating up the roof deck



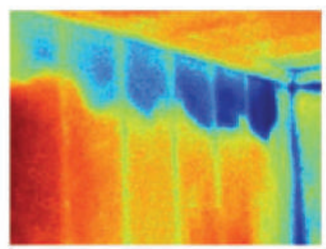
Heat comes through the building envelope due to excessive air infiltration.



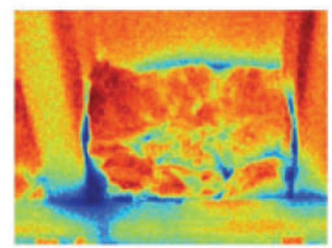
'Cold' pours in through the lop plate of a typical interior wall insulated with fiberglass batt insulation.



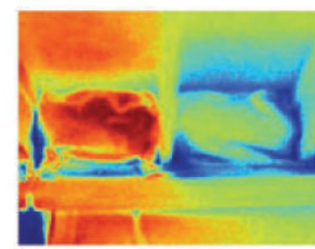
This fiberglass-insulated wall cavity is performing far worse than its neighboring wall cavities because the batt in this cavity is compressed behind a plumbing pipe.



"Cold" gets the top of this wail cavity due to a gap and/or compression of the fiberglass batt installed in this wall cavity



The performance of fiberglass is dramatically pours in through the one and gaps. Observe an the right due to compression the poor thermal performance at the edges and in all the areas where the batt is compressed.



Fiberglass batts installed in a rim-joist. More "cold" pours in through the one on the right due to compression

LOUISVILLE SPRAY FOAM INSULATION

LouisvilleInsulation.com

LOUISVILLE SPRAY FOAM INSULATION

LouisvilleInsulation.com

Foam Science 101

1403 Rowan St. Louisville KY 40203
Admin@LouisvilleInsulation.com
502 - 377 - 0078

Foam Science 101

Open cell foam

Two Basic Categories of Foam - Open-Cell & Closed-Cell. Each has its own unique characteristics and unique applications. Both open and closed cell spray foams are created by combining an "A" component which is commonly referred to as "ISO" and a "B" component known as "resin". The two individual raw chemicals are heated to approx. 140 degrees F and mixed or proportioned together at an equal ratio under pressures ranging from 1000-1700 psi. As the components are combined an exothermic reaction occurs and foam is made.

Open Cell .5

ThermalGuard OC1

Open Cell Spray Foam

Open cell foam products also have a tight cell structure however, the foams expand with such speed and force that the cells literally come open. The gases created during the reaction process leech or off-gas immediately and are replaced with air making them very healthy and stable. Most open cell foams utilize water as their blowing agent and R-values for open cell foams range from 3-5.5 per inch which is lower than their closed cell counterparts. This is due to the larger cell structure and absence of an "insulating" gas in the cells as with closed cell products.

Open cell foams tend to be physically soft and expand at a rate of 100-120x causing them to have a lower density, larger cell structure, and higher permeability rating. Typically open cell foams achieve a density of between 0.3 -1.2lb/cu.ft., however, some can be as high as 2 lb/cu.ft. They are most often used as building insulation in wall cavities and attics. Because they are soft and have little or no compressive strength they add no structural rigidity to the building envelope. However, their soft and flexible nature enables them to move with the building without pulling away from the substrate assuring that the building envelope remains insulated and air-sealed. Perm ratings for open cell foams range from 3-16 which qualifies them as an air-barrier, but not a vapor barrier. Open cell foams can be applied to a depth 3-8 inches in a single pass. The high rate of expansion makes it difficult to install the product at a precise depth and a normal project can have up to 4 inches of variance from the target depth. When installed in open wall/ceiling cavities this can cause installers to have to trim the excess foam that protrudes past the face of the studs or joists creating a large amount of wasted product and adding additional labor expense and time. However, open cell products are less expensive than closed cell products with installed prices ranging from $1.25 - $1.65 per square foot at an approx, depth of 3.5 inches.

Open Cell foams are a bio-renewable spray foam insulation system that is presently redefining the spray foam industry with best-in-class designation in the areas of fire-resistance, bio-renewable content, and R-value rating. It is designed for interior residential and commercial construction & is well suited for insulating all areas of the building envelope, particularly unvented attic spaces where the excess foam can be left in place adding to the insulating value.

Open Cell can be applied in a variety of ambient conditions with little effect on yield or spray ability. It offers R-value, permeability, and speed/ease of installation that rival that of a closed-cell spray foam, but maintains the affordability of an open-cell product. In addition, its slightly lower rate of expansion makes it ideal for use in wall and ceiling cavities where it where it can be applied at a controlled depth significantly reducing labor expenses, job duration, and waste.

Foam Science 101

Closed cell foam

Two basic categories of Foam - Open-Cell & Closed-Cell. Each has its own unique characteristics and unique applications. Both open and closed cell spray foams are created by combining an "A" component which is commonly referred to as "ISO" and a "B" component known as "resin" or "polyol". The two individual raw materials are heated to approx. 120 0-150 0 F and mixed together at an equal ratio under pressures ranging from 1000 -1700 PSI. As the components are combined an exothermic reaction occurs and raw materials combine to form a new spray foam product.ade.

Closed Cell Spray Foam

Closed cell foam products (commonly known as SPF or spray polyurethane foam) have a tight cell structure and each cell is closed with gases trapped inside. The primary gas is called a blowing agent and can be a variety of industrial propellants depending on the foam manufacturer. Prior to manufacturing the foam this gas is present in liquid form in the resin (B) drum. Once healed and mixed with the ISO (A) at the appropriate ratio this liquid blowing agent becomes a gas and causes the curing foam to rise. Currently the most foam manufacturers use 245fa which is safe and environmentally friendly blowing agent. The gas trapped in the cells adds to the product's insulating value. Over a short time after spraying a small portion of this gas may 'leech" out of some closed-cell foams through a process called off-gassing. When this occurs the foam's R-value is diminished slightly. That is why all dosed cell foam specs typically include an initial R-value and an aged R-value if the off-gassing affects the R-value. R-values of closed cell foams will range from R5 -R7.

Closed cell foams tend to be physically rigid and have a relatively low rate of expansion - typically around 2O-30x - which accounts for their higher density, tight cell structure, and thus extremely low vapor permeability ratings. Traditionally closed cell foams have a density of 171bfcu.fl or greater. They can achieve compressive strength ratings of up to 100 psi giving them the ability to add tremendous structural strength and rigidity to a building envelope without adding significant weight. They are commonly used as interior and exterior insulation/vapor barrier on walls and foundations, under slabs, and in roofing applications where they are covered with a weather proof coating. Their low rate of expansion makes it possible to spray them at a very consistent depth with little variation beyond the "rough" texture. Atypical 2.0lb closed cell foam can be applied at a maximum of 2" in a single pass and thus when greater depth is required, the product is sprayed in 2" layers called "lifts" until target depth is achieved. Typical installed price of a 2.0lb closed cell foam will range from $1.80 - $2.45 per square foot at a depth of 2 inches Closed cell products can achieve perm ratings of less than 1 meeting the building code requirements for classification as a class I vapor barrier. The cost/benefit diminishes greatly when 2.0lb SPF is installed al depths greater than 4' because there is no significant improvement in thermal or vapor performance beyond that depth regardless of manufacturer.

2.0lb SPF can be applied to a wide variety of substrates including brick, concrete, wood, steel, as well as others. It can typically be successfully appli ed at temperatures as low as 35"F, though cold conditions do adversely affect product yield and therefore SPF contractors may charge more for winter applications.

Closed Cell

Foam Science 101

Why spray foam?

Spray foam has been around for over 60 years and is in many products you use every day. It is used in hot tubs, jet fighters, space shuttles, travel mugs, seat cushions, beds, theme park attractions, TV and movie sets, sound stages, and etc. It has one of the widest range of applications of any product produced today.
The chart below demonstrates why spray foam is also the preferred choice for sealing and insulating buildings.

Insulation Comparison Chart

Feature or Benefit	Fiberglass Batts	Wet Sprayed Cellulose	Open-cell, Semi rigid Spray Foam	Closed Cell, Rigid Spray Foam
Perfect fit and conformity to cavity size/shape			✓	✓
Meets vapor barrier requirements				✓
Meet air barrier requirements			✓	✓
Does not wick or absorb water			✓	✓
Contains no formaldehyde		✓	✓	✓
Does not settle or sag over time			✓	✓
Remains adhered to vertical substrate such as walls			✓	✓
Remains adhered to horizontal substrate such as floors			✓	✓
Remains adhered to angled substrate such as roof decks			✓	✓
Will not support combustion	✓	✓	✓	✓
Provides additional structural strength				✓
Can help reduce combustion in a fire event due to air-seal		✓	✓	✓
Will not shrink	✓		✓	✓
Does not require drying time	✓		✓	✓
No food value for pests or rodents	✓	✓	✓	✓
Does not emit harmful gases or dust particles			✓	✓
Maintains R- value in extreme cold/hot conditions			✓	✓
Significantly reduces sound transmission		✓	✓	✓
Help maintains good indoor air quality			✓	✓
Will not become a habitat for dirt, allergens, and dust mites			✓	✓
Total Score	**4**	**5**	**18**	**20**

LOUISVILLE SPRAY FOAM INSULATION

LouisvilleInsulation.com

Foam Economics 101

1403 Rowan St. Louisville KY 40203
Admin@LouisvilleInsulation.com
502 - 377 - 0078

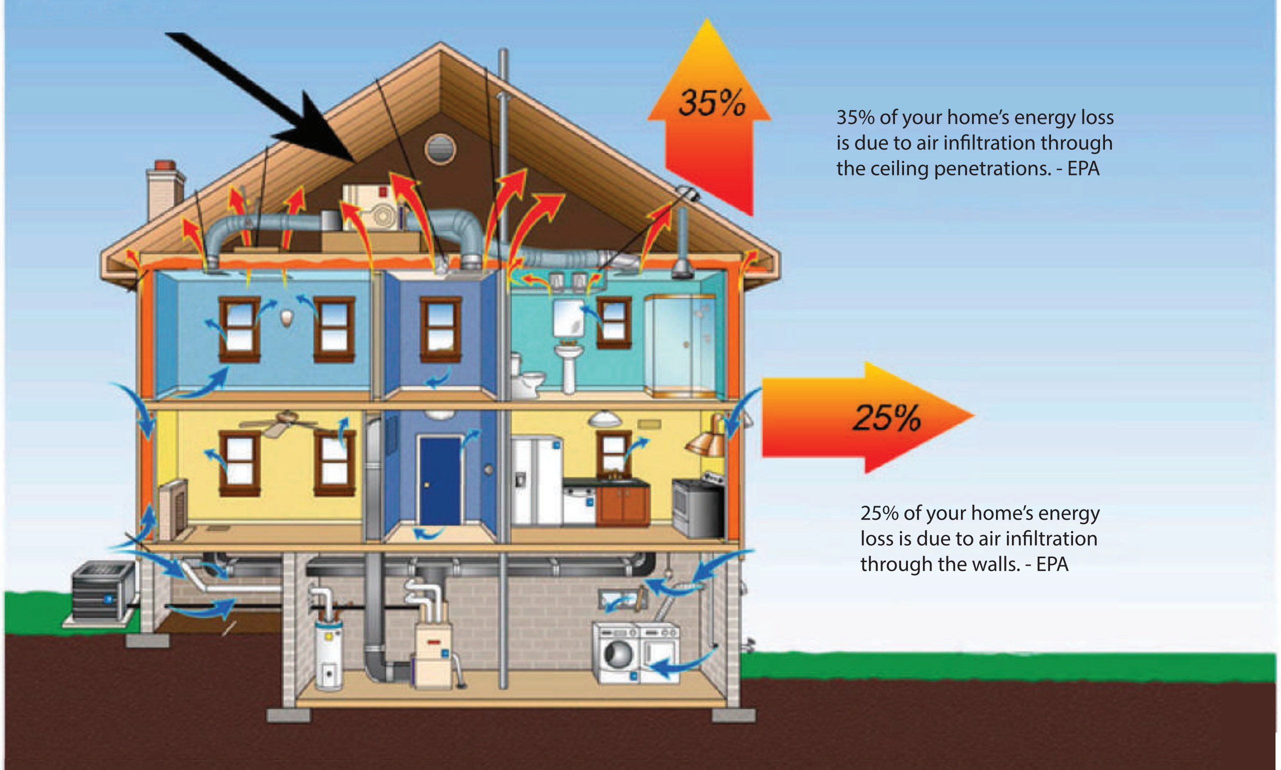
Foam Economics 101

How much do air leaks and poor thermal performance cost?

Fibrous insulation is not an air barrier therefore it does not solve the problem of convective heat loss/gain. The EPA and the U.S. Department of Energy estimate that convection accounts for jp to 60% of energy loss/gain n houses in the U.S.
In addition, Oak Ridge National Laboratories found that fibrous insulation performs at 50% of its labeled R-value during periods of extreme cold or he: outdoor conditions. This means that when you need them most these products' fa.il to be an effective thermal insulator to stop conductive heat loss/gain.
Convection and conductor combined account for 9C% of teta energy gainloss through the building envelope.

Building Science Facts: Vented Attic Assembly Problems

1) In Summer attic temps soar upwards of 130D F as the sun pours in radian/conductive heat. Coding your home down to 75c F creates a 55 " F &T across the ceiling boundary, causing heat from the attic to travel down into the interior of the structure rather than exiting through the attic vents.
2) The efficiency of ducts located in the attic drops dramatically as the cool, conditioned in them air gains heat as it travels through a 130F attic.
3) Roof vents allow humidity lo enter the attic causing a build up of condensation on cool metal ducts carrying conditioned air. This condensation will soak into the surrounding insulation reducing its insulation R-value to zero and eventually causing mold, mildew, and other moisture related building failures.
4) Conversely, in winter, attic temps drop sucking heat from the duct system, and from within the house to the outdoors causing comfort problems and increasing energy bills.



THIS HOUSE:

Monthly Payment: $1657.00
Monthly Utility Bill: $287.00
Total Monthly Cost: $1944.00

Turn the page and see how spray foam insulation can turn this home's energy losses into

$$$ SAVINGS
every month and improve Comfort reduce noise increase indoor air quality

LOUISVILLE SPRAY FOAM INSULATION
LouisvilleInsulation.com

Foam Economics 101

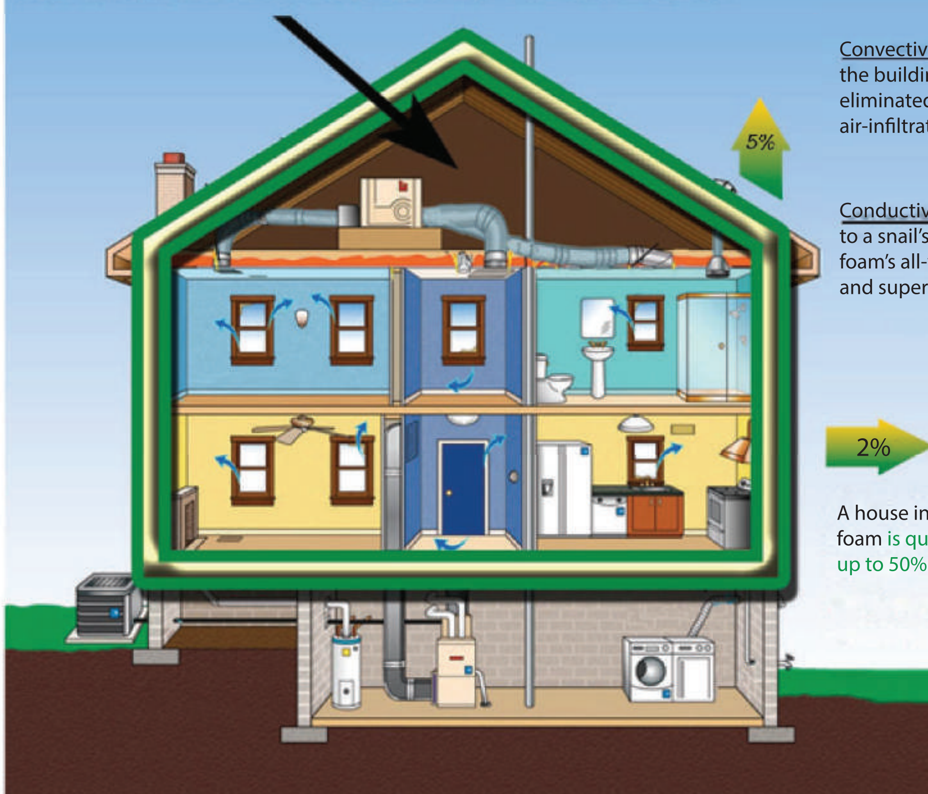
How much can foam insulation save?

Spray foam insulation serves two purposes by insulating and air-sealing a building's thermal enve lope. Therefore it prevents both convective and conductive heat loss/gain in a building.

By sealing as well as insulating, spray foam can reduce energy costs by up to 50% over fiberglass and cellulose insulation products, which do not have the ability to seal the building envelope and lose their ability to insulate during periods of hot and cold

Building Science Facts: Sealed Attic Assembly Advantages:

1) The attic stays within 5M0" F of interior temp because hot outside-air and the sun's radiant heat energy are locked out in summer, and warm air is held in in the winter.
2) In Summer humidity is locked out of the attic preventing condensation, mold and mildew, and in winter, interior humidity levels are easily maintained increasing comfort and indoor air-quality.
3) The efficiency of the duct system increases because all duct leakage is retained inside the building envelope and not allowed to escape to the outside & heat loss/gain is virtually eliminated as conditioned air travels through a duct system in an attic environment that is neither extreme hot nor cold.



Convective heat loss/gain through the building envelope is virtually eliminated with the reduction of air-infiltration

Conductive heat/loss is reduced to a snail's pace because of spray foam's all-weather-stable R-value and superior insulating ability

A house insulated with spray foam is quieter, healthier, and up to 50% more energy efficient.

THIS HOUSE:

Monthly Payment: $1657.00
Monthly Utility Bill: $148.00
Total Monthly Cost: $1840.00

increase mortgage cost: $35.00
energy savings per month: $139.00
net monthly savings: $104.00
net annual savings: $1248.00

Spray foam insulation saves more $$$ than it costs you.

It is the only upgrade you can put in your home that pays for itself in the first month and ...

- improves comfort & temp consistency
- stops unwanted noise intrusion
- reduces dust, allergens & pollutants
- allows smaller HVAC equipment
- eliminates the conditions that cause mold and mildew

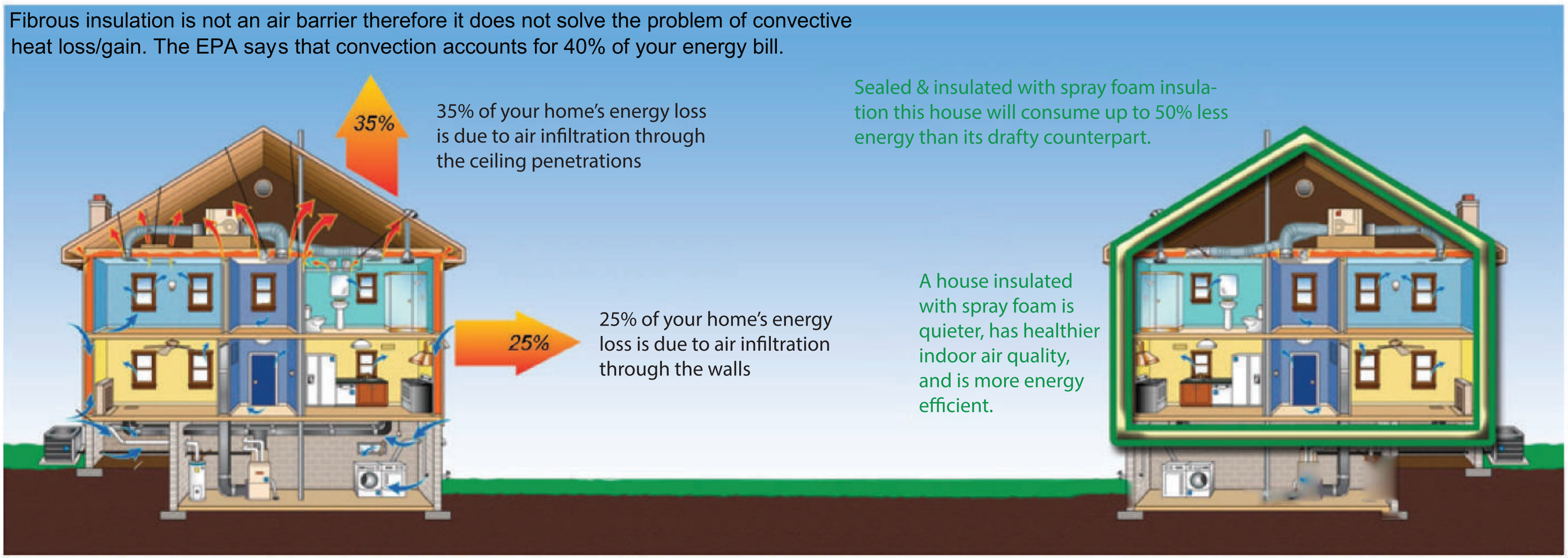
LOUISVILLE SPRAY FOAM INSULATION
LouisvilleInsulation.com

Foam Economics 101

Cost/Benefit Analysis

Spray foam insulation serves two purposes by insulating and air-sealing a building's thermal envelope. Therefore it prevents both convective and conductive heat loss/gain in a building. Convection and conduction combined account for 90% of the total heat loss/gain in a typical building according to the EPA.

By sealing as well as insulating, spray foam can reduce energy costs by up to 50% over fibrous insulation products, which do not have the ability to seal the building envelope.



Monthly Payment: $1657.00
Monthly Utility Bill: $287.00
Total Monthly Cost: $1944.00

Monthly Payment (include foam upgrade): $1692.00
Utility Bill: $148.00
Total Monthly Cost: $1840.00

Additional Monthly Cost To Purchase Foam Upgrade: $35.00
Energy Savings Per Month; $139.00
Net Monthly Savings: $104.00
Net Annual Savings: $1248.00

Invest in your home ... not your heating bill.

LOUISVILLE SPRAY FOAM INSULATION
LouisvilleInsulation.com

Air Infiltration

Air infiltration, or convection, accounts for up to 60% of your utility bills & can lead to moisture condensation inside wall cavities

Below are the results of independent blower-door tests performed on houses of the similar shape, size, and orientation. All houses were built by the same builder in Pella, Iowa. All houses were insulated to an R13 on exterior walls and R38 in the attic.

Wall Insulation
R13 Blown-in Fiberglass Blanket Insulation
Attic Insulation
R38 **Blowin-in** Fiberglass

Air leakage test:
29ACHnat
(natural air changes/hour)

avg, utility bill
$144/month

Other Considerations
- cold/hot spots common throughout house
- air moves relatively freely through leaks in the building envelope making condensation within wall cavities likely

Wall Insulation
R13 Fiberglass Batt Insulation
Attic Insulation
R38 **Blowin-in** Fiberglass

Air leakage test:
19ACHnat
(natural air changes/hour)

avg, utility bill
$115/month

Other Considerations
- cold/hot spots common throughout house
- air moves less freely, however infiltration still occurs resulting in potential condensation & mold growth

Wall Insulation
R13 Open-cell Spray Foam Insulation
Attic Insulation
R38 Open-cell Spray Foam Insulation

Air leakage test:
19ACHnat
(natural air changes/hour)

avg, utility bill
$65/month

Other Considerations
- even temperatures throughout with no drafts
- quite indoor environment
- healthier indoor air quality