



# Icynene Spray Foam Insulation

## Is It Right For Your Project?

Presented by: **Rich Brown**  
Icynene Dealer/ Certified Sprayer

### What is Icynene?

Icynene is a low-density, open-cell, flexible spray-on foam insulation.

- Low-density                                      ½ lb per cubic foot
- Open-cell                                         Icynene is 99% air
- Semi-flexible                                    Icynene will flex with your structure and is not easily separated from building materials. It has the approximate texture and softness of angel food cake.
- Conforms to your building                  Icynene expands at a rate of 100:1. As it expands it takes the shape of building materials and clings very effectively to them.
- Urethane Foam (closed cell) → Isocyanate + Resin + Alcohol = polyurethane foam
- Icynene (open cell)                            → Isocyanate MDI + Proprietary Resin + Water = polyicynene foam

### Icynene is an effective AIR BARRIER, but NOT a vapor barrier

By ASTM Standard E-283:

Air Barriers allow air passage of less than 0.02 Liters of air, per second, per meter squared  
Icynene's ASTM E-283 test results show: 0.0049 L/sec/m<sup>2</sup> @75 Pa for 5" and 0.0080 L/sec/m<sup>2</sup> @75 Pa for 3"

(In this test, 5 inches of fiberglass allows 35 liters of air per second to pass through!)

By ASTM Standard E-96:

Vapor barriers require a perm rating of less than 1.

Icynene's ASTM E-96 test results show: 16 perms for 3" and 10 perms for 5"

(This shows how readily water will dry out of Icynene if there is a water leak)

### Fire Properties

Fire needs temperature, fuel and oxygen to exist. Air is 21% oxygen, Icynene has an oxygen index of 23 (ASTM D-2863), which means it needs extra oxygen to begin burning.

Icynene contributes ZERO fuel to a fire.

Icynene has a Flame Spread Index of less than 20 (ASTM E-84) and Smoke Development of less than 400. 2006 Code requires flame spread of less than 25 and smoke development of less than 450 for a Class A fire rating. Icynene will not melt, flow or drip when exposed to fire. It will be consumed by the type of intense flame produced after a fire has been burning for 15 minutes or so.

## Icynene and Water

Icynene is Hydrophobic:

If submerged, water will infiltrate it, then run out with gravity.

Water will continue to dry out of the open-cell structure.

Icynene will not wick water.

Icynene will not trap water against the structure.

Water from a leak in a roof will run straight through Icynene and drip directly below the leak.

Icynene can be sprayed on framing that is still wet from rain without harm to the foam or the structure.

## Icynene and Mold

Icynene provides no food for mold or mildew. (Confirmed by independent studies at Texas Tech University)

As an air barrier, Icynene inhibits the movement of air-borne moisture, spores, food for mold, pollen and other contaminants into the structure. It also reduces the movement of moisture-laden air near outside walls where the moisture tends to condense.

## Icynene and Sound

Icynene's sound ratings are only slightly better than perfectly installed fiberglass batting, installed in perfectly spaced framing, with perfectly straight lumber. However, a variation of one quarter inch in the position of framing, or a 1/4" bow or twist in lumber will result in a huge variation of sound qualities in batting, while making no difference in those of Icynene. Icynene's tested sound characteristics for a 2x4 wall assembly are: STC: 37, NRC: 70

## Open Cell vs. Closed Cell Foams

**There are advantages and disadvantages to both types of foam.**

	<b>OPEN CELL</b>	<b>CLOSED CELL</b>
Structural Value	None	Measurable structural value, adds to stiffness and structural integrity of a building within certain parameters.
Air Barrier	High rating	High initial rating. <u>Aged values</u> vary widely with brand and blowing agent.
Fire Qualities	Varies with brand, primarily Class A fire rating (check reports)	Varies with brand, largely Class B fire rating – See ICC Reports.
Flexibility	High – Moves with building during severe temperature change, structural settling and weight shifts.	Low – Will move slightly with the building but will crack when wood framing flexes or masonry expands.
Water	Highly Permeable	Non-permeable
Masonry Walls in Crawls	Not well suited for below grade applications in non-heated areas.	Handles below grade conditions on block and concrete very well.
Above-Grade Masonry	Handles expansion/contraction well and clings to masonry. May be sprayed across movement joints.	Does not expand and contract at the same rate as masonry. May crack and spall over time.

## OPEN CELL

## CLOSED CELL

Crawl or Basement Ceiling	Well suited under ideal or adverse conditions. Allows water leaks to drain, allows floors to flex under heavy loads without cracking or separating.	Well suited under ideal conditions. Adverse conditions like water leaks would be a disaster because of closed cell's inability to dry moisture from against the substrate.
Roof Deck	Ideally suited to accommodate: <ul style="list-style-type: none"><li>- Large temperature changes</li><li>- Roof flex from wind, snow or ice</li><li>- Leaks in the roof</li><li>- Water introduced through vents</li></ul>	Not well suited for this application. Lack of flexibility causes cracking and spalling of foam with high winds and abrupt temperature changes. Also traps water from leaks against decking.
Repairing Your Boat:	Don't try it.	Closed cell spray foam is a Coast Guard approved flotation substance.

## Movement of Building Materials

The ACI-530 Masonry Standard, adopted by NC over 13 years ago has long required allowance for up to +/- one inch of movement per ten linear feet of concrete block (CMU) wall. Movement joints are required to allow for this. Cutting movement joints into closed cell spray foam would defeat its air barrier qualities, not cutting them would result in natural cracking, or breakaway from the substrate, again, defeating the air barrier qualities. Open-cell foam could be sprayed across expansion joint without harm.

Heavy wind loads in wooden exterior walls can result in deflection of the wall which exceeds the maximum deflection of closed cells foams, resulting in either cracking of the insulation, separation between the substrate and insulation, or both.

Severe temperature differences of over 100 degrees between daytime and night are common in NC. (200 degree roof temperature during summer days, and 70 degrees at night). These severe shifts in temperature can cause materials to shrink and grow more than closed cell foam can accommodate.

## Getting the Most Out of Spray Foam Insulation

Spraying an air barrier in the entire house is not an expense you want to incur with mixed results. To get the most out of your foam, we recommend a full air-sealing package:

Full Draft-Stop Service

Low-Expansion Foam Around All Windows and Doors

Caulk All Corners, Tee's, Jack-Studs, Top Plates, Bottom Plates, Doubled Roof Rafters and Headers

Fill all empty Corners, T's and Headers with Spray Foam

## Documentation is the Key to Success in Foam

Your spray foam contractor should be able to provide written proof that they are a valid alternate method of insulation for North Carolina. According to Barry Gupton, an ICC Code Compliance report is the primary way to accomplish this. Make sure the report is for the exact product the contractor is providing and is current, not expired. (Many brands have two to four types of foam, and only one with an ICC report. Contractors routinely spray more than one, and leave the single report).

When spraying to the roof deck, your contractor needs to provide proof that his product is part of an accepted assembly, and that the warranty on your roofing material is protected. (See attached letters from roofing manufacturers).

## Upon completion of your job, your contractor should provide:

- A Site Certificate (aka Attic Card) from the foam manufacturer, stating the properties of the foam, and filled out by the contractor with site-specific information.
- Product Specifications for the foam
- An ICC Code Compliance Report for the foam
- Certification that the correct foam thicknesses have been applied to meet code requirements
- Proof of Performance Values, if they are being used to meet code
- Warranty Paperwork for the site (preferably a fully transferrable lifetime warranty)

## Icynene and HVAC

Different brands of foam claim a variety of results on energy savings. The claims range from 35% to 60%. Our experience so far has shown us an average downsize on HVAC system of about 30 to 33% and typical savings on HVAC energy costs from 40 to 50%. On average, the extra mortgage cost for buying spray foam rather than fiberglass should be more than offset by the HVAC energy savings.

Bringing fresh air into a fully sprayed structure is critical. The penalty for not doing so is stale air, inefficiently running HVAC equipment, decreased life of HVAC equipment, moisture problems, air pressure problems and lack of draft in fireplaces and hood fans. In addition, according to the type of furnace installed, a separate intake for furnace combustion air may be required.

Below is a list of the information that your HVAC contractors/engineer can use to do his load calculations and rightsize the equipment for the structure if Icynene is being utilized. **Basics:**

Based on the performance engineering by Icynene, use R-19 for walls and floors and R-30 for ceilings, slopes, cathedrals and overhangs on the foam. (We have the engineer's letter to handle R-38, as well). Avoid using extra safety factors in calculations, such as assuming worst-case orientation of the home, adding extra people or using a 95 degree rule of thumb, instead of the book value for degree days of 91 degrees and so on.

The Water Vapor permeance of the foam according to ASTM E96 data is:

16 perms 941 ng/(Pa-s-m<sup>2</sup>) @ 3" thick

10 perms 565 ng/(Pa-s-m<sup>2</sup>) @ 5" thick

The Air Permeability (in liters per second per square meter) according to ASTM E283 data is:

0.0049 L/S-m<sup>2</sup> @75 Pa for 5.25" (Same thickness of fiberglass batts is 37.0 liters per second)

0.0080 L/S-m<sup>2</sup> @75 Pa for 3.25"

As previously mentioned, this foam makes the structure so air-tight that the introduction of fresh air through the HVAC system is absolutely essential. The amount of air infiltration on an Icynene house under normal conditions is typically 0.1 ACH (Air Changes per Hour). Icynene suggests the use of ASHRAE 62.2, or other manufacturer approved method to calculate the proper amount of fresh air required. They lean towards a target air change of 5 ACH while the system is running

## Icynene and Severe Weather

A study conducted by The Alan G. Davenport Wind Engineering Group at the University of Western Ontario showed that a home employing spray foam and the unvented attic assembly performed far better than a traditionally vented home under hurricane conditions. The traditionally vented house allowed wind-driven rain in through the soffit vents, gable vents and ridge vents. In some cases, enough water was allowed in to fully flood the attic to the top of the plates, while no water got into the unvented attic that had Icynene installed in the roof deck. There is also a huge difference in likelihood of the entire roof being torn off by the hurricane winds. When severe winds can get in through the vents, upward pressure on the roof deck lifts it up fairly easily. Finally, an unvented attic assembly virtually eliminates ice-damming and roof-edge icicles during cold weather, further lowering risk of water damage to the home.