



# ICYNENE™

HEALTHIER, QUIETER, MORE ENERGY EFFICIENT\*

## THE ICYNENE® ADVANTAGE

### APPLICATION CASE STUDY:

### *Energy Efficient Remodel of a Heritage Home*



#### **Synopsis:**

- ✓ Achieved more than a 50% reduction in the size and cost of the HVAC system by installing ICYNENE LD-C-50™† rather than fiberglass insulation
- ✓ Improved Indoor Air Quality
- ✓ Maintained low moisture/humidity levels, despite extreme outdoor levels
- ✓ Reduced energy consumption

*(Note: all references to the HERS index in this case study reflect the original rating system. HERS changes have taken effect January 2007. These changes are outlined in the footnote on pg. 2)*



### The Challenge:

Built in 1908 and situated within the federally designated historic district of Wilmington, North Carolina, an abandoned home was acquired for rehabilitation by homeowner, Martyn St. David. Deemed to be in a general state of disrepair, the building was to be gutted and restored in order to serve as Martyn's residence as well as her office. This was to be achieved while remaining sensitive to environmental concerns when choosing building materials.

Moreover, Martyn's allergic reactions to mold and mildew demanded a high-performance insulation that is dedicated to air barrier and moisture control. By controlling random airflow, Icyne minimizes condensation caused by infiltrating moist/humid air which would otherwise be transported through the building envelope, invading cool, air-conditioned surfaces and potentially leading to mold growth within the walls and ceilings.



*This abandoned home in Wilmington's historic district was gutted and restored to meet Energy Star® standards.*



*Icyne, a high-performance insulation, was selected to address the homeowner's strong allergic sensitivity and reaction to mold and mildew.*

The challenge was to convert this previously abandoned house into an Energy Star®-rated home. To earn the Energy Star® designation, the home must receive a minimum Home Energy Rating (HERS) of 86, which translates to at least a 30% increase in energy efficiency versus the 1993 Model Energy Code.

#### HERS Update:

*Prior to January 2007, the HERS index was based on the 1993 Model Energy Code where the "code" home score was 80. Every 5% reduction in total energy consumption achieved 1 point with 100 being the best possible score. To meet Energy Star® requirements, a home needed to be 30% more efficient than the model energy code (equivalent of HERS 86). Under the new system (in effect January 2007), the HERS index is based on the 2004 International Energy Conservation Code where the "code" home score is 100. For every 1% reduction in total energy consumption, the HERS index is lowered by 1 point. Under this system, a zero-energy home would score 0. To meet new Energy Star® requirements, a home in a cold climate needs a HERS index no higher than 80 (20% more efficient than the reference home). In moderate or hot climates, an index no higher than 85 is required. Visit [Energystar.gov](http://energystar.gov) for complete details.*



This one-story, five-room, 1,104 square foot home was to be converted to 2 bedrooms with a home office. This made the reduction of airborne sounds a key factor when evaluating insulation alternatives.

The original clapboard structure was designed long before air conditioning was a standard household feature, so it was built to circulate air throughout the wall system. In balloon frame tradition, all interior wall stud cavities were open from the crawlspace to the attic, which had vents installed into the gable ends. These gable vents would provide an avenue of escape for the hot air. By incorporating lots of windows for primary ventilation, this design provided for a fairly comfortable home in the days of unlocked doors and no security alarms. However, high humidity levels experienced in North Carolina during the summer months affected the humidity levels inside the home. During these months, interior humidity levels were equivalent to the extreme levels that were present outside.

### **The Solution – Insulate with Icynene:**

The need for a Healthier, Quieter, More Energy Efficient® living environment inevitably resulted in the decision to install Icynene in this heritage home. This high-performance, expanding foam insulation was required to tighten the building envelope in order to decrease interior humidity levels, improve indoor air quality, regulate the attic temperature and incorporate a properly-sized heating and cooling system to optimize performance and energy efficiency.



*Icynene is sprayed directly into the wall cavity. The foam softly expands to fill all of the cracks and crevices around the studs and window casings. Any excess foam is easily trimmed in preparation for drywall.*



*Icynene is water-blown and does not contain synthetic blowing agents such as HFCs. An Icynene-insulated environment is highly recommended for those suffering from allergies, respiratory problems and chemical sensitivities.*

The installation included:

- R-20 (5.5 inches) of Icynene to the underside of the roof deck, making the attic part of the conditioned space and allowing the temperature to adjust within 10°F of the ambient interior temperature of the house.
- R-13 (3.5 inches) of Icynene in the walls
- R-20 (5.5 inches) of Icynene in the floor
- The HVAC system installed was a 10 SEER, one-ton, ductless unit



*After the Icynene® application, blower door test data confirmed that this home met and exceeded the energy efficient requirements for designation as an EPA Energy Star® Home.*



*Icynene was key in restoring this heritage home, which was once considered irreparable. Now, the home provides the owner with a Healthier, Quieter, More Energy Efficient® environment.*

## The Results:

As a complete air barrier, Icynene helps minimize the infiltration of warm, moist air that can condense and lead to the growth of mold and mildew. By sealing out dust, allergens, odors and pollutants, Martyn does not have to worry about the detrimental effects caused by poor indoor air quality, which would otherwise irritate her allergies. She also notices much less dust around the house, which causes even less disruption to her respiratory condition.

Icynene's philosophy of building tight and ventilating right proved to be a successful technique, according to the data supplied by the homeowner:

- The house was designated as an Energy Star® home, **exceeding** the EPA requirements of HERS 86
- Total HVAC energy costs for a 52-week period from May 2002 to May 2003 were \$343.04, for an average of \$0.94 per day.<sup>1</sup>
- The installation of the HVAC system amounted to \$1,367. Had the house been insulated with fiberglass, the HVAC contractor estimated that a 2 1/2-ton unit would have been required, with the installed unit costing approximately \$3,500. Icynene saved the homeowner \$2,133.
- Humidity readings for the period between May 2002 and October 2002 ran between 44-50% inside, even when the humidity levels exceeded 90% outside.<sup>2</sup>
- The attic temperature never exceeded 7°F above the ambient temperature of the conditioned living space.<sup>3</sup> The temperature was monitored during the months of August and September 2002, when the exterior temperatures ran above 92°F for extended periods of time.

With regard to the performance of Icynene as a method of minimizing the intrusion of airborne sounds, Martyn attests that the office is not invaded by unwanted noises. As the sidewalk was being replaced near the home during the summer months of 2002, Martyn's work space was not affected; *"Even with the back hoe operating only 25 feet from where I sit in my office, there was no need to raise my voice in conversation with staff to compensate for the sounds or vibrations, as they were minimal"*.



### The Icynene-Insulated Heritage Home:

- ✓ Created an airtight building envelope to minimize moisture and condensation, thus helping to prevent mold growth
- ✓ Optimized energy efficiency with HVAC rightsizing and lower energy costs
- ✓ Decreased and maintained interior humidity levels
- ✓ Minimized the intrusion of airborne sounds to create a quieter work and living environment

### Icynene Insulation

Icynene foam insulation products are sprayed into/onto walls, crawlspaces, underside of roofs, attics and ceilings by Icynene Licensed Dealers. They expand in seconds to create superior insulating and air-sealing results. Every crevice, crack, electrical box, duct and exterior penetration is effortlessly sealed to reduce energy-robbing random air leakage. Icynene products adhere to the construction material and remain flexible so that the integrity of the building envelope seal remains intact over time.

Icynene is ideal for residential, commercial, industrial and institutional indoor applications. The products are:

**Healthier:** Icynene spray foam products are CHPS (Collaborative for High Performance Schools) EQ 2.2 Section 01350 Compliant, meeting nationally recognized requirements as Low-Emitting Materials (LEM) and Environmentally Preferable Products (EPP). Icynene spray foam products are 100% water-blown and contain no HFCs or PBDEs. Icynene seals out dust, pollen and other allergens from entering the structure. As air barriers, Icynene products minimize the potential for airborne moisture build-up and related problems such as mold and mildew.

**Quieter:** By air-sealing the building envelope, Icynene effectively minimizes airborne sounds. Icynene is perfect for reducing unwanted noises from home theaters, plumbing runs and playrooms.

**More Energy Efficient:** Icynene delivers up to 50% more energy savings versus traditional insulation.

Information about Icynene insulation can be obtained by calling Icynene Inc. (800-758-7325), visiting the website [Icynene.com](http://Icynene.com), or contacting your local Icynene Licensed Dealer.

† The Icynene product installed and addressed in this project example is Icynene's classic formula, ICYNENE LD-C-50™.

#### Endnotes:

1. Progress Energy
2. Weems & Plath Weather Station
3. Oregon Scientific digital/dual thermometer located on the floor of the sealed attic



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