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THE ICYNENE[®] ADVANTAGE

APPLICATION CASE STUDY: *Energy Performance Peaks at the Home Builders Association's Office*



Synopsis:

- ✓ Heating costs reduced by 92%
- ✓ Created an air tight building envelope for a comfortable indoor environment
- ✓ Helped in improving the HVAC performance





Overview:

The office of the Home Builders Association of South Carolina (HBA of SC) is located in the historic area near the University of South Carolina Horseshoe in downtown Columbia, SC. It is an historic residence built over 112 years ago.

The HBA office and its members and volunteers have worked together for many years, to help the community pursue the American dream of homeownership. The HBA of SC has provided resources and training to the local builders/remodelers for incorporating energy efficient features in new and existing homes that improve the overall energy performance of the buildings.

But ironically, the HBA of SC office building itself was experiencing energy cost nightmares. The aged building suffered from severe air leakage and the energy costs were completely unjustifiable for a 3,651 square foot structure.

The HBA of SC planned to undertake a complete renovation and face-lift of their office, mainly to improve energy efficiency, reduce energy bills and restore the historical appeal of the structure. The contract for the renovation project was awarded to Remodeling Services Unlimited, Inc.

The Challenge

The building was balloon framed with rustic timbers and featured a vented attic assembly. Outdated HVAC equipment was located in the unconditioned attic space, causing poor energy performance. The walls were not straight and not properly supporting the floors and the roof above. Many areas in the framing were over spanned, especially in the ceilings, and there was no insulation in the walls.

During most summer afternoons, when the mercury hit 90°F, the upper level would reach 80°F. This was caused by hot and humid outside air continually leaking into the building through the cracks in the walls and ceiling. Not only was the indoor temperature at an uncomfortable level but the air conditioning costs were also unreasonably high.

“Our energy bills were making a big hole in our pockets. While promoting energy efficient buildings in the state, it was time for us to achieve it in-house and educate the industry by providing our own example,” says Mark Nix, Executive Director, HBA of South Carolina.



The new HBA office building got a complete facelift inside and out while heating bills were reduced by a remarkable 92%.



The building had no insulation prior to the renovation. Icyne insulation and air barrier was installed in the walls, floors and attic for reduced air leakage.



The Solution

The renovation included increasing the space available for office and meeting areas and making a complete cosmetic change to the interior as well as exterior of the building. For an energy efficient, healthier and quieter building, the remodeling contractor Tony Thompson from Remodeling Services Unlimited decided to upgrade the building's performance by controlling air leakage, while improving the indoor air quality and reducing airborne noises.



When sprayed, Icnene expands 100 times and completely adheres to the substrate reducing the chances of any air gaps forming inside the wall cavity.



The wall cavities were overfilled and trimmed to ensure a complete fill of insulation in the walls.

Conditioning the attic was a major renovation feature which would greatly affect the energy efficiency of the new structure.

As the first step, the remodeling contractor listed the key objectives of the project:

- Create a tighter building envelope for reducing air leakage;
- Improve the heating and cooling efficiencies by creating a conditioned attic;
- Improve Indoor Air Quality and serenity for building occupants;
- Expand the office space to accommodate a larger meeting area;
- Select building products that can deliver an immediate return on investment.

Having experienced the best of the best products in the remodeling industry, Tony knew exactly the product that could serve most of the building objectives for this project - ICYNENE LD-C-50™† light density spray foam insulation and air barrier material which insulates and air-seals in one step due to its very high expansion rate and superior air-sealing capabilities.

The interior and exterior of the office building were completely gutted. Walls were furred to straighten them and framed as necessary to provide additional support.

A two-man crew from HBS Foam Insulation, an Icnene Licensed Dealer, sprayed the 2x4 exterior walls and floor joists with 3.5 inches of Icnene providing an R-value of R-13 and insulating the entire building perimeter. Icnene was applied directly under the roof deck at 5.5 inches providing an R-value of R-20. The vertical wall and roof insulations formed a continuous air-seal converting the old ventilated attic into an unvented attic assembly.

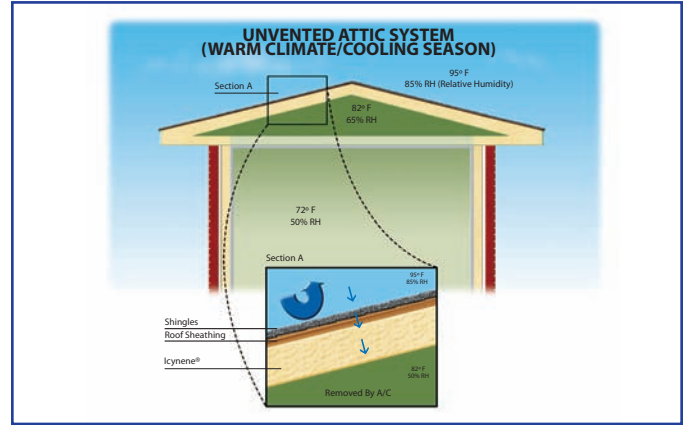
Insulating & Air-sealing – A 2005 National Institute of Standards and Technology (NIST) study indicates that an air barrier system could reduce air leakage by up to 83% in commercial buildings¹. Icnene is a tested and qualified air barrier when applied at only one inch thickness².



When sprayed, it adhered and expanded to 100 times its original volume in seconds to fill every gap, crevice and penetration in the walls, ceilings, floors and attic, creating an air tight building envelope.



The air tight building envelope construction allows for optimum heating and cooling cycles and reduced energy costs.



Icynene-insulated unvented attic assemblies are popular in hot/humid climates as they help improve the energy efficiency and moisture management of a building by reducing air infiltration.

The Results

The renovation project was completed in September 2007. The building was given a complete face-lift inside and out. The new building included the removal/ addition of non-structural interior walls for adding a new staircase to the front of the office leading to a larger conference room upstairs. A new kitchen, new rear porch and entry were built for added storage and work space.

Unvented Attic – Columbia, SC experiences widely varying temperatures. The summer temperatures can reach highs of 95°F and winter temperatures can go as low as 24°F³.

Icynene minimizes air infiltration into the attic space when applied directly to the underside of the roof deck. Icynene-insulated unvented attic assemblies are indirectly conditioned and the temperature of the attic remains within about 5°F of the directly conditioned living space below.

These attic assemblies are highly popular in hot/ humid climates as they improve the energy efficiency and moisture management of a building by reducing air infiltration. Since the attic is indirectly conditioned, the ductwork placed inside an unvented attic is cooler and performs more efficiently because any duct leakage stays within the building's thermal enclosure.

HVAC is a prime target for achieving reduced energy consumption, since HVAC systems account for approximately 40% of the energy used in United States' commercial and residential buildings⁴. Using Icynene can reduce HVAC loads and energy requirements, saving upfront purchase costs of a potentially smaller unit and later ongoing operating expenses too.

Increased Energy Efficiency – Prior to the renovation, conditioned air was escaping through the building envelope putting additional loads on the already overworked HVAC unit.



A new upgraded HVAC system was installed and sized to complement the new design and tighter construction. The HVAC performance improved as a result of the significant drop in random air leakage. The air tight building envelope construction allows for optimum heating and cooling cycles and reduced energy costs. The energy cost savings recorded by the HBA of SC's office⁵ for a period before and after the renovation are given below:

Heating Energy Cost Summary		2006		2008		% Savings
Heating Months	Bill Amt (\$)	Usage (Therms)	Bill Amt (\$)	Usage (Therms)		
January	580	306	31	6		95
February	369	179	31	7		92
March	402	226	31	6		92
April	247	141	30	6		88
Average monthly savings						92
Electricity Cost Summary		2006		2008		% Savings
Cooling Months	Bill Amt (\$)		Bill Amt (\$)			
May	413		315			31
June	515		364			41
July	681		432			58
August	726		438			66
Average monthly savings						49

A 92% reduction in heating costs and a 49% reduction in cooling costs⁶ helped the HBA of SC to realize an immediate return on their investment.

"The energy savings are significant and remarkable. I'm glad we decided to choose Icnene for the job because it would've been very difficult to achieve such results with conventional air-permeable insulation materials," said Tony Thompson, Remodeling Contractor, Remodeling Services Unlimited, Inc.

Other Benefits

Sound Control - Located near the University of South Carolina, Icnene's sound attenuation properties helped minimize the airborne sounds originating from outside. The staff of the HBA office reports that the work environment in the office is now much quieter.

Improved Indoor Air Quality - Icnene controlled air infiltration and with the help of the mechanical ventilation system, it also delivered healthier indoor air by locking out the entry of outdoor dust, allergens and pollutants.

Upon the completion of the project and after many months of occupancy, the office is clean and comfortable for the occupants, easy on the HBA's pocketbooks and eye-appealing for the visitors.



By meeting the office renovation goals, the HBA of SC aims to educate the industry by providing their own example.



Increased space utilization, improved energy efficiency and reduced energy bills are a few results of this renovation project.

Remodeling Services Unlimited, Inc. won the Remodeling Contractors Association (RCA) award in the commercial renovation over \$150,000 category for this project. The HBA of Greater Columbia's Remodelers Council holds the RCA awards to recognize the outstanding work by members of the Remodelers Council of Greater Columbia in the areas of whole house remodel/ additions.

"Icynene helped us meet all our goals in the office renovation of our 112 year old building," said Mark Nix.

Icynene contributed to the goals and standards set forth for the project by:

- ✓ Helping achieve reduction of 92% heating and 49% cooling costs
- ✓ Reducing air leakage by providing a continuous air barrier
- ✓ Improving energy efficiency by creating an unvented attic assembly
- ✓ Improving indoor air quality by locking out dust, allergens and other outdoor pollutants

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, or contacting your local Icynene Licensed Dealer.

Endnotes:

1. National Institute of Standards and Technology (NIST), Investigation of the Impact of Commercial Building Envelope Airtightness on HVAC Energy Use, 2005
2. Tests conducted by Bodycote Materials Testing Canada in accordance with ASTM E2178-03.
3. Air Conditioning Contractors of America (ACCA) Manual J, 8th Edition
4. The Air Conditioning Heating Refrigeration News, June 2008
5. The Energy Bills were tracked for the same period in 2006 and 2008. The building was under renovation in the year 2007.
6. The utility data for the cooling months represents the total electricity cost. Air Conditioning costs are inclusive.

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



For more information, contact your local Icynene Licensed Dealer

**Visit our website: Icynene.com
or call
1-800-758-7325**

