# Ducts in Conditioned Space:

## *Insulating the Attic Roofline for Comfort & Energy Savings*

**Builder's Experience**

**EASE OF INSTALLATION**
DIFFICULT — EASY

**SPEED OF CONSTRUCTION**
SLOWER — FASTER

**COST EFFECTIVENESS**
POOR — EXCELLENT

**COMPETITIVE EDGE**
NONE — SIGNIFICANT

**HOMEOWNER INTEREST**
LOW — HIGH

**Challenges**: Modifying duct installation

**Would he do it again?** Yes

**PATH Attributes:**

- Energy Efficiency
- Quality/Durability

**Builder Tips:** Add make-up air to airtight homes; try to keep the house pressurized to +4 Pascals

### Builder:
Robert Black, CAPS, CGR
Access of Sarasota, Inc.
Sarasota, Florida

### Builder Type:
Remodeler/Small Custom Builder

### The Technology:
Ducts in Conditioned Space

### The Project:
A 2,000-square-foot, one-level concrete-block home completed in February 2006 in Sarasota.

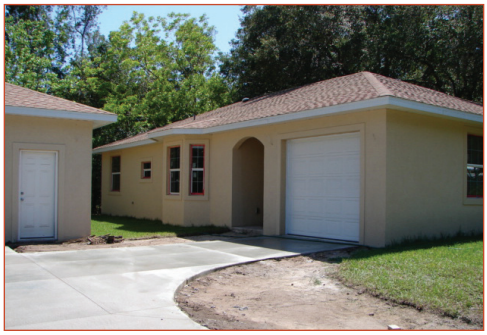
Client Mike Feil, a high-end trim carpenter and Black's former employee, plans to live in his new home for the rest of his life. Concerned about rising energy prices, Feil knew he wanted his ductwork installed in a conditioned attic. This isn't difficult, but spraying Icynene in the unvented attic's roofline to create conditioned space does change how the ductwork is hung and necessitates bringing make-up air into the home.

***"You can't control taxes, but you can control a building's energy use, so I put ducts in conditioned space. This makes for happy clients because they know their energy costs are going to be much lower over the lifespan of the building."***

– Robert Black

## BLACK'S STORY

"Clients view getting a highly energy-efficient home as one of the benefits of choosing our business," says Black. "We sell energy efficiency to people who plan on living in their homes for the rest of their lives, so energy costs are an important consideration for their overall lifetime costs. Putting the ducts in conditioned space and insulating the attic roofline helps us cut our customers' energy costs."



This 2,000-square-foot home is about 30 percent more energy efficient than code.

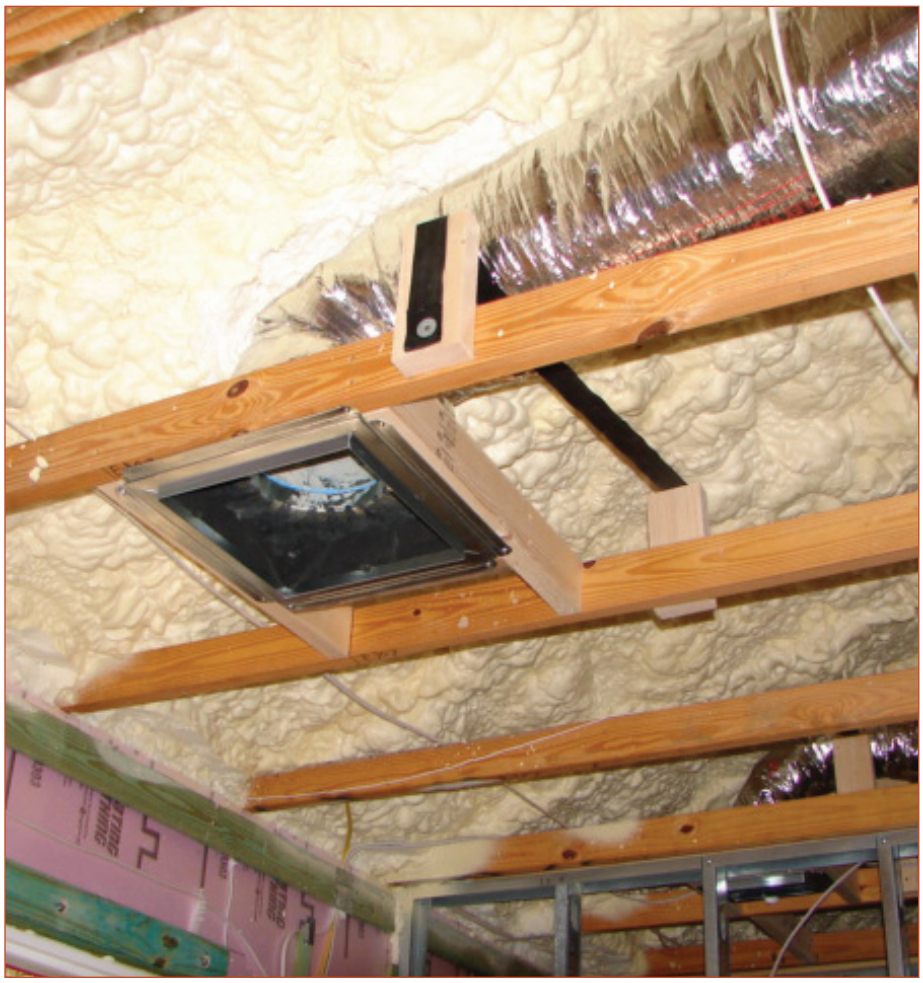
"Instead of putting the insulation in the attic floor, we put it up against the roof. It gives you a much more energy-efficient shell. By using foam insulation, it completely seals everything, and it gives you more room to run duct work on the attic floor. Spraying insulation is also really easy. You can find Icynene contractors everywhere."

Leaky ductwork and equipment can draw in unhealthy air when located in crawlspaces or unconditioned attics. Locating the ducts in conditioned space

Robert Black founded Access of Sarasota in 1994. He averages about 30 remodeling and building projects and $0.5 million in sales annually, primarily in Sarasota and Manatee Counties. After more than 40 years in the construction industry, Black now specializes in aging-in-place retrofits. Many of his older clients are especially concerned about rising energy costs.

### Why Black installs ducts in conditioned space:

"When you put ducts in conditioned space, the home becomes much more healthy and energy efficient right off the bat."



Because the insulation is blown in under the roof deck, the ductwork is supported by straps strung between pieces of 2x4 scrap, rather than hung down from the roof truss.

"It's no problem convincing people to spend a little more money when it makes for a much more comfortable, energy-efficient home."

- Robert Black

eliminates this problem and can reduce heating and cooling costs by 20 to 35 percent. Insulating and sealing the attic roofline is a straightforward way of placing the system in conditioned space.

## INVESTING IN ENERGY SAVINGS

"By insulating the attic and knee walls, we were able to downsize the mechanical unit by half a ton," Black says. "We were right on the edge between 2 ½ and 3 tons, but because there were so many windows, we opted for 3. We also saved about $120 on the cost of duct board by using 1" instead of 1 ½" because the ducts were in conditioned space. We put these savings toward the cost of the Icynene insulation, which is more expensive."

"To spray Icynene along the attic roofline cost about $5,000 for this 2,000-square-foot home. But this money will be more than made up over time because insulating the attic roofline and installing the duct work in conditioned space will reduce total energy costs by 20-30 percent. It will provide added protection against water infiltration from hurricanes as well."

"Spraying the roofline also gives you some additional useable storage in the attic that is only 10 degrees above air-conditioned temperatures in the living areas. This helps solve a storage problem since the high water table in coastal Florida prevents us from installing basements."

## IMPROVING DURABILITY, COMFORT

"Because we insulated below the roof deck, we didn't use vented soffits. After the last two years of hurricanes in Florida, we found out that a lot of wind-driven rain was getting in through the soffit areas. It also keeps the hot-humid air that we have in Florida in the summer from coming in contact with the duct work or other cool parts of the building, which can cause condensation and then mold. Instead of having attic temperatures in the 130-degree range, the attic temperature will be in the 80-90 degree range."

"In addition, by installing the insulation in the roof early on, we're also keeping the temperature more stable inside while we're working, which makes a big difference in Florida."

## SIMPLE STEPS FOR SUCCESS

"What we are doing is not rocket science," Black says. "People everywhere are doing this every day using easily available materials. Your standard mechanical contractor that you work with shouldn't have any problems adapting. He can basically do things just as he always has."

Black offers a few tips:

"Because overspray from the spray foam insulation tends to get everywhere, all the roof penetrations, electrical boxes, and any penetrations for exhaust fans need to be covered and sealed," Black says.

## TECHNOLOGY HIGHLIGHTS

This project included the following PATH-profiled technologies:

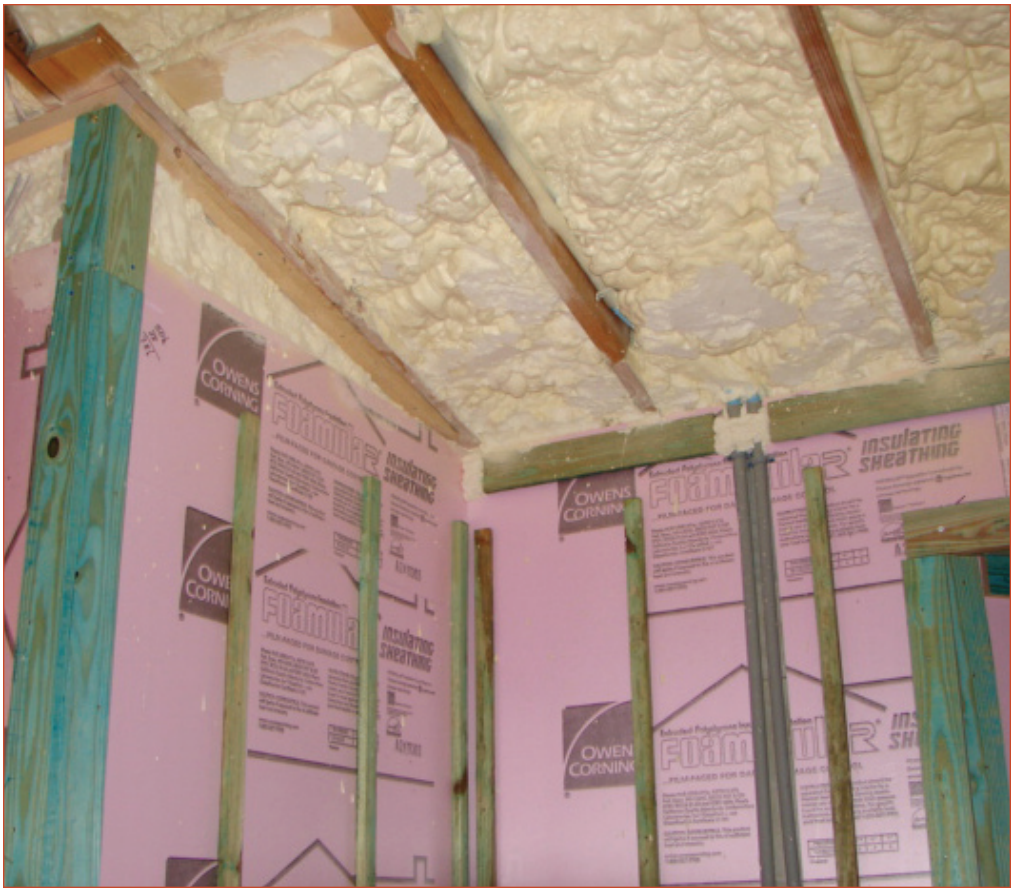
- Air admittance valves
- Drywall clips and stops
- Ducts in conditioned space
- In-line exhaust fan
- Low-VOC paints
- Steel framing
- Tubular skylight
- Windows with high-performance glass
- Wood with low-toxicity preservatives

"A lot of times, people put a plaster ring and maybe a wire behind a roof penetration. The problem is that it gets buried in the foam insulation and then we have to dig around for the wire. Other times, somebody has forgotten to seal up a box. As the general contractor, I need to remember this and warn the subs. After the first time, you learn really fast."

"Hanging ductwork is also different. In certain situations, you might nail a hanger to the top chord of a truss, but here you can't because it's going to be covered with foam insulation. But that's the advantage of Icynene. We had to reconfigure how we were going to hang the duct, and take it off of web members of the roof trusses. For example, from the bottom chord of the truss, we built a support of two uprights made from scrap 2x4, and hung the black strap to support the ductwork from these two upright pieces."

"When you put the A/C in conditioned space in a tightly sealed building, you also have to think about introducing make-up air to compensate for the air expelled by exhaust fans. That air should be introduced from outside through a small duct on the return side. That way it is filtered and either cooled or heated before it gets pumped through the house."

"In our case, since it's a small house, the make-up air duct is 4". It's a totally passive system, so when the HVAC is on, it will pull air into the house. You want to keep a small positive pressure inside the building to keep the pollutants and outside air out. Experts recommend about 4 Pascals of positive pressure in the building at all times."




Black blew Icynene under the roof decking and along the top portion of the walls adjacent to the cathedral ceilings.

The Partnership for Advancing Technology in Housing (PATH) brings together builders, manufacturers, researchers, government agencies, and other members of the housing industry. PATH partners work to improve the quality and affordability of new and existing homes. The program is administered by the U.S. Department of Housing and Urban Development's Office of Policy Development and Research.

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