



Building America Case Study Technology Solutions for New and Existing Homes

Ducts Sealing Using Injected Spray Sealant

Raleigh, North Carolina

PROJECT INFORMATION

Project Name: Raleigh Housing Authority Duct Sealing

Location: Raleigh, NC

Partners:

Raleigh Housing Authority
www.rhaonline.com/

Advanced Residential Integrated Solutions Collaborative (ARIES)
<http://levypartnership.com/>

Building Component: HVAC

Application: Retrofit; single and multifamily

Year Tested: 2012

Applicable Climate Zone(s): All

PERFORMANCE DATA

Cost of energy efficiency measure (including labor): \$700 per unit

Projected energy savings: 17% heating and cooling

Projected energy cost savings: \$300/year-\$600/year

Duct leakage is a significant problem in many residential buildings that can contribute to energy waste, reduced comfort, poor indoor environmental quality, and moisture problems. Duct sealing alone can save up to 20% of home heating and cooling energy expenditure; therefore, it is important for enhancing building performance. Unfortunately, ducts can be difficult to access (for example, when located in floors, in cramped crawlspaces, or under low, sloped roofs), making the repairs expensive or impossible with traditional manual methods.

In this project, the Raleigh Housing Authority (RHA) worked with U.S. Department of Energy Building America team, the Advanced Residential Integrated Solutions Collaborative (ARIES), to determine the most cost-effective ways to reduce duct leakage in its low-rise housing units. The team evaluated the use of injected foam sealant and found it to be an effective way to eliminate duct leakage when combined with manual sealing of other easily accessible areas. This process involves injecting spray sealant into pressurized supply ducts. Sealant particles accumulate at leakage locations, gradually closing the leak. The injection system continuously measures airflow and leakage throughout the sealing process, which stops when the leakage has been reduced to the desired level. After the duct sealing procedure in the RHA units, the ducts were extraordinarily airtight, resulting in more comfortable and energy-efficient housing.

“The Building America program has shown us new ways of energy conservation that are effective, reproducible and more importantly, the measures can be implemented within the budget constraints of public housing agencies.”

– Gail Iris Keeter, Director of Development, Raleigh Housing Authority

Hand Sealing



In addition to the injected spray sealant, the return plenums were sealed by hand with mastic.



Air handlers were sealed with foil tape or mastic.



Duct boots were sealed to floors and ceilings with foil tape or mastic.

For more information, see the Building America report, *Air Distribution Retrofit Strategies for Affordable Housing*, at www.buildingamerica.gov

Image credit: All images were created by the ARIES team.



The assembled injection system includes a blower with heater (background) and a sealant injection unit (foreground). The connection to the supply plenum is shown in the photo above. Gaps larger than $\frac{5}{8}$ in. are sealed manually with fiberglass and mastic. The connections from the duct system to the air handler as well as to registers are blocked off to prevent the sealant from fouling HVAC equipment or escaping into the living space.

Lessons Learned

- Challenges encountered in this project included high ambient humidity, which prolongs sealant drying time, space constraints to configuring the equipment in the small living units, and the small size of the duct systems, which were at the low end of the ability of the injection equipment.
- Costs were \$700 per living unit for duct sealing using spray injection with manual sealing of nontreated areas. Larger homes would cost more.
- Manual sealing only of similar units cost \$300 to \$500 but was less effective (60% leakage reduction compared to 90% leakage reduction).

Looking Ahead

Injection spray duct sealing is available today through local application companies. The technology could be further streamlined for production-scale work and smaller spaces such as the RHA units. Nevertheless, RHA intends to seal more units using the injection system. This technique also can be helpful for new home builders to meet duct leakage requirements of the code or above code programs such as ENERGY STAR® and DOE Challenge Home.