

Building America Case Study

Field Trial of an Aerosol-Based Enclosure Sealing Technology

Clovis, California

PROJECT INFORMATION

Project Name: Field Trial of an Aerosol-Based Enclosure Sealing Technology

Location: Clovis, CA

Partners: De Young Properties
deyoungproperties.com

Building America Team: Alliance for Residential Building Innovation; Western Cooling Efficiency Center, University of California-Davis
arbi.davisenergy.com
wcec.ucdavis.edu

Building Component: Building envelope

Application: New, single-family

Year Tested: 2014

Applicable Climate Zones: All

PERFORMANCE DATA

Cost of energy-efficiency measure (including labor): \$355

Projected energy savings: 7.5% heating and cooling

Projected energy cost savings: Marginal compared to other sealing methods of equal effectiveness.

Building codes demand tighter building envelopes; thus, significant effort has been made to reduce the leaks in building shells through current construction practices. However, the problems of excess labor costs, constant vigilance, and quality control remain. Studies have indicated that tightening building envelopes to reasonable levels could reduce heating and cooling loads by 30%.

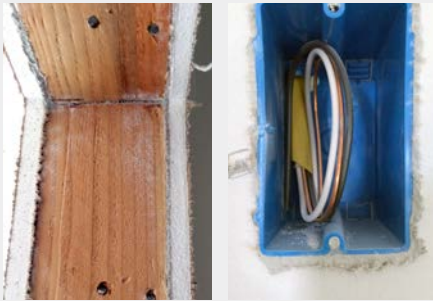
This project demonstrated a new method for sealing building envelope air leaks using an aerosol sealing process developed by the Western Cooling Efficiency Center at the University of California-Davis, which is part of the U.S. Department of Energy's Building America research team Alliance for Residential Building Innovation. Developed in a laboratory setting, this process was applied to six single-family homes in this study. The process involves pressurizing a building while applying an aerosol sealant to the interior. As air escapes through leaks in the building envelope, the aerosol particles are transported to the leaks where they ultimately form seals and block the leaks. Standard blower door technology is used to facilitate the building pressurization, which allows the installer to track the sealing progress during the installation and automatically verify the final building tightness.

The appeal of the proposed technology is that it should be able to seal at a low cost (reducing sealing costs to tens of dollars per 100 ft² of building floor area) and to automatically provide verification of the entire sealing process while certifying the performance of the building envelope. The aerosol has been proven to be nontoxic. The process can be employed with any type of building construction and now uses standard building sealants that make the process more attractive to builders and consumers. Recent tests of the technology on multiple apartments in Queens, New York, demonstrated excellent performance—at least 80% of the air leakage was sealed in less than 2 hours. This project demonstrated that these previous tests and successes with smaller multifamily units can be replicated on single-family production homes.

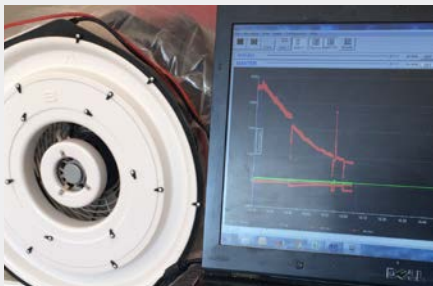
DESCRIPTION



Emitters are placed throughout the house to inject an aerosol into the air while pressurizing the house.



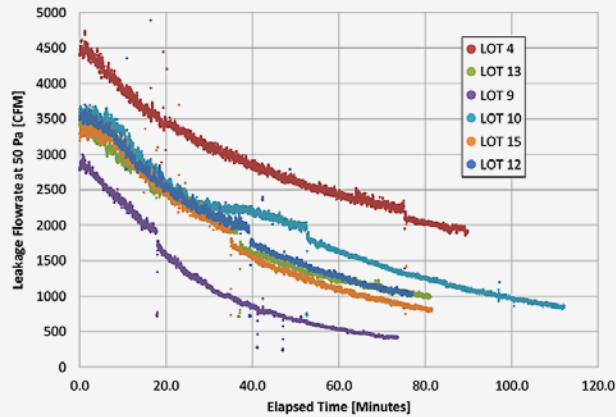
The aerosol collects at gaps in the building and gradually seals leaks.



Sealing progress is tracked on a computer until the airtightness goal is achieved.

For more information see the Building America technical report *Field Trial of an Aerosol-Based Enclosure Sealing Technology* at buildingamerica.gov.

Image credit: All images were created by the Alliance for Residential Building Innovation team.



This plot shows the sealing profiles for each of the six aerosol envelope sealing demonstrations. The homes ranged from 2,000 to 3,500 ft² and were sealed after the drywall was installed and taped. Each home was sealed to 60%–85% of the initial leakage level in less than 2 hours; the average sealing rate was 290 cubic feet per minute (CFM) at 50 Pascal (Pa) every 10 minutes.

Lessons Learned

- **Results:** Six homes were sealed to leakage levels ranging from 1.7 to 5 air changes per hour at 50 Pa (ACH50) (average 2.9) at an average sealing rate of 290 CFM per 10 minutes.
- **Benefits:** Sealing a building to low leakage levels takes less time than manual methods; sealant can be applied before or after drywall depending on the location of the air barrier. The process seals leaks that are inaccessible for caulking and does not disrupt construction schedules.
- **Comparison to Other Options:** Airtightness goals can be achieved in less than 90 minutes of application, whereas more labor-intensive manual methods can take more than a day.
- **Challenges:** The sealant must be applied under controlled relative humidity and temperature conditions and requires specialized equipment.
- **Costs:** The expected cost is about \$355 for a large house if applicators are trained, experienced, and properly equipped.
- **What would the builder do differently?** The same personnel could be used for sealing and verification. Manual sealing of large gaps still must be completed, and duct openings must be taped off as typically required.

Looking Ahead

As regional and national energy standards become more stringent and builders seek higher levels of performance, the demand for low-cost methods to reduce building leakage to low levels (2–3 ACH50) will grow. The impetus to make this proven technology commercially available exists now and will increase in the future.