



Building America Case Study

Challenges of Achieving 2012 IECC Air Sealing Requirements in Multifamily Dwellings

Upstate New York

PROJECT INFORMATION

Construction: Low-Rise Dwellings

Type: Multifamily

Partners:

Consortium for Advanced Residential Buildings, carb-swa.com

LECESSE Construction Company, lecesseconstruction.com

Housing Visions, housingvisions.org

Date Completed: 2014

Climate Zone: Cold (5A)

RESEARCH BUILDINGS

Coburg Village: 78 units; Rexford, NY

Shaker 4: 69 units; Watervliet, NY

Housing Visions: 50 units; Syracuse, NY

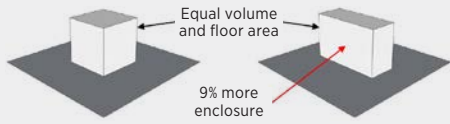


Previous versions of the International Energy Conservation Code (IECC) have included provisions to improve the airtightness of dwellings; however, for the first time, the 2012 IECC mandates compliance verification through blower door testing. Simply completing the Air Barrier and Insulation Installation Checklist through visual inspection is no longer sufficient. The 2012 IECC also mandates a significantly stricter air sealing requirement. In climate zones 3 through 8, air leakage may not exceed 3 ACH50, which is a significant reduction from the 2009 IECC requirement of 7 ACH50. This requirement is for all residential buildings, and includes Group R-2 apartment dwellings. Although this air leakage rate requirement is an important component to achieving an efficient building thermal envelope, currently, the code language doesn't explicitly address differences between single-family and multifamily applications. The 2012 IECC also does not provide an option to sample dwellings for larger multifamily buildings, so compliance would have to be verified for every unit.

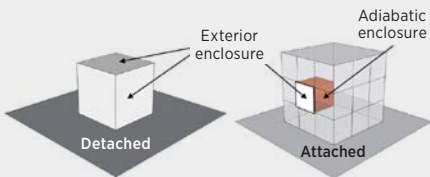
With having to comply with the 2012 IECC air leakage requirements on the horizon, several multifamily builder partners of the U.S. Department of Energy's Building America team Consortium for Advanced Residential Buildings (CARB) wanted to evaluate how best to comply with the 2012 IECC air leakage requirements. Builders are not sure whether it is more practical or beneficial to simply pay for guarded testing or to revise their air sealing strategies to improve compartmentalization to comply with code requirements based on unguarded blower door testing.

This project sought to create a well-documented design and implementation strategy for air sealing in low-rise multifamily buildings that would assist in compliance with the building infiltration requirements of the 2012 IECC as it is adopted across the country, without having to go through the potential added expense of guarded blower door testing.

Should air leakage rates for multifamily dwellings be based on enclosure area rather than volume?



In any dwelling, energy loss occurs at the exterior enclosure, and the relationship between the dwelling's enclosure and its volume is not constant. For example, a dwelling with an elongated plan will have a larger enclosure area than a square-shaped dwelling of the same floor area.



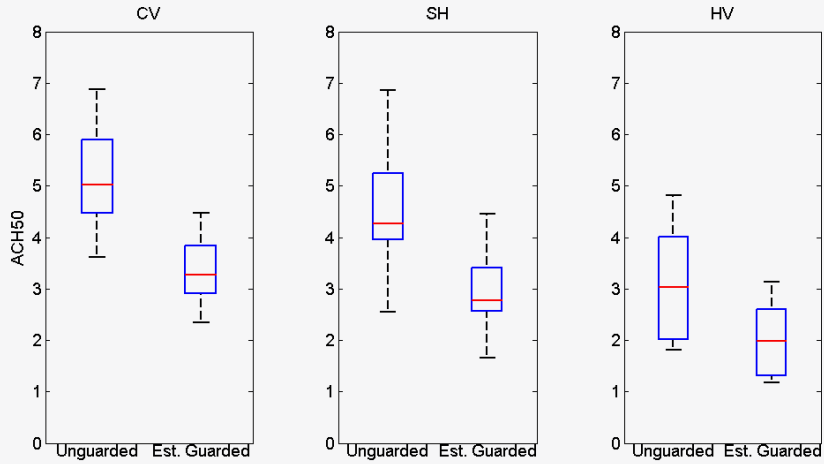
The discrepancy in exterior enclosure area is even greater when comparing attached and detached dwellings. Assuming the abstract dwellings shown above have the same shape and volume, the exterior enclosure of the attached dwelling is a small fraction of the exterior enclosure of the detached dwelling.

COMPARTMENTALIZATION BENEFITS:

- Increased smoke/fire control
- Increased occupant comfort, including reduced odors, drafts, and sound transmission
- Greater control and effectiveness of HVAC systems
- Increased overall building performance (by reducing pressure differentials and therefore heat loss caused by stack effect, wind, etc.).

For more information, see *Multifamily Envelope Leakage Model* at: buildingamerica.gov

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



ACH values from both unguarded field testing and estimated guarded test values based on past studies by the New River Center of Energy Research & Training, Center for Energy and Environment, and CARB.

CARB conducted research to assess the feasibility of meeting the 2012 IECC air leakage requirements with unguarded blower door testing. By analyzing testing results from numerous dwellings within three multifamily projects, CARB compared performance based on several variables, including construction details (insulation, framing, etc.) and design characteristics (dwelling layout, location within the building, etc.). Based on research findings, CARB created an air sealing guideline in low-rise, wood construction multifamily buildings. This guide provides builders/developers/contractors with the critical details needed to comply with the air leakage requirements of the 2012 IECC. Still, achieving an unguarded 3 ACH50 in multifamily dwellings is not easy. Housing Visions (HV) had the highest percentage of units, 50%, that met the 2012 IECC air leakage requirement of 3 ACH50 based on unguarded blower door testing. Twelve percent of units at Shaker 4 (SH) met the requirement, and none of the units at Coburg Village (CV) met the requirement.

Lessons Learned

- Reducing air leakage starts during the design development process; design teams must make decisions that allow the air leakage requirement to be met.
- Construction teams must understand the design teams' intent while incorporating their experiences from previous successes and failures. Implementation is crucial; subcontractors will not meet their air leakage reduction goals without heightened awareness, support, and oversight.
- Until design and construction teams become familiar and comfortable with the tasks required to meet the air leakage requirement, construction schedules will be slowed down and implementation costs will be high.