

TECHNOLOGY BRIEF

AIR SEALING IN MULTIFAMILY BUILDINGS



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Improving air sealing is an important strategy to reduce energy waste in buildings. Across much of the U.S., air leakage testing in single-family homes has become an established practice for residential new construction ever since the 2009 International Energy Conservation Code (IECC) was published (see table below). Yet the more complex practice of air sealing in multifamily buildings hasn't yet become a common practice due to limited code enforcement by building departments and concerns about whether tighter air sealing is achievable in these buildings.

Residential Air Tightness Testing Requirements in the International Energy Conservation Code (IECC)					
Code version	2006 IECC	2009 IECC	2012 IECC	2015 IECC	2018 IECC
Level of air tightness required	Not specified, lists air barrier strategies to follow	7 ACH @ 50 Pa	3 or 5 ACH @ 50 Pa (varies by climate zone)		
Optional?	N/A	Yes	No		

ACH = air changes per hour



When conditioned air leaks through air gaps it can make a home's heating, ventilation & air conditioning (HVAC) systems work harder and consume more energy than the building should need to keep occupants comfortable. And when an HVAC system works harder than needed, it also drives up utility bills. Air sealing can help. In fact, according to the U.S. Department of Energy (DOE), typical American homes can achieve 10 to 20 percent whole-home energy savings through improved air sealing.¹ Higher-than-necessary energy use also results in needless air pollution. Many areas of the country, including Utah, face poor air quality and one of the sources of emissions comes from burning natural gas.² Conserving natural gas through effective air sealing in buildings is a solution to help keep the air clean.

In multifamily buildings (e.g. apartments and condominiums), shared walls that separate units (also called "party walls") are a common area of air leakage, including the possibility of air leakage from interior to exterior spaces, and are therefore a priority for improved air sealing. In addition to addressing the issues noted previously, improved air sealing also increases occupant comfort; reduces odors, drafts, and sound transmission between multifamily units; and provides improved safety through better controlling smoke and fire in a building.³

Since it started regulating air leakage, the IECC has had the same air tightness requirement for single-family and multifamily buildings, yet the implementation of air sealing in multifamily buildings is more complex. This is not a new

issue. For example, a 2014 report published by DOE notes that although the air leakage requirements in the energy code "are desirable, there is concern that this requirement is geared toward single-family construction only and doesn't address the nuances of multifamily construction."⁴ The report also states that "specific air leakage requirements for multifamily dwellings may be worth considering."⁵

WHAT IS THE CORRECT LEVEL OF AIR TIGHTNESS FOR MULTIFAMILY BUILDINGS?

As noted above, recent versions of the IECC require residential construction to meet a level of air tightness of 3 to 5 air changes per hour (ACH), depending on the climate zone. In the 2014 report, DOE notes that 3.5 ACH is attainable in multifamily buildings, but that it requires contractors to increase efforts to reduce air leakage, such as the use of sprayed polyurethane foam insulation or working more closely with a Home Energy Rating System (HERS) Rater to utilize alternative air testing techniques.⁴ Anecdotal evidence from several Utah-based HERS raters report seeing new multifamily air tightness test results commonly come in at a range of 8 to 14 ACH; nearly five times the amount of air leakage recommended by DOE and allowed in the IECC.

While this anecdotal information suggests that multifamily homes simply can't meet a more stringent air tightness requirement, data from one of Utah's largest HERS Rating companies show that numerous multifamily buildings



constructed during 2018 have much higher levels of air tightness than the anecdotal results observed by other HERS Raters. The table below shows that the vast majority of multifamily homes in Utah that were tested by this single company achieved air tightness levels that are tighter than 5 ACH, with an average ACH of 4.79. It should be noted that the contractors whose units were tested tend to build to above-code standards, such as ENERGY STAR. While these units are not statistically representative of Utah's multifamily projects, the fact that over 1,100 multifamily units tested in 2018 achieved an air tightness level of below 5 ACH shows that it is possible for multifamily buildings to be built with less air leakage. That over 10% of these multifamily units are tighter than 3.5 ACH, the same air tightness level recommended by the DOE's 2014 report, shows that this transition to air tight multifamily buildings is already underway. Generally, achieving an air tightness level of 5 ACH or below is challenging for the first few buildings, but becomes simpler and more straight forward after building trades have had experience staging construction practices correctly to preserve air sealing.⁶

Sampling of Utah Multifamily Unit Air Tightness Test Results (2018) ⁷	
Total units tested	1,130
Average ACH	4.79
% below 5 ACH	81% (923 total)
% below 3.5 ACH	11.5% (130 total)

To help answer the question about what the correct level of air tightness for multifamily buildings is, Utah energy code stakeholders, including Utah Clean Energy, looked to how other states or jurisdictions have handled the question. Several regional jurisdictions adopted air tightness requirements for multifamily buildings in their codes that are slightly looser than the requirements for single-family homes.

The energy code adopted into law is only as good as the compliance and enforcement taking place in the field. As air tightness requirements for multifamily buildings take effect in Utah and other states, additional energy code training for contractors, subcontractors, and building departments is needed. The [2014 report](#) (see appendix, pg. 29) from U.S. Dept. of Energy includes a *Multifamily Air Sealing Guide* that is a great place to start.

For example, the State of Nevada adopted a slightly looser air tightness standard for multifamily buildings of 4.5 ACH.⁸ In addition, Colorado's Division of Local Affairs, which handles code adoption and enforcement for unincorporated jurisdictions in Colorado revised its residential energy code to create an air tightness standard for multifamily buildings at 5 ACH.⁹ And the City of Ft. Collins, Colorado, a jurisdiction that is known for progressive clean energy and energy conservation policies, replaced the air changes per hour metric and adopted the metric that ASHRAE uses: cubic feet per minute per square foot of surface area. Ft. Collins' specific standard is 0.30 CFM50/square foot of unit enclosure surface area (the total surface area of all walls, floors, and ceiling).¹⁰ This roughly translates as 4 to 5 ACH.

Utah recently joined the list of states/jurisdictions with a multifamily-specific air leakage requirement. On February 28, 2019, Utah lawmakers adopted an air tightness requirement of 5 ACH for multifamily properties as part of House Bill 218, Construction Code Modifications. This code change is set to take effect on July 1, 2019.¹¹

NOW WHAT?

The jury is out on whether this is the "correct" level of air tightness for multifamily buildings. For now, in Utah contractors will work to achieve 5 ACH in multifamily buildings, which is an improvement over the 8-14 ACH that was observed by Utah HERS Raters. The changes in Utah and other states are certainly a step in the right direction for energy conservation and improved air quality in Utah. And it's not over.

Proponents of energy efficiency, clean air, occupant comfort, and quality construction will have the opportunity to weigh in on how multifamily air leakage is handled in the IECC as the 2021 IECC code development process wraps up over the next few months. One air tightness proposal was preliminarily approved in May at the 2021 IECC code committee hearings that would allow an exception of 0.30 CFM50/square foot for attached dwellings. (As noted above, this roughly translates to an air leakage rate of 4 to 5 ACH.) Readers can follow the code development status at the [ICC website](#).

This Technology Brief was authored by [Kevin Emerson, M.Sc.](#): Kevin is the Energy Efficiency Program Director for [Utah Clean Energy](#) – SWEEP's partner organization in Utah.

¹ U.S. Department of Energy, *Retrofit Techniques & Technologies: Air Sealing A Guide for Contractors to Share with Homeowners* (2010)

² American Lung Association, *State of the Air 2019* (2019)

³ U.S. Department of Energy, *Challenges of Achieving 2012 IECC Air Sealing Requirements in Multifamily Dwellings* (2014)

⁴ See note 3, page 24

⁵ See note 3, page 18

⁶ Personal comm. w/ Mitch Richardson, *Building Science West*, June 12, 2019

⁷ Data is from [Building Science West](#), a Utah company providing air tightness testing and HERS Rating services for residential contractors and is not statistically representative of Utah construction practices.

⁸ [Nevada Senate Bill 374](#) (2015)

⁹ Colorado Department of Local Affairs, *Administrative Rules, Building Codes and Standards Section* (see pg. 12) (July 2018)

¹⁰ City of Fort Collins [Commercial Building Air Leakage Test Protocol](#)

¹¹ [Utah House Bill 218](#) (2019)