

## SEALING THE DEAL: WHY ENERGY RECOVERY VENTILATION IS CRITICAL FOR AIR-SEALED BUILDINGS

Energy recovery ventilation provides cleaner and healthier indoor air while generating long-term energy savings

By Nick Agopian

One of the most effective ways to boost the energy efficiency of a home or building is by improving the construction technologies and methodologies used to insulate — or seal — its envelope, which consists of the outer walls, ceiling, windows, doors and floors. Reducing air leakage — or uncontrolled air movement — cuts heating and cooling costs, furthers occupant comfort and strengthens structural durability.

The technologies and methodologies that allow for increased air sealing have advanced considerably, making it easier and less costly to minimize and eliminate air leaks in structures of all sizes. Examples of air-sealing products and techniques include spray foam, window film, insulated framing, gas-injected windows, vacuum insulation panels, insulating concrete forms, rigid foam insulation, caulking and weather stripping, among many others.

However, as construction methodologies have progressed, and more and more buildings become increasingly air-sealed, one of the main challenges is the deficient indoor air quality (IAQ) caused by a decrease in ventilation. Without the proper amount of fresh outdoor air coming in and stale indoor air going out, internally generated contaminants build up and harm the quality of the indoor air, which impacts health, wellness and productivity.

### Air-Sealed Buildings Suffer from Deficient IAQ

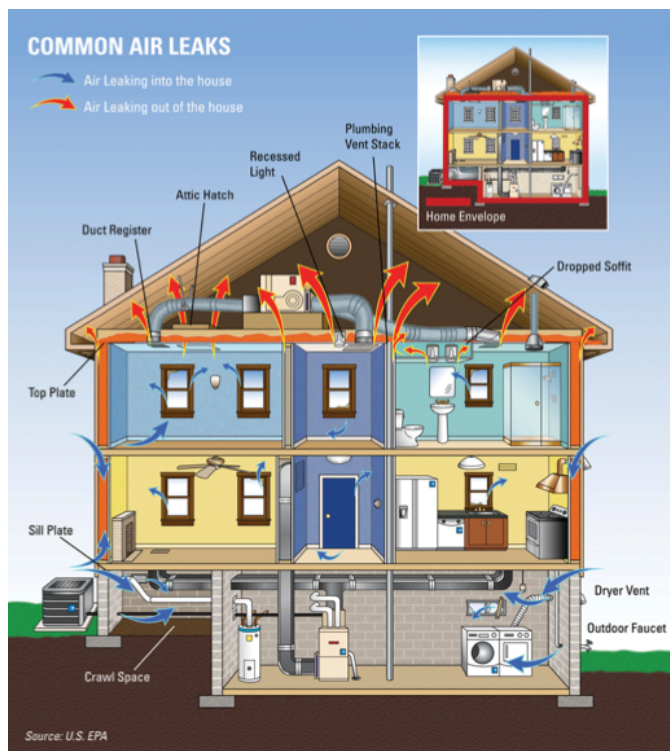
Deficient IAQ is a major issue because it's found in many air-sealed buildings and can cause an array of reversible and irreversible problems, including discomfort, sickness, many diseases and cognitive impairment, to name just a few. It's especially concerning considering people spend approximately 90% of their time indoors — the elderly up to 95% — and the U.S. Environmental Protection Agency (EPA) ranks indoor air pollutants as a top-five health risk.

Both the occurrence and potency of deficient IAQ are on the rise as a growing array of toxins, vapors, gases, chemicals and other Volatile Organic Compounds (VOCs) are continuously introduced into our indoor spaces. Contaminants enter inside in many ways, but the primary means is by being off-gassed from such sources as construction materials, furniture, fabrics, carpets, paints, sealants, finishes, cleaning supplies and even ourselves.

### Problems Caused by Deficient IAQ

With deficient IAQ on the rise, more indoor occupants are suffering from its adverse effects. The first, and most recognizable, of these ailments are short- and long-term health problems. These include allergies, headaches, coughs, asthma, skin irritations and breathing difficulties, as well as serious diseases such as cancer, liver and kidney damage and central nervous system breakdowns.

What's more, deficient IAQ has been shown to cause cognitive impairment. Studies done by the Harvard School of Public Health and the Department of Energy's Lawrence Berkeley National Laboratory found that carbon dioxide



Common home air leaks as identified by the EPA  
Image courtesy of U.S. EPA

has a direct and negative impact on cognitive abilities and decision-making. And it doesn't take a lot of carbon dioxide to make an impact as the negative effects were detected at levels commonly found in indoor spaces.

Deficient IAQ is especially harmful to children and students. First of all, due to the high occupant density of daycare centers, school, colleges and universities, the ill effects of breathing in too much carbon dioxide are compounded. Further, because of the physiological characteristics of children and young people, they are more vulnerable to low-quality indoor air since they inhale larger amounts of toxins compared to adults.

In addition, deficient IAQ causes many employees to call in sick or work anyway but in a downgraded condition due to Sick Building Syndrome, which is caused by breathing in too many indoor air contaminants. This combination results in a lack of productivity that costs the U.S. economy about \$168 billion annually, according to AirMD. And the problem is widespread as the EPA found that indoor air pollution affects approximately 30% of all commercial buildings.

## Enhance IAQ & Maintain Air-Sealing Integrity with Energy Recovery Ventilation

What's the solution for providing cleaner and healthier indoor air while also maintaining air-sealing integrity? The answer is more and better ventilation. As long as enough fresh outdoor air is coming in and stale indoor is exhausted out, the indoor space will enjoy high-quality air. In fact, the Occupational Safety and Health Administration (OSHA) states that inadequate ventilation is one of the main causes of problems with workplace air.

The challenge of greater ventilation is how to achieve better indoor/outdoor airflow while also maintaining the energy efficiency established through air-sealing efforts. How is this possible? Through energy recovery ventilation, a process that optimizes energy efficiency by preconditioning outside air coming in with the otherwise-wasted energy of the exhaust air going out.

This process enables energy recovery ventilation to provide cleaner and healthier indoor air while also reducing HVAC loads. The energy efficiency achieved through air-sealing methodologies is enhanced and significant [year-over-year energy savings over the long-term](#) are realized. This shows that when designing a high-performance home or building, energy recovery ventilation should always be applied to an air-sealed structure.

## In Sum

Increased air sealing of a building's envelope through more advanced technologies and methodologies fosters energy efficiency, but an unintended consequence is deficient IAQ due to a build up of indoor air contaminants. Greater ventilation will create higher-quality indoor air, and energy recovery ventilation will make this possible while also optimizing energy efficiency, reducing loads and generating substantial annual energy savings for many years to come.

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