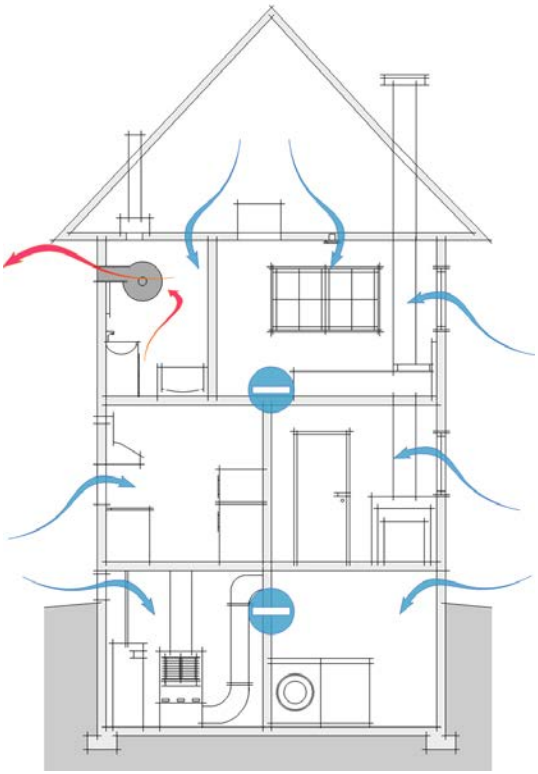


Building America Case Study

Selecting Ventilation Systems for Existing Homes

Ventilation is a fundamental component of a high performance home. With tighter building envelopes, a mechanical means of removing contaminants is critical for ensuring indoor environmental quality and building durability. Local ventilation—exhaust fans in kitchens and bathrooms—has been a common practice for decades. Now, whole-building ventilation is also required by many home performance programs and standards.

Choosing the best ventilation system for a particular home can be confusing, and installing systems in existing homes can present more challenges. In this project, the U.S. Department of Energy Building America team, the Consortium for Advanced Residential Buildings (CARB), developed a measure guideline to help contractors and building owners choose the best ventilation for existing homes. This guideline draws on work by many Building America research teams, national laboratories, manufacturers, and contractors.

Selecting the best ventilation system involves balancing performance, efficiency, cost, required maintenance, and several other factors. This case study outlines questions to consider when choosing a system and describes some of the advantages and limitations of three common types of whole-house ventilation systems:

- Exhaust ventilation
- Central fan integrated supply (CFIS)
- Balanced energy recovery ventilators or heat recovery ventilators (ERVs or HRVs).

Selecting the Best System

When determining the most practical ventilation system for an existing home, planning is crucial. Keep these questions in mind when selecting a system:

- What code or program requirements must be met?
- What is the scope of the renovation project?
- What heating, air conditioning, and ventilation systems are currently in the home?
- What type of heating and air conditioning system will be in the renovated home?
- What is the project budget?
- What are the project goals with respect to ventilation?
- What levels of maintenance are acceptable?
- What climate is the home in?

Building America SM U.S. Department of Energy

Pros and Cons of Each System

EXHAUST ONLY

Pros:
- Low first cost
- Simple installation
- Low maintenance
- Low electrical energy

Cons:
- No control of air intake
- No distribution of outdoor air
- No filtration

CFIS

Pros:
- Low first cost
- Often easy to install
- Low maintenance
- Outdoor air filtered and distributed

Cons:
- High energy use

ERV/HRV

Pros:
- Heat recovery
- Air can be filtered and distributed
- Potential for low energy costs
- Balanced (pressures)

Cons:
- Higher first cost
- Higher maintenance
- Installation may be more difficult

For more Information, see the Building America report, *Measure Guideline: Selecting Ventilation Systems for Existing Homes,* at: *buildingamerica.gov*

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

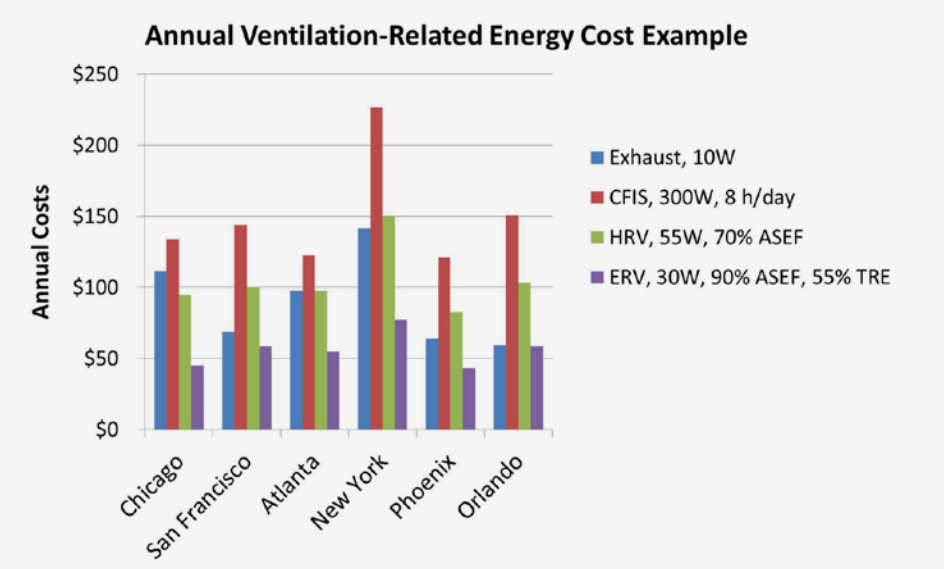
System Benefits and Drawbacks

Exhaust ventilation systems are very popular because they are simple and offer low first cost. Their maintenance and operating costs are also low. One problem with exhaust ventilation is that the source of outdoor air is not controlled. For example, exhaust ventilation might draw in combustion gases, garage fumes, mold from crawlspaces, etc. Exhaust ventilation also often does not dilute contaminants equally throughout a home.

CFIS systems, which use the central air handler, are also relatively simple and have low up-front costs. They also distribute air to all parts of homes. Their main drawback is that, even with efficient fan motors, these are usually the most costly system to operate.

Because **ERVs** and **HRVs** transfer heat to (or from) the incoming air, they reduce heating and cooling costs associated with ventilation. These systems can be expensive to purchase, however, and installation, integration, and maintenance are usually more complicated than for other systems.

First costs and operating costs can vary tremendously, but the chart below shows examples of annual energy costs for these systems in several cities. The systems are assumed to provide 50 CFM continuously (or the equivalent). See the measure guideline for more information.



Looking Ahead

As the guideline describes, there is no "ideal" ventilation system for many projects. The CARB team continues to investigate performance of new systems and innovations as they become available.

U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy

For more information, visit:
buildingamerica.gov

The U.S. Department of Energy's Building America program is engineering the American home for energy performance, durability, quality, affordability, and comfort.

DOE/GO-102014-4368 • December 2014