

Whole House Ventilation

By The Ci Team

Today, we build homes tighter to save energy, improve durability and enhance our client's comfort. We have learned that uncontrolled air leakage wasted energy, and brought in pollutants from outdoors like pollen and dust. The benefits of a tighter home comes with the need to add mechanical ventilation to control indoor air quality and manage interior moisture. For some builders it seems strange to build a tight home and then add ventilation; why not just leave it leaky? We now realize that tight homes offer the control of comfort, efficiency and durability while offering filtered, distributed ventilation, making these homes better and healthier. When ventilation and combustion air requirements are met, you can now build a tighter home without concern.

How much ventilation is enough?

The good news is that the amount of fresh air required for a house is not tied to the tested airtightness of the house. We can calculate the level of fresh air delivery that is acceptable based on the occupants and the volume of the home.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 62-2010 prescribes that the amount of fresh air provided to be:

Here is the ventilation rate formula as an example:

*7.5 cfm per bedrooms + 1 (including two occupants in the master bedroom)
PLUS
0.01 cfm per square foot of floor area.*

*Example: 3-bedroom, 2,000 ft² house would require a total of
50.0 cubic feet per minute (cfm):*

*7.5 cfm x 4 (total bedrooms + 1) = 30 cfm
PLUS
0.01 cfm x 2,000 = 20 cfm*

Leave the math right out of it and use the table (below) to determine the amount of fresh air required.

Floor Area Sq. Ft.	Number of Bedrooms		
	1	2-3	4-5
<1500	30	45	60
1501 - 3000	45	60	75
3001 - 4500	60	75	90
4501 - 6000	75	90	105

There are a few basic strategies for whole house ventilation: exhaust, supply, and balanced.

Exhaust and Supply Systems

The exhaust side: In an upper floor bathroom or central hallway, install a quiet (less than 1 sone) exhaust fan to run either continuously at low-speed or periodically at high speed. A couple manufactures offer clever controls that allow for timers, motion sensors and even humidity control to change speeds adding more or less ventilation. Now that's control!

The supply side: At the return portion of the air handler, install a fresh air intake with a damper and circulation controller from outdoors (this is a different intake than one that delivers combustion air to HVAC equipment).

In some situations, you can forgo the exhaust fan and simply install the fresh air feed to the air handler. In cold climates, this might need some modification to avoid moisture problems.

Installation/planning tips:

- Install the exhaust fan near the central air return to get mixing assistance from the air handler.
- Upgrade filters to minimize pollen and dust levels. (Select a filter with a MERV rating over 10.)
- Seal all HVAC equipment and ductwork using mastic on all joints and seams, including the boots in the floor, and install the mechanical system inside conditioned space.

Balanced Ventilation with Energy Recovery

The system: A balanced ventilation system uses a heat or enthalpy recovery ventilator (HRV or ERV). These units transfer energy between exhaust air and fresh air by passing the two streams of air by each other (the same volume comes in as goes out, hence the 'balanced' system). In cold climates, exhaust air pre-warms the fresh air, and in hot climates, the exhaust cools the fresh air. In humid climates, ERVs remove moisture from the air before it enters the home. Advanced controls allow airflows to be increased as needed. These systems can be tied to forced air ducting or, where space conditioning is met by hydronic or strip electric, they can have a dedicated low-flow duct system of their own.

Installation/planning tips:

- Have the system properly balanced when it is commissioned
- Upgrade filters to minimize pollen and dust levels
- Seal all HVAC equipment and ductwork and install it within the conditioned space