energyCOMPLETE™ with Flexible Seal Technology

Whole Home Insulation and Air Sealing System

# VENTILATION OF ENERGYCOMPLETE™ SYSTEM HOMES

**TECHNICAL BULLETIN**

*Mechanical Ventilation*

## Introduction

Air infiltration can account for up to one third of a home's heating and cooling costs and can contribute to problems with moisture, noise, dust, pollutants, pests, and insects. Reducing infiltration can significantly cut heating and cooling costs, improve building durability, and create a comfortable indoor environment[1]. The EnergyComplete™ System is a whole-house system that addresses the problems of air infiltration. Owens Corning is recognized for its trusted and proven insulation. The EnergyComplete™ System compliments the insulation with breakthrough air-sealing technology. The air sealant – EnergyComplete™ Air Infiltration Barrier with Flexible Seal Technology – is a safe, low-expanding foam material that penetrates to fill seams, gaps and holes in the building envelope, which significantly reduces air infiltration and the problems associated with it. While reducing uncontrolled air flow into the house is paramount, it is still important to allow the house to breathe in a controlled fashion, which is why it is essential that all EnergyComplete™ System houses utilize mechanical ventilation.

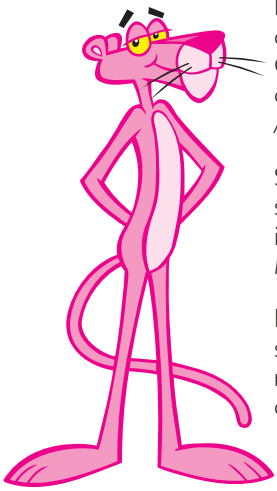
## Why Is Ventilation Important?

Homes need ventilation for a number of reasons. At the most basic level, occupants need air to breathe and the products of respiration (carbon dioxide and water vapor) must be removed. Beyond these basic requirements, occupants expect a safe and comfortable environment. In addition to thermal comfort (temperature and humidity control) occupants expect "acceptable indoor air quality". Source control and ventilation are the primary means of providing acceptable indoor air quality in residences. While this document will focus on whole-house ventilation, it is important that the homeowner understand that source control of pollutants and localized ventilation are equally necessary. This involves practices such as using building materials, furnishings, finishes, and cleaning products and processes that emit low levels of non-toxic VOCs, as well as using localized ventilation to exhaust air from kitchens when cooking and bathrooms when showering.

## How is Ventilation Provided?

Traditionally, ventilation in residences has been by operable windows and occupant controlled exhaust fans in combination with natural infiltration through openings, joints and cracks in the building envelope. As the importance of energy conservation has increased, houses are being built tighter. Concerns over the ability of these methods to provide adequate ventilation on a consistent basis have led to increased utilization of mechanical ventilation in residential construction. The phrase "build tight, ventilate right" summarizes the design philosophy of many energy-conscious designers.

## How Much Ventilation Do I Need?



Providing a comfortable indoor environment for building occupants is the primary concern of architects, designers, builders, and HVAC engineers. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) is the leading technical organization active in the development of building ventilation standards. For residential construction, the most recent ventilation standard is *ASHRAE Standard 62.2-2007, Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings*[2].

Several states have adopted or are considering adoption of ASHRAE Standard 62.2-2007. Several other states (Minnesota, Vermont, and Washington) have incorporated requirements for mechanical ventilation in their state energy codes that exceed the ventilation rates in the current standard. In Canada, the *National Building Code* requires mechanical ventilation at levels that exceed ASHRAE Standard 62.2-2007.

HVAC design engineers and others concerned with residential ventilation and indoor air quality should specify mechanical ventilation rates compliant with the current local codes (which establish minimum requirements) or to the latest ASHRAE Standard (which is generally viewed as the standard of care for design professionals), whichever is greater.

energyCOMPLETE™ with Flexible Seal Technology

Whole Home Insulation and Air Sealing System

# TECHNICAL BULLETIN

*Mechanical Ventilation*

The scope of ASHRAE Standard 62.2-2007 covers single-family houses and multifamily structures of three stories or fewer. The standard requires that:

> "A mechanical exhaust system, supply system, or combination thereof shall be installed for each dwelling unit to provide whole-building ventilation with outdoor air at no less than the rate specified…based on the floor area and number of bedrooms".

The specified ventilation rate is based on the conditioned floor area of the residence and the number of bedrooms, and is given by the following equation:

$$\text{Flow rate [cfm]} = 0.01 \times \text{floor area [ft2]} + 7.5 \times (\text{number of bedrooms} + 1)$$

For example, a 3,000 sq ft house with four bedrooms would require a minimum of 68 cfm of outdoor air on a continuous basis.

It is significant that the standard does not base the ventilation requirement on the air tightness of the envelope. The standard lists limited exceptions where whole-building mechanical systems are not required and also contains requirements for local exhaust ventilation for kitchens and bathrooms. See the standard for details on these exceptions and additional requirements.

## What Equipment Is Available?

ASHRAE Standard 62-2007 does not specify how the ventilation requirements are to be met, but guidance is included in the standard. Available options are generally classified as 1) exhaust systems, 2) supply systems, and 3) balanced systems.

Exhaust systems draw air from the house and outdoor air enters the house through leaks in the building envelope. Exhaust systems typically utilize ceiling-mounted bath fans that may be used for both continuous whole-building ventilation and intermittent local ventilation. Dedicated fans, either single pickup or multipoint pickup, can draw from one or several locations which typically include the bathrooms, kitchens and laundry rooms. The primary disadvantage of exhaust ventilation is that the distribution of ventilation air within the residence will be inconsistent. Fresh air will enter the residence at locations that may not be optimum from an air quality viewpoint. Filtration of incoming air is generally not practical. Air may be drawn from attached garages, crawlspaces, attics, and other less-than-desirable locations.

Supply systems ventilate the house through a dedicated supply fan or through the central HVAC system air handler. Supply systems pressurize the house and air escapes through leaks in the building envelope. Supply systems may have a dedicated supply duct system or use the HVAC ducting. These systems typically utilize filters in the incoming air stream.

Balanced systems utilize both a supply fan and an exhaust fan to provide ventilation. If the flow rates are approximately equal, the house remains at a neutral pressure relative to the outdoors. Balanced systems are often integrated in a central ventilating unit, with filtration and tempering of the incoming air stream. Balanced systems may include energy recovery systems which can reduce the cost of conditioning the ventilation air. Heat Recovery Ventilators (HRVs) utilize air-to-air heat exchangers to recover a portion of the sensible heat from the exhaust-air stream. Energy Recovery Ventilators (ERVs) recover portions of both the sensible and latent heat.

Many variations within each of these categories are available. The options differ in initial costs, operating costs, reliability, installability, maintainability, and ventilation effectiveness. The best choice for a particular application will depend primarily on the climate and the designer's objectives for a particular project.

# TECHNICAL BULLETIN

*Mechanical Ventilation*

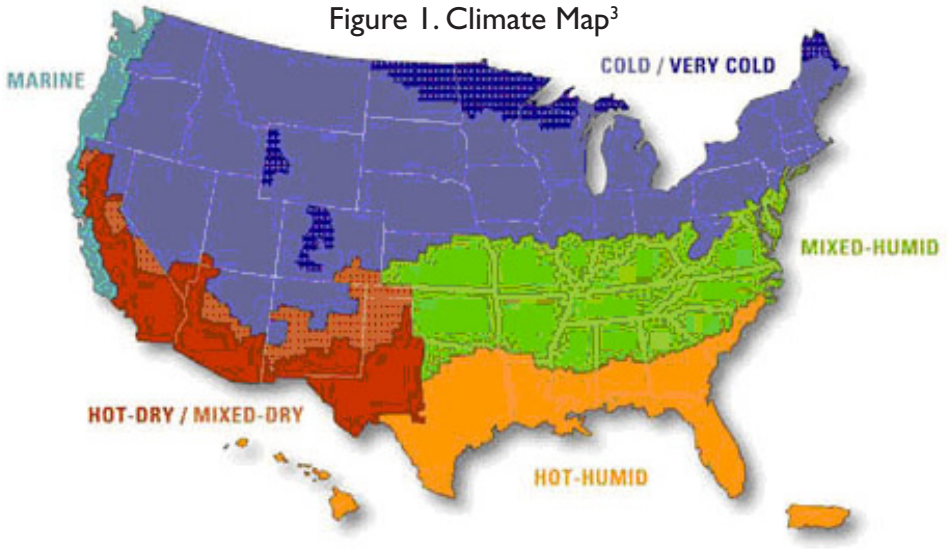
General guidance is summarized in Table 1 relative to the climate zone map shown in Figure 1.

Table 1. Recommended Options by Climate Zone

| Climate Zone | System Recommendation |
|---|---|
| Very Cold | Exhaust or balanced systems. Supply only systems are not recommended due to the potential for increased moisture transport into the envelope and condensation concerns. Consider Heat Recovery Ventilators (HRVs) to conserve energy and reduce the cost of conditioning ventilation air. |
| Cold | Exhaust or balanced systems. Supply only systems are not recommended due to the potential for increased moisture transport into the envelope and condensation concerns. Consider HRVs above 6,000 Heating Degree Days. |
| Mixed Humid | Exhaust, balanced, or supply systems. HRVs/ERVs are probably not cost justified. |
| Hot/Humid | Supply or balanced systems. Energy Recovery Ventilators (ERVs) and/or dehumidifier may be desirable for humidity control. Exhaust only systems not recommended due to potentially excessive moisture transport into the envelope. |
| Hot-Dry/Mixed-Dry | Exhaust, balanced, or supply systems are acceptable. |
| Marine | Supply or balanced systems are acceptable. Exhaust only systems not recommended due to potentially excessive moisture transport into the envelope. |

NOTE: Supply and balanced systems should incorporate filters (MERV ≥ 6) to further improve indoor air quality. Exhaust systems do not offer the opportunity for filtration.

Figure 1. Climate Map[3]



energyCOMPLETE™ with Flexible Seal Technology

Whole Home Insulation and Air Sealing System

# TECHNICAL BULLETIN

*Mechanical Ventilation*

## Where Do I Get More Information?

Contact your HVAC Contractor for information on the systems utilized in your area.

## Summary

Historically, residences have relied on natural infiltration to provide ventilation. With very tight houses, infiltration cannot provide adequate ventilation on a consistent basis. This has led to the increased utilization of mechanical ventilation in residential construction.

While local code requirements vary and will continue to change, it is recommended that design professionals concerned with indoor-air quality and energy efficiency specify mechanical ventilation systems to provide ventilation rates compliant with the requirements of ASHRAE Standard 62.2-2007 or their local codes, whichever is greater.

[1] Air Sealing, Office of Building Technology, State and Community Programs, Energy Efficiency and Renewable Energy, U.S. Department of Energy, Publication No. DOE/GO10099-767, 1999.
[2] Available from ASHRAE, 1791 Tullie Circle NE, Atlanta, GA 30329 (www.ashrae.org)
[3] Building America, "Introduction to Building System Performance: Houses that Work II" NREL/SR-550- 34585, April 2004.

ASK ABOUT ENERGY STAR

GREENGUARD® Indoor Air Quality Certified

Children & Schools GREENGUARD® Indoor Air Quality Certified


Pub. No. 10011116-A. Printed in U.S.A. March 2010. 