

# The EnergyComplete® System Enhances Building Energy Efficiency

## Introduction

A properly insulated building uses less energy for heating and cooling than the same building without insulation. The higher the insulation R-values, the greater the energy savings. Air leakage (infiltration and exfiltration) (See Figure 1), and the significant impact on energy use is becoming a major factor in code requirements and homebuyer expectations. Since air leakage is crucial to a building's energy use, what can a builder or building owner do to reduce it?

To reduce air infiltration and achieve a more energy-efficient building, the key areas where air leakage occurs must be addressed. Detailed in figure 1, these include any/all penetrations for electrical wiring and plumbing, and gaps at the intersections of the component materials and assemblers which make up the enclosure. All of which require a gasket or an expanding sealant using durable materials that will assure an effective, long-lasting seal.

Owens Corning Insulating Systems developed EnergyComplete® Sealant, a flexible air sealing solution that forms a gasket between lumber and drywall. EnergyComplete® combines innovative chemistry and world class Building Science you can't get anywhere else. When applied to a home or building prior to installing insulation, EnergyComplete® Sealant reduces air leakage which in turn can lower heating and cooling energy costs.

What follows is detailed information about what the EnergyComplete® technology is, how it is applied to a home or building, and how it enhances energy efficiency in a cost-effective manner.

## What is EnergyComplete® Sealant?

EnergyComplete® is a latex-based foam sealant, applied in a continuous bead by extrusion through an exclusively designed machine. The installing contractors are certified through a classroom and field training program conducted by Owens Corning staff. The combination of material and machine technology, and installer training ensures maximum air sealing performance. EnergyComplete® is designed to be used with other insulating materials such as EcoTouch® PINK® Fiberglas™ batts or loosefill insulation. When used together, EnergyComplete® and EcoTouch® Fiberglas™ insulation provide optimum control of heat flow, air flow and moisture throughout the thermal enclosure. Cavity insulation can be installed just 20 minutes after applying EnergyComplete®.

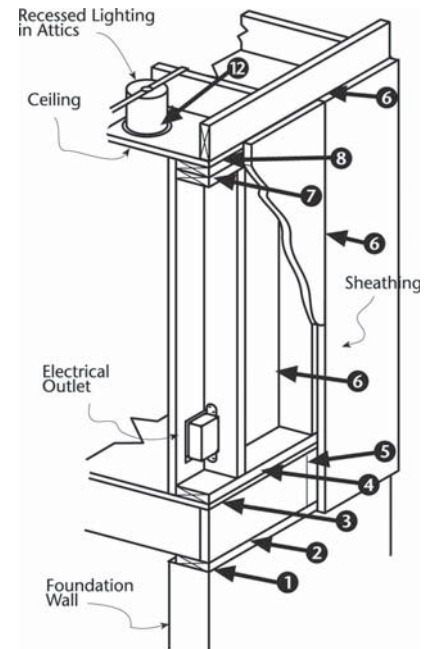


Figure 1\*

1. Sill plate/foundation wall interface
2. Sill plate/band joist interface
3. Band joist/subfloor interface
4. Bottom plate/subfloor interface
5. Band joist
6. Sheathing joists/stud/cavity
7. Double top plate interface
8. Top plate/ceiling interface
9. Windows and doors (not shown)
10. Window and door frames/rough opening surface (not shown)
11. Electrical/telephone/plumbing/cable intrusions (not shown)
12. Recessed lighting in attics





## Why use EnergyComplete® Sealant?

EnergyComplete® reduces a home or building's energy use for heating and cooling. EnergyComplete® makes a building comfortable in winter by reducing drafts caused by cold outside air flowing into the home or building through gaps.

Likewise, in cooling conditions, EnergyComplete® helps eliminate moisture problems by reducing the infiltration of humid outdoor air. The higher humidity leads to discomfort as well as greater air conditioning energy use.

Recent code changes have strengthened air sealing requirements. The 2012 International Energy Conservation Codes (IECC) calls for no more than 5 air changes per hour at 50 pascal (ACH50) in the extreme southern U.S., and a maximum of 3 air changes per hour at 50 pascal (ACH50) in the remainder of the country. Additionally, EnergyComplete® may contribute to the requirements and credits for various green and energy-efficiency building programs such as LEED® for Homes, the NAHB National Green Building Standard and the EPA ENERGY STAR® New Home program.

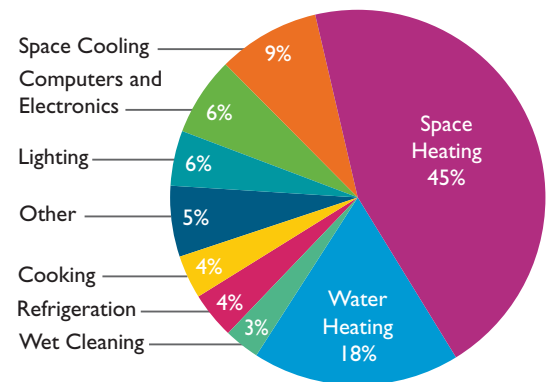
While the results of a blower door test are also dependent on building components that are unaffected by EnergyComplete® Sealant (such as doors and windows), it is typical to achieve less than 0.3 Natural Air Changes per Hour in a home with EnergyComplete® when running this blower door test.

The home or building must be tested for air leakage using a blower door apparatus. Since this test is run on a completed building, the builder and/or the building owner will want to be assured that the building will meet the requirements on the first try. Failure to meet the requirements, requires additional tests to identify where air leakage occurs and steps to remediate, possibly requiring the walls and/or ceiling be opened up and eventually reconstructed. These steps are both time consuming and costly. Using EnergyComplete® gives the builder and/or building owner confidence that the home or building will meet the blower door test requirements on the first try.

## Background

### How much of a typical home's energy use is for heating and cooling?

The pie chart, taken from the U.S. Department of Energy web site (<http://energy.gov/energysaver/articles/tips-your-homes-energy-use>), gives a typical home's energy use in percentages. Space heating and cooling account for almost half of a home's total energy use. The remainder is used for water heating, lighting, electronics, appliances, refrigerators and freezers, and other.



Energy use for a typical home

### How important is air infiltration in building energy use?

According to the North American Insulation Manufacturers Association (NAIMA) web site (<http://www.naima.org/pages/resources/library/pdf/BI480.PDF>), air infiltration through a home can account for as much as 35% of the home's energy use. On the same web site, NAIMA points out that a study in 1996, conducted by the Union Electric Company in St. Louis, MO, concluded that a sealant package can decrease air infiltration by more than 50% compared to a home that does not have one. Further, Union Electric concluded that air infiltration does not depend on the type of thermal insulation used. The conclusion is that air infiltration is a major contributor to a typical home's annual energy use for space heating and cooling.



For more detailed information on installing EnergyComplete® Sealant, visit [ocenergycomplete.com/resources](http://ocenergycomplete.com/resources).

## Features and benefits of EnergyComplete® Sealant:

Spray foams, such as spray polyurethane foam (SPF), claim to both insulate and air seal, but depending on the application, sometimes fail to seal. Several manufacturers of these materials claim that using SPF results in significant reductions in air leakage and significant energy savings when compared to fibrous and cellulosic insulation materials. They also generally don't point out that SPF insulation materials are very expensive - as much as three to five times more than fiberglass insulation materials.

Trying to simultaneously insulate and seal with just one of the materials currently available on the market doesn't optimize the home's energy package. To optimize both performance and economics, it is best practice to select your insulation and air sealing material to insulate and seal. Fiberglass insulation has a long track record as an effective wall and ceiling insulation. EnergyComplete® Sealant, as an effective

high-performance sealant, enhances that thermal performance in a cost-effective manner. Its performance has been verified in numerous homes with blower door testing.

### How is the EnergyComplete® installed?

EnergyComplete® Sealant is installed by a certified contractor using a specially designed machine and applicator. It is applied as liquid foam that sets in less than 20 minutes, so it does not hinder the schedule for insulating the walls and ceilings. When the job is complete according to installation instructions, the likely locations of air leakage will have been effectively sealed with this PINK® foam sealant.

EnergyComplete® Sealant with Flexible Seal Technology is a non-allergenic, high-performance latex-based foam used to seal cracks, penetrations and from floor to floor in a house or building. EnergyComplete® Sealant is safe to install and does not require a chemical mask or fresh air ventilation suit, and other trades can work in the house while the sealant is applied. Insulators can install fiberglass in the walls shortly after the sealant is applied.

### Advantages of EnergyComplete® Sealant over conventional building enclosure sealants

Traditionally, contractors have used caulk to seal building enclosures. While appropriately selected caulks can be effective as sealants, they must be carefully applied and inspected to assure that all potential leak locations have been fully plugged. Applying sufficient quantities of caulk to effectively seal all potential sources of air infiltration is labor intensive, is difficult to do well, and can yield unpredictable results. Builders have also expressed concerns about cracking and the overall long-term durability of caulk.

By contrast, EnergyComplete® Sealant can be installed in the first application—in a typical North American home, in just several hours—making it a cost-effective sealant. Furthermore, due to its PINK® color, its application is easy to verify visually.





## How safe is EnergyComplete® Sealant?

EnergyComplete® Sealant is safe to install. It does not require a chemical mask or fresh air ventilation suit, so other trades can work in the building while the sealant is being applied. Plus, insulation contractors can install fiberglass or other types of insulation in the walls shortly after the sealant is applied. Owens Corning recommends that installers of EnergyComplete® use chemical gloves, goggles or a face shield, wear a long-sleeved shirt and, if the installation site is dusty, a dust mask. Additionally, unlike with spray polyurethane foam, there is no need to quarantine the work area. Other trades are welcome to work in and around the home during the installation of EnergyComplete®.

## EnergyComplete® performance

EnergyComplete® Sealant has been tested for physical properties that are generally recognized by the construction industry for materials used in residential and commercial buildings. Following is a list of those properties with the associated test standard and the results of testing EnergyComplete® Sealant.

- **Flame Spread & Smoke Developed**—Testing for flame spread and smoke developed indices per ASTM E 84. Results: flame spread index < 25, smoke developed index < 50.
- **Air Infiltration**—Testing of wall sections for air leakage rate per ASTM E 283. Results: air leakage rate <0.01 cfm/ft.<sup>2</sup>
- **Long-Term Performance**—EnergyComplete® Sealant maintains its flexibility, air sealant properties and adhesion to common building material substrates over time, as demonstrated through accelerated aging tests designed to represent typical wood frame movement and climatic changes throughout the United States over a 50-year period. EnergyComplete® Sealant also maintains an air seal after being subjected to the pressure from three-second gust hurricane windspeeds of up to 150 MPH. EnergyComplete® Sealant adheres to and is noncorrosive to typical materials found in residential construction such as wood, cardboard, PVC, ABS, steel, galvanized steel, concrete, masonry block and expanded polystyrene.
- **Water Vapor Permeability**—Testing for water vapor permeability per ASTM E 96 for water vapor transmission. Results: Wet cup—113 perms; dry cup—41 perms.
- **Low-Pressure, Flexible Seal**—Testing for pressure-build per AAMA 812-04. Results: Expansion force is less than 0.1 psi and will not cause door or window frames to warp. In addition, the foam remains flexible when cured, and will not transfer structural load to window or door framing.

For more information about the performance of EnergyComplete® Sealant, see the *EnergyComplete Sealant Product Data Sheet*, available online at [ocenergycomplete.com/resources](http://ocenergycomplete.com/resources).

## How should you ventilate a tightly sealed building?

The expression “seal tight, ventilate right” summarizes in four words what needs to be done. The first step is to tightly seal the building during construction or retrofit. The next step is to add energy-efficient mechanical ventilation. This can be done by having the heating and cooling system contractor add an air-to-air heat exchanger into the air handling ductwork. Such a heat exchanger allows for removal of a certain amount of air and the simultaneous introduction of fresh outdoor air into the ducts. These two air paths cross one another in the air-to-air heat exchangers, allowing the recovery of as much as 80% of the energy in the conditioned air.



## Conclusions

EnergyComplete® Sealant enhances the building enclosure to reduce air infiltration while maximizing thermal performance. In so doing, it can reduce the energy use for space heating and cooling by up to one-third, depending on geographic location. Because EnergyComplete® Sealant is quick to install and visual inspection is easy, the new building is more likely to meet the requirements of the blower door test for air tightness. With a compliant thermal insulation system in the walls and ceiling or roof, along with high-quality windows and doors, the building is better positioned to meet ENERGY STAR® requirements. EnergyComplete® delivers savings the minute the home is heated or cooled.

EnergyComplete® is the optimal solution for enhancing the energy efficiency of a properly insulated building.



Contact your Owens Corning Area Sales Manager today for complete details about the EnergyComplete® Sealant and training opportunities.

**Learn more at [ocenergycomplete.com](http://ocenergycomplete.com) or by calling 1-800-GET-PINK®.**



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\*Illustration from the North American Insulation Manufacturers Association (NAIMA), Pub. No. B1480.

\*\*Air infiltration can account for 30% or more of a home's heating and cooling costs and can contribute to problems with moisture, noise, dust and the entry of pollutants, insects and rodents. Reducing infiltration can significantly cut annual heating and cooling costs, improve building durability and create a healthier indoor environment. Air Sealing, Office of Building Technology, State and Community Programs, Energy Efficiency and Renewable Energy, U.S. Department of Energy. No. DOE/GO10099-767, 1999.