

Turn Down The Heat!

The benefits of attic ventilation.

With regard to summer cooling, I was prompted to peck out a few words on attic ventilation. In addition to keeping us warm, and preventing condensation & mildew in the winter, an adequately insulated and ventilated attic space will reduce the summer heat load in living spaces. A well ventilated attic will function much like a big shady tree! The general rule of thumb is "one square foot of *unobstructed* ventilation area for every 300 square feet of ceiling space; no less than 50% of the total inbound air through the soffits or gable vents, and no more than 50% outbound via roof or ridge vents. When there is no vapor barrier over the attic ceiling the ratio changes to 1 to 150. The bird and bug screens and/or louvers can diminish the effectiveness of the vents by as much as 50%, so double this amount.

For example, a 1500 sq. ft house requires a minimum of 5 sq. ft of unobstructed ventilation area (min. 10 sq. ft. of screened vent area). This would likely be accomplished with 5 (1 sq ft) roof vents (or a larger number of smaller vents) and in most new homes, a continuous vented soffit covering. In older homes with wooden soffit coverings incorporating individual soffit vents, subsequent covering with vented aluminum will drastically impede air flow through the original openings. The wood soffit covering should be removed prior to installation of the aluminum soffit covering. If aluminum has already been applied over plywood, temporarily remove this covering to introduce more openings into the wooden soffits.

To determine whether or not your attic is adequately ventilated, first survey the number of roof vents. Then lift the access hatch inside the house (usually found in a closet or hallway ceiling). If the attic temperature is extremely high, especially on a cooler day, this means heat-loaded air is not being sufficiently vented. Also, you may notice a rush of air entering up through the access hatch. This means you might have enough roof vents, but not enough soffit (or gable) vents. The relative heights of roof versus gable vents will also be a determining factor. The higher the roof vents are above the gable vents, the more effectively the attic will ventilate.

A minimum of R20 (approx. 8") of insulation over the upper floor ceilings is required to effectively isolate the attic from the living spaces, and continuous vapor barriers behind walls and ceilings will stop infiltration of hot outside air, and the release of cooler (hopefully) inside air. Check that your soffit vents are not obstructed by insulation materials.

Without air conditioning, it helps to open all the windows overnight, and then shut down the house and close the window coverings all day, just like grandmother did it! Aluminum foil, or commercially available tinting, can also help when applied to south and west-facing windows.



Protect Your Roof for Life

A balanced attic ventilation system reduces the temperature difference between the outside air and the attic space, improving energy efficiency, helping maintain the structural integrity of the roof, reducing moisture accumulation and extending the life of your roof.

Energy Efficiency

In warmer months, balanced attic ventilation allows the roof to breathe, lowering attic temperatures and cooling the roof deck (base). A cooler attic will help reduce cooling costs. Accumulated attic heat is removed quickly. The air-conditioning unit does not need to compensate for long hours of oven-like attic temperatures. In cooler months, a balanced ventilation system keeps attic humidity at lower levels, minimizing condensation and reducing the likelihood of mold and mildew growth. Condensation dampens and compacts the insulation, reducing its efficiency. The heating system has to work harder to replace the heat lost through the less-efficient insulation.

Structural Integrity

A properly ventilated attic helps reduce the risk of structural deterioration in your home by protecting wood rafters and the roof's decking (base) from moisture damage and rot.

Reduced Moisture Accumulation

Balanced attic ventilation allows cool, fresh air to enter the attic through vents in the soffit or eaves and hot, stale air to escape through a ridge vent installed under the ridge cap shingles. When properly installed with intake vents, this system creates the most effective way of removing heat and moisture from your attic. Look at the temperature comparison below. Notice how dramatically the attic temperature is reduced with proper ventilation. After the sun sets, the attic temperature will drop significantly faster when the attic has been properly ventilated.

EXAMPLE TEMPERATURE COMPARISON

	Improperly Vented Attic	Balanced Attic Ventilation
Outside	90°	90°
Rooftop	170°	170°
Attic	165°	120°

Probably the most common problem encountered in home inspections is lack of attic ventilation. Most people don't understand the full meaning and benefits of good attic ventilation. There is also a lack of understanding of how to size and position vents for an adequate design.

Attic ventilation is one of the most important factors affecting the long term health of a house. Wood rot, mildew, peeling exterior paint, rusty nails and structural steel, roofing deterioration, energy losses, and other problems are often the direct result of inadequate attic ventilation. Wood damaging pests such as carpenter ants and termites are attracted to moisture buildup and rot which is often caused by inadequate ventilation.

Ironically, improving ventilation conditions can often be accomplished with low to moderate cost expenditures. Once a homeowner understands the problems associated with poor ventilation, there is usually a willingness to make these improvements. In a home inspection, the buyer usually will accept the responsibility to improve the ventilation because of the low cost and because of the argumentative nature of the subject. However, when there is significant damage from poor ventilation such as delaminated subroof with substantial mildew buildup, improving the ventilation becomes secondary to repairing the damage.

Heat Control in Summer

It is commonly understood that good ventilation is needed in the attic to control the temperature in the summer. Attic temperatures can reach 170 F in the summer in poorly ventilated homes. The temperature reduction can be dramatic as ventilation is improved. The amount of attic heat that is transmitted to the interior thru the ceiling or walls depends on the level of insulation. It can be shown that, in a poorly ventilated home with less than adequate insulation, more than one ton of air conditioning is needed just to overcome these heat gains.

Ironically, attic fans are most often not the best answer to this problem. An attic fan is only as effective as the positioning and number of complementary vents from which it draws. If roof vents are too close to the attic fan, there could be short circuiting of the vent stream. Power vents tend to draw from a source with the least resistance which nearby vents provide.

The University of Illinois did research on power roof vents controlled by a thermostat in the attic and found that the cooling load in the house was not reduced sufficient to pay for the operation of the fan. They recommended investing the money which may be spent on power vents in more insulation and/or in good natural ventilation system which has no cost of operation. For homes with an existing attic fan during home inspections, we usually discuss methods to make the fan more effective.

On the other hand whole house fans, which are mounted at the attic floor and draw from the home interior, are usually effective in both cooling the attic and house interior and minimizing the use of air conditioning. Whole house fans should be insulated and sealed for the substantial heat losses that can occur during the heating seasons or the savings that occur in the summer will be lost in the winter.

Moisture Control in Winter

The most important aspect of attic ventilation is for drying internal moisture which develops during the heating season. Internal moisture refers to the condensation of more humid interior air when it escapes to cold wall and attic cavities. Warm air can hold more moisture in vapor form than cold air. When that warm air cools, it releases the vapor in the form of condensation. When the ventilation in the attic is not sufficient to dry this condensation, a house can experience mildew buildup, wood rot, delaminating of subroofs, peeling exterior paint, and other problems.

A cold, drafty attic during the winter is the best condition for the health maintenance of a house. Insulation is used to protect the interior house from this cold area.

Without prior knowledge of the consequences, it is a normal instinct to want to close vents in the winter. At a brick-sided home with wood roof soffits in Aurora, the diligent homeowner blocked the vents every winter and every two years scraped and repainted the soffits and roof fascia area. Another Glen Ellyn couple had a walk-up attic and every winter blocked off the large end gable attic vents. The internal moisture buildup one winter got so heavy on the subroof that they replaced the roof because they thought it was leaking.

Sources of Internal Moisture

There are many sources of increased humidity in the house air during the heating season. Humidifiers, either portable or attached to furnaces, have the specific purpose of adding moisture to the air for health, comfort, and other considerations. The human body can give off over a pound of water per day to the surrounding air. Cooking, showers, and baths, add water to the interior air as well.

By far, the largest supplier of humidity to the interior air can be uncovered ground areas, such as in a crawl space. When open ground in a crawl space is not covered by a vapor barrier, such as a polyethylene sheet, there is an unlimited and continuous supply of vapors from ground water. The ground surface does not have to be wet or damp to supply moisture to the air because vapors from the underlying moisture will pass. The cost to correct this problem is low and relatively easy to execute. Just cover the ground with a 4 or 6 mil Visquene (polyethylene) sheet and try to cover all of the exposed ground.

Ventilation Methods

Ideal design has placement of both high and low level vents. Good ventilation is provided by the arrangement shown in Figure 1 with soffits or eaves vents and roof vents. Ridge vents as found in many newer homes in place of roof vents will improve the ventilation. Less ideal but acceptable ventilation can be obtained with end gable vents and eaves vents as shown in Figure 2.

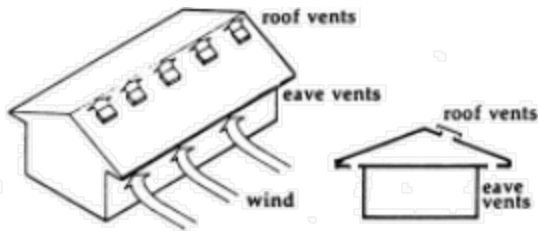


Figure 1 Ventilating an attic with roof vents.

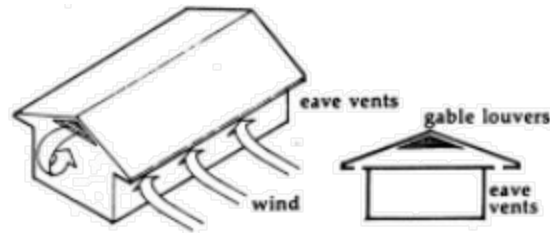


Figure 2 Ventilating an attic with gable louvers.

For homes without an overhang or eaves for the placement of eaves vents, it is recommended that low side roof vents and gable vents be added to complement the high side roof vents. The goal should be to minimize the dead air space in the attic.

Air moves naturally through the attic space because of two forces:

1. Induction or wind force
2. The chimney effect

Induction forces are in effect in attics with gable vents where winds can pass. The chimney effect is by far the biggest factor in air movement in attics. The movement of light warm air up thru a space and out a vent creates a vacuum which forces air up from low level eaves vents. This is the chimney effect. The greater the difference in height between the high and low vents the more movement of air will take place. Soffit vents alone or roof vents alone are inadequate but of course better than nothing.

For commonly found Cape Cod homes with 2nd stories defined by knee walls which create triangular cavities on the sides, it is still ideal to have high and low vents with an air passage over the insulation on the sloped ceiling. For homes with vaulted ceilings, there is still a need for ventilation except that all the air movement should be between the insulation and the subroof.

If you ever want to test the validity of the need for attic ventilation, the next time you see a house with a peeling paint problem check the ventilation. It is very likely that the house has inadequate ventilation. Many home owners with peeling paint problems have decided to cover the symptoms of poor ventilation with new siding such as aluminum. This aluminum covering on soffits will often give the illusion of vents with screen holes in the aluminum with no hole or vent in the wood under the aluminum.

Over time vents can become blocked with dirt, paint or birds' nests. To be effective, these vents should be cleaned. The benefit to cost ratio for improving attic ventilation is so large that no conscientious homeowner should overlook the problem.