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Attic and Crawlspace Ventilation

Attic ventilation in the Pacific Northwest is required to remove heat in the summer, and to prevent moisture build-up and the formation of ice dams in winter. *Crawlspace ventilations* is required to remove moisture, and in some areas, to reduce the amount of radon gas entering the living space.

This Update discusses proper ventilation techniques for attics and crawlspaces. The information is intended for a heating climate such as Washington State and will not be applicable in southern states where cooling is the major load.

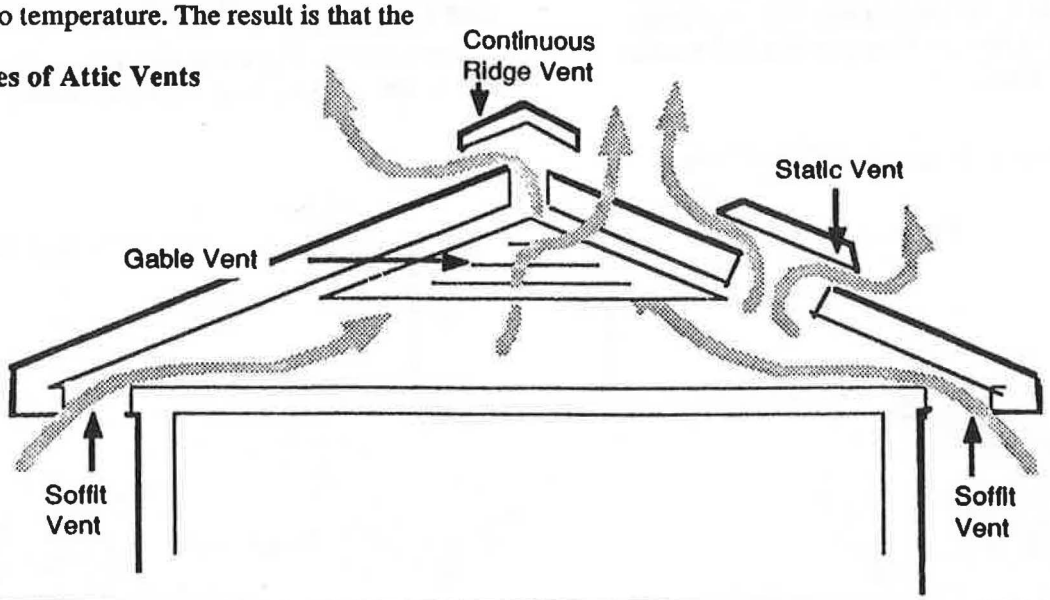
The Attic Problem

Older homes often have little or no insulation in the attic. This means that the attic temperatures are modified by the house temperature. When the house is cooled in the summer, the attic cools; when the house is heated in the winter, the attic warms up. Allowing the attic to follow the house temperatures means that the attic is less likely to overheat in the summer or get cold enough in the winter for larger amounts of condensation to occur.

Today's energy-efficient homes have higher insulation levels and less air leakage than homes built in the past. These means that the attic must now stand on its own in regard to temperature. The result is that the attic, if not properly vented, may become too hot in the summer (Figure 2) and too cold in the winter.

Most roofing materials are designed to stay cool and will deteriorate more quickly if exposed to high temperatures. During the winter, moisture from inside the house will migrate into the attic and condense if the attic is very cold and unventilated. In addition to moisture build-up, ice dams can form on the roof exterior. As the attic warms up during the day, snow on the roof melts, and water runs down to the colder overhang and refreezes to ice. As the process continues, ice or water can back up under the shingles causing roof damage and water leaks inside the home.

Figure 1. Types of Attic Vents



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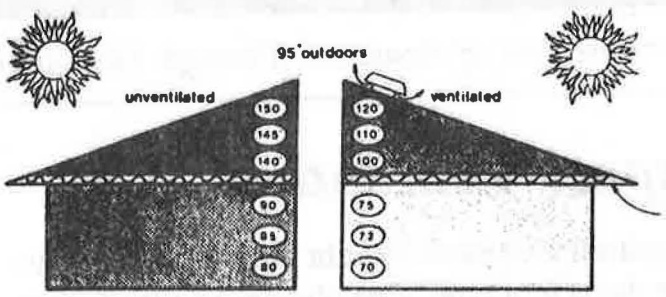


Unventilated attics can build up temperatures reaching 150° F during a hot, sunny day. This trapped heat radiates to rooms below, creating uncomfortably hot conditions and imposing heavy cooling loads on air conditioners.

Figure 2. Attic Temperatures on Hot, Sunny Days

The Attic Solution

The solution to the problem is proper attic ventilation. Proper ventilation involves: 1) adequate vent area, and 2) proper placement of the vents.

- Adequate Vent Area. The old practice for vent area was one square foot of net free vent for every 300 square feet of attic floor. This practice worked well for uninsulated attics. The term net free refers to how much air actually moves through the vent, figuring in blockage for louvers and bug screens. Most vents on the market today are stamped with a net free or free flow area to help with sizing the vents to the attic. The new practice required by the Uniform Code, is more appropriate for today's higher levels to attic insulation. It provides one square foot of net free vent to every 150 square feet of attic floor.
- Proper Placement. The best ventilation occurs when attic vent systems utilize an even distribution of high and low vents which are positioned on all sides of the roof. One of the best ways to achieve this is by installing continuous ridge and soffit vents (Figure 3). Less effective combinations such as gable vents, or roof jacks by themselves require two to three times more vent area to be equally effective.

Passive, non-motorized ventilation is more economical and more reliable than ventilation that requires electric fans or maintenance of moving parts. therefore, it should be used whenever possible. Installation of mechanical ventilators should only be used in cases when roof design doesn't allow high and low passive venting. These systems should meet local code specifications.

Additional Attic Recommendations

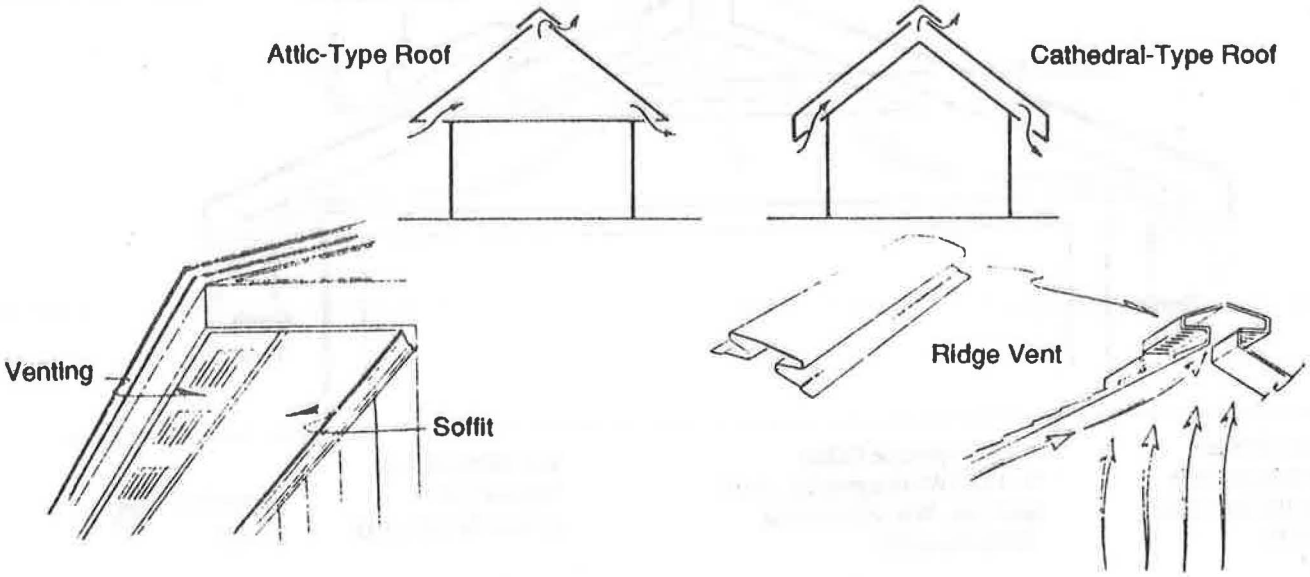
Take care that attic insulation does not obstruct low roof jacks or soffit vents. Provide non-combustible baffling above soffit vents to ensure air flow and to prevent wind from blowing the insulation. Contact the local building department for advice if needed. If loose fill insulation is blown into the attic after vents are installed, check all vents, both high and low, to ensure that insect screens are not clogged with insulation.

Insulation should be held back at least one inch from the under side of the roof. That space between the top of any insulation material and the bottom of the roof sheathing is critical for allowing good air movement.

The Crawlspace Problem

Crawlspaces like attics need to be ventilated to prevent moisture build up on the underside of the

Figure 3. Soffit and Ridge Vent Combination



house. As with the attic, the need for ventilation increases once underfloor insulation is installed. floor insulation, while reducing heat loss from the house, allows the crawlspace to get colder and increases the potential for condensation to occur.

The Crawlspace Solution

Homes with insulation installed under the floor should have the crawlspace vented year-round. Water pipes should be insulated and, in colder climates, fitted with heat tape to prevent freezing. Homes with perimeter crawlspace insulation generally have operable vents. These should be closed in the winter to conserve heat and to prevent pipe freezing, and then opened during warm weather to vent accumulated moisture.

The standard practice for crawlspace ventilation is one square foot of net free vent area for every 150 square feet of crawlspace. The vents should be distributed evenly around the perimeter to maintain good cross-ventilation. If the crawlspace is well drained and dry, with no evidence of seasonal standing water, this recommendation may be reduced by half (a 1/300 ratio of vent area to crawlspace area).

Ventilate year-round unless perimeter insulation with operable vents is present, in which case vents may be closed during the heating season.

Install a six mil black polyethylene ground cover/moisture barrier over any exposed soil. Overlap joints 12 inches and extend up foundation walls six inches (but not in contact with any wood member).

If radon gas is present, ventilate the crawlspace year-round as recommended by local code or by a qualified mitigation contractor. The local health office may keep a list of qualified contractors, or contact the Washington Energy Extension Service at 1 (800) 962-9731.

Conclusion

Current research confirms the need for attic and crawlspace ventilation to ensure the long-life of materials and comfort of those who live in the home. Recommendations for today's homes must reflect changes in insulation levels, today's construction techniques, and our new understanding of the many factors involved.

WEES Publications

Home Insulation (WAOENG-89-21)
Indoor Air Pollutant—Radon (FS1807)
Reducing Home Air Leakage (FA1101)
The Energy Efficient House (WAOENG-89-33)

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Washington Energy Extension Service

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