

Principles of attic ventilation

by **Mark S. Graham**

Proper attic ventilation is recognized by most roofing professionals as a necessary component of a successfully performing steep-slope roof assembly. However, recent research has caused some roofing professionals to re-evaluate their positions on attic ventilation.

Code requirements

Each of the four model building codes—*The BOCA National Building Code*, *International Building Code*, *Standard Building Code* and *Uniform Building Code*—require attic spaces to be ventilated. Generally, building codes require that a minimum net free ventilating area for attic vents be a 1-150 ratio of the area of the attic space being ventilated. The four model building codes also generally allow for a reduction of the ventilation ratio from 1-to-150 to 1-to-300 if attic vents are balanced on a roof and/or a vapor retarder is installed on a ceiling assembly's warm side.

These ventilation requirements were promulgated in 1942 by the National Housing Agency. Currently, it is acknowledged by recognized ventilation experts that the technical data used to derive these ventilation requirements are limited.

ASHRAE's position

According to the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the primary aim of the current codes' requirements for ventilating attics is to prevent condensation from occurring on the undersides of roof sheathing. Cooling of attic air during the summer and possible extension of bitumen-based roofing products'

service lives also are named as additional benefits of attic ventilation.

In ASHRAE's *1997 Fundamentals Handbook*, several disadvantages of providing attic ventilation are cited. For example, cold air that is vented into attics during winter can degrade attic insulation's thermal performance. Also, in warm, humid climates, venting tends to increase an attic's moisture and humidity levels.

ASHRAE indicates the advantages and disadvantages of providing attic ventilation need to be evaluated on a case-by-case basis. For heating climates (cool climates), ASHRAE states the benefits typically outweigh the drawbacks; therefore, attic ventilation should be provided. For cooling climates (warm, humid climates), ASHRAE indicates the net benefits of venting do not always clearly outweigh the disadvantages; therefore, venting should not be required and should be considered a design option.

In mixed climates, venting may provide some benefits if effective vents can be installed relatively easily and inexpensively.

NRCA's position

NRCA recommends designers of steep-slope roof assemblies provide attic ventilation by using static, balanced ventilation systems with a minimum amount of 1 square foot (0.09 m²) of net free ventilating area for every 150 square feet (28 m²) (1-150 ventilation ratio) of attic space measured at the attic floor level.

A balanced ventilation system uses ridge vents or provides about one-half of the total ventilation area at a roof assembly's low points, such as soffit

vents, and the remaining area at or near the ridge. Balancing ventilation in this manner allows for air intake to occur at the low points and exhaust to take place at high points. Air movement from low to high points is aided by natural convection.

In place of balanced ventilation systems, forced or mechanical ventilation may be appropriate. Ventilation measuring 1 cubic foot per minute per square foot (0.3 m³/minute/m²) of attic space at an attic floor effectively is equivalent to the 1-150 ventilation ratio for static ventilation.

For large-volume attics, such as attics with roof slopes greater than 8-in-12 (34 degrees), consideration should be given to increasing attic ventilation.

Closing thoughts

Although some published research appears to contradict the long-established guidelines for attic ventilation, the need for attic ventilation still is required by most building codes, including the four model building codes.

NRCA's guidelines for attic ventilation are consistent with the building codes' 1-150 ventilation ratio provisions. As additional research regarding attic ventilation is brought forward, NRCA will re-evaluate its guidelines when appropriate.

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