


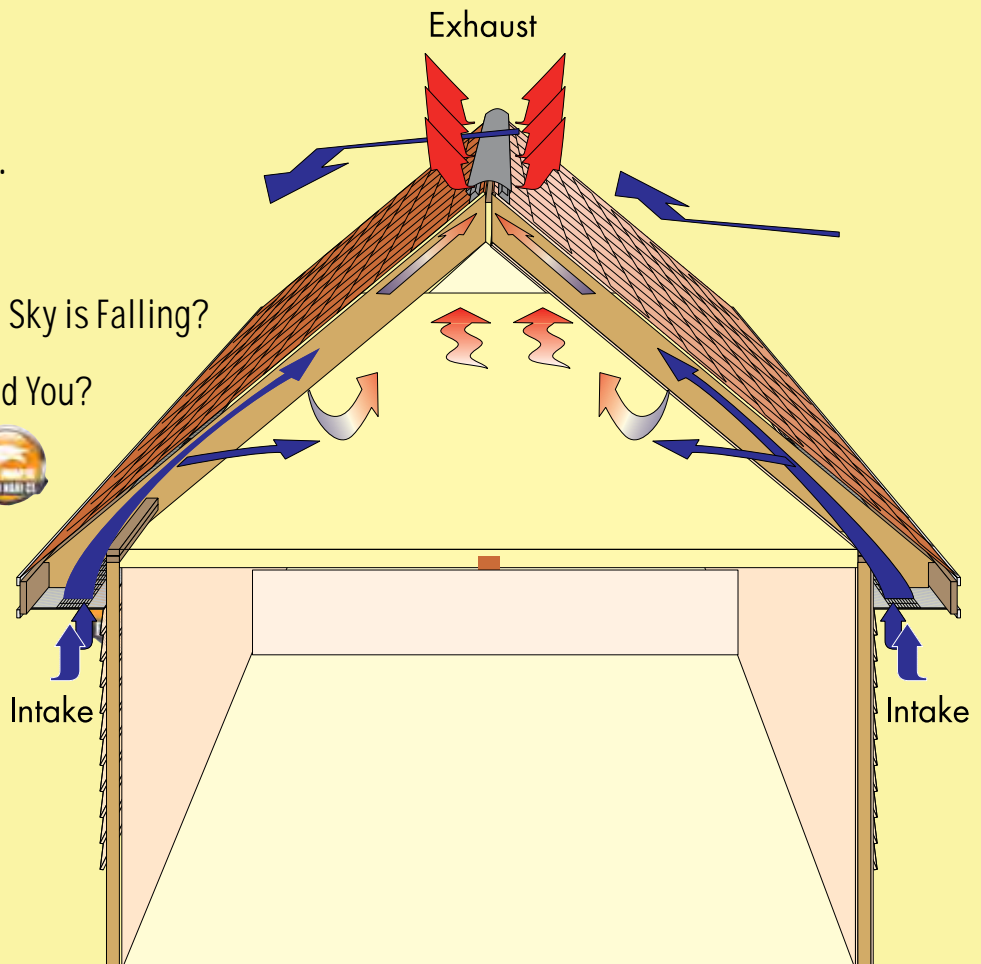
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## Attic Ventilation Calculations Made EASY

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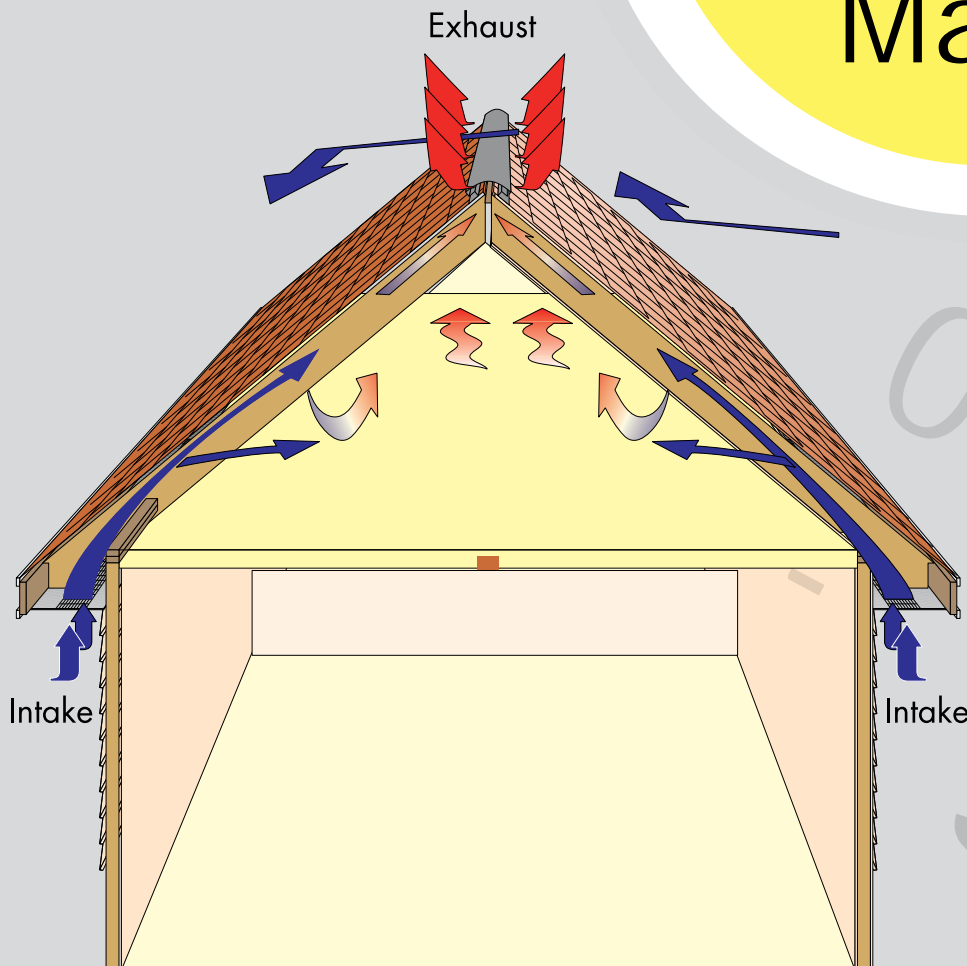
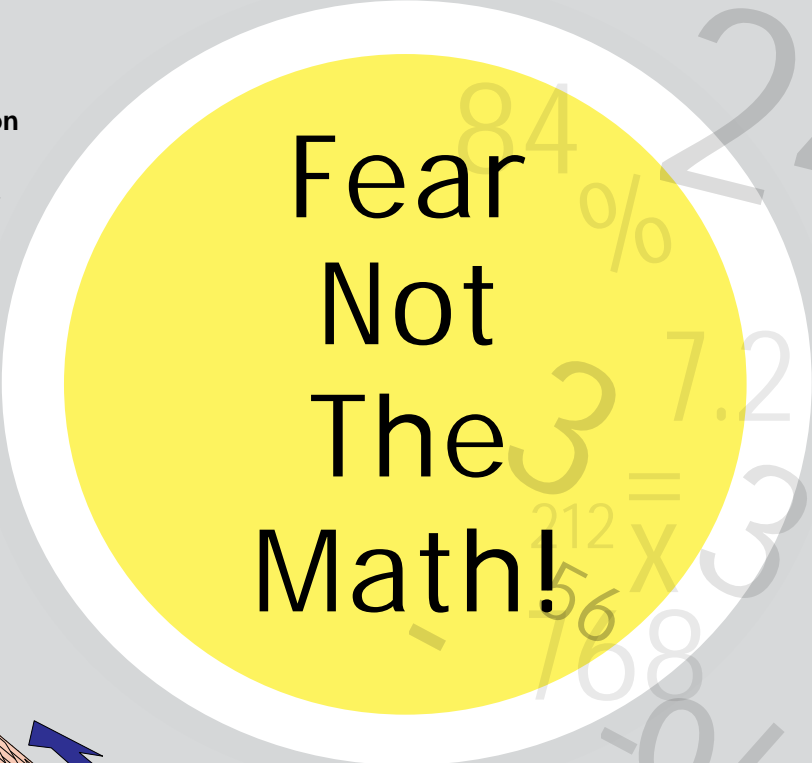
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# Attic Ventilation Calculations Made EASY

By: Paul Scelsi, Air Vent, Inc.,  
on behalf of the Roof Assembly Ventilation Coalition

Whether you're a builder breaking ground on a new residential community, an architect writing specs for a client, a contractor hired to reroof, or a home inspector providing information to a potential homebuyer, it's imperative to understand how to calculate if there is enough attic ventilation if you want that system to perform optimally. It's the recommendation of the **Roof Assembly Ventilation Coalition (RAVC)** that all roofing professionals have a basic understanding of the attic ventilation calculations necessary to help the system fight heat in the summer, moisture in the winter and ice dams in cold climates.



## Checking Code

In general, the building code sets minimum requirements for attic ventilation and it also provides “exceptions” (that is, the code will allow less than minimum if specific conditions are met). To keep this article simple, we’ll focus on the **code minimum** as listed in the 2012 International Residential Building Code, (IRC), Section R806 – Roof Ventilation.<sup>1</sup>

Code minimum is 1 sq. ft. of Net Free Area for every 150 sq. ft. of attic floor space. This means, for every 150 square feet of attic floor space (defined as length x width, floor of the attic) there should be 1 square foot of Net Free Area (NFA). Two important points before we continue:

1. It is the recommendation of the RAVC that the attic ventilation system always be balanced. This means, once we know the needed NFA for the entire attic, 50% of it will be exhaust vents and 50% will be intake vents.
2. Since attic ventilation products are rated or specified by the manufacturer in square inches – not square feet – we’ll have to convert from square feet to square inches when it comes time to pick a vent for the project.

So, let’s apply the code minimum requirements and the RAVC recommendations to a real-world example.

## Doing the Math: An Example

The starting point for any attic ventilation project is always: What is the size of the attic space we’re trying to vent? In other words, what’s the attic square footage? Let’s say the attic is 2,000 square feet (40 ft. length x 50 ft. width attic floor space). Here’s how the code minimum of 1/150 (1 sq. ft. of NFA for every 150 sq. ft. of attic floor space) looks on paper.

**Step One:** Determine the total NFA needed for the attic. Example: 2,000 sq. ft. attic ÷ 150 (code minimum) = 13.3 sq. ft. NFA needed for the entire attic.

**Step Two:** Balance the system with 50% intake vents and 50% exhaust vents. Example: 13.3 sq. ft. NFA needed ÷ 2 = 6.6 sq. ft. of intake Net Free Area needed and 6.6 sq. ft. of exhaust NFA needed.

**Step Three:** Convert to square inches because that’s how vents are rated by manufacturers. Example: 6.6 sq. ft. x 144 (the number of sq. in. per sq. ft.) = 950 sq. in. of intake NFA needed and 950 sq. in. of exhaust NFA needed.

**Step Four:** Pick the vents for the project. It’s time to select a type of intake vent and a type of exhaust vent that is appropriate for the project and find out its NFA rating as supplied by the manufacturer. Manufacturers specify their vent NFA ratings in square inches per linear foot or per unit/vent. Member companies of the RAVC have a comprehensive offering of intake and exhaust vents. Visit [www.ravcoalition.org](http://www.ravcoalition.org) for specific vent types and NFA specifications. Due to space limitations we will refer to intake and exhaust generically here. Let’s say the “Intake Vent” and “Exhaust Vent” has the following NFA ratings measured per linear foot:

- Intake Vent: 9 sq. in. NFA per linear ft.
- Exhaust Vent: 18 sq. in. NFA per linear ft.

**Step Five:** Determine the quantity of vents needed. We’ve reached the home stretch. It’s now time to determine how many of the vents selected in Step Four will be needed to provide the necessary NFA we calculated in Step Three. For example:

- To achieve 950 sq. in. of intake NFA would require 106 linear ft. of the 9 sq. in. NFA Intake Vent (because  $950 \div 9 = 106$ ).
- To achieve 950 sq. in. of exhaust NFA would require 53 linear feet of the 18 sq. in. NFA Exhaust Vent (because  $950 \div 18 = 53$ ).

# Answers to Common Calculation Questions

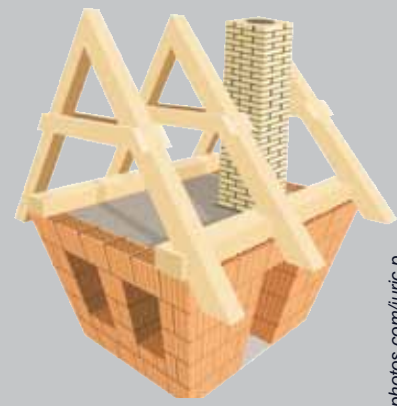


Photo credit: depositphotos.com/juric.p

Here are the two common attic ventilation calculation questions the RAVC fields.

## Q

: What if the math calls for 40 ft. of ridge vent but there is actually 60 ft. of available ridge length?

Answer: It’s OK to install 60 ft. of ridge vent as long as it can be properly balanced with intake ventilation.

## Q

: What if the attic ventilation system cannot be balanced exactly 50% intake and 50% exhaust?

Answer: If the attic ventilation system cannot be balanced 50% intake/50% exhaust, it’s better to have more intake than exhaust because it’s been our experience most houses lack proper intake. Additionally, any excess intake will become exhaust on the leeward side of the house because the intake vents on the windward side of the house will have “pressurized” the attic. As a result, the intake vents on the leeward side of the house will work “with” the exhaust vents to release air. However, if the attic has more exhaust than intake it potentially can cause the extra exhaust to pull its missing intake from itself (if it’s a ridge vent) or from a nearby exhaust vent (if it’s a wind turbine or roof louver) which means possible weather ingestion.

## Sizing Power Fans

Power fans are specified in CFM (cubic feet of air moved per minute) instead of Net Free Area (NFA). To determine the proper size power fan for a particular attic use the following formula based on the Home Ventilating Institute’s recommendation of 10-12 air exchanges per hour.

**Attic sq. ft. x 0.7 = CFM needed**

For example:

- 2,000 sq. ft. attic x 0.7 = 1400 CFM power fan is needed.

To calculate proper intake ventilation for the power vent, divide the CFM capacity of the power fan by a factor of 300 and then convert to square inches.

For example:

- 1400 CFM power fan ÷ 300 = 4.6 sq. ft. of intake NFA needed.

Now convert to square inches by multiplying by 144 (the number of sq. in. per square ft.).

For example:

- 4.6 sq. ft. of intake x 144 = 663 sq. in. of intake NFA needed.

## Here's a Handy Shortcut

While it's good to know where the attic ventilation calculations come from – especially if your customer asks for an explanation – you may be pressed for time in some instances and cannot afford to go through the 5-step calculations just reviewed. Good news. Here's a handy shortcut to the math.

$$\text{Attic sq. ft.} \div 2 = \text{sq. in. of intake NFA and exhaust NFA needed @ 1/150 ratio.}^2$$

Go back to Step 1. We used a 2,000 sq. ft. attic as our example. Now apply the shortcut.

• 2,000 sq. ft.  $\div$  2 = 1,000 sq. in. of intake NFA and 1,000 sq. in. of exhaust NFA. You'll notice that in Step 3 we calculated 950 sq. in. of NFA intake and 950 sq. in. of exhaust NFA was needed. The shortcut overestimates a little but that's OK.

Hopefully you now have a better understanding of how to apply code requirements to actual projects. And if you're in hurry just remember the "divide by 2" shortcut. RAVC member companies have resources on their respective websites to further assist you with calculating balanced attic ventilation. ■

By Paul Scelsi, Air Vent, Inc. Scelsi is Chairman of the Roof Assembly Ventilation Coalition, whose mission is to be the leading authority and technical resource on ventilated roof assembly design and performance.

<sup>1</sup> In part, the IRC states: Enclosed attics and enclosed rafter spaces formed where ceilings are applied to the underside of the roof rafters shall have cross ventilation for each separate space. ...The minimum net free ventilation area shall be 1/150 of the area of the vented space. ...Exception: The minimum net free area shall be 1/300 of the vented space provided one or more of the following conditions are met: 1) In Climate Zones 6, 7 and 8, a Class I or Class II vapor retarder is installed on the warm-in winter side of the ceiling. 2) At least 40% and not more than 50 % of the required ventilating area is provided by ventilators located in the upper portion of the attic rafter space...with the balance of the required ventilation provided by eave or cornice vents. Check local codes for any differences between the IRC and local municipalities.

<sup>2</sup> For the 1/300 ratio divide attic sq. ft. by 4.

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