

**Attic Ventilation:
Understanding the Why**

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Description

Vented attics have long been a critical part of residential structures. With the complexity of roof designs and increased energy code requirements, attic ventilation design is worth revisiting. This webinar will examine baseline attic ventilation code requirements, highlight common trouble spots in new construction, and provide best practice recommendations for new homes.

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Learning Objectives

1. Examine baseline code requirements for attic ventilation in the 2018 International Residential Code.
2. Discuss the key functions of attic ventilation including ice dam prevention, moisture relief, and others to maximize the durability of the roof assembly and reduce the risk of mold growth.
3. Review common pitfalls when applying attic ventilation principles to common roof designs in new homes, including the challenges associated with complex roof designs.
4. Understand best practices for providing a robust and durable roof assembly using modern construction materials and assemblies.


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What is the Building Enclosure?

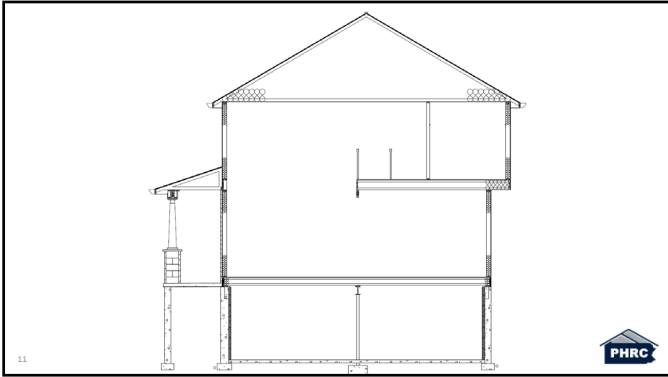
- “That part of any building that **physically separates the exterior environment from the interior environment(s)** is called the building enclosure or building envelope.”

- Dr. John Straube, BSD-018: The Building Enclosure

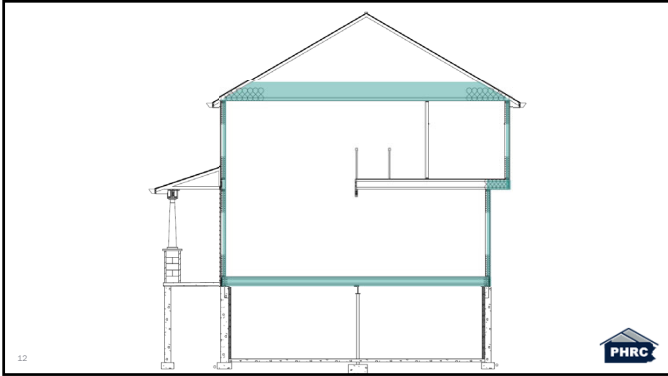


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Building Enclosure Functions

- Support (structural)
- Control (heat, air, moisture, smoke, odor, sound, fire, insects, etc.)
- Aesthetics (exterior and interior finishes)
- Distribution of Services (MEP)




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2018 IRC Table N1102.1.2

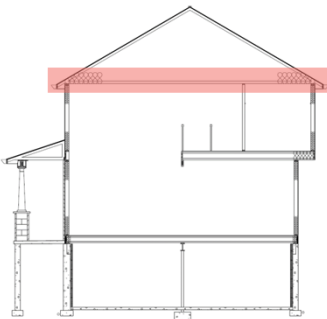

Table N1102.1.2 (R402.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT *

Climate Zone	Fenestration U-FACTOR	SKYLIGHT† U-FACTOR	GLAZED FENESTRATION SHGC‡	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE	FLOOR R-VALUE	BASEMENT† WALL R-VALUE	SLAB† R-VALUE & DEPTH	CRAWL SPACE† WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13 + 5"	8/13	15	5/13"	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13 + 5"	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13 + 5"	13/17	30*	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20 + 5" or 13 + 10"	15/20	30*	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20 + 5" or 13 + 10"	19/21	38*	15/19	10, 4 ft	15/19

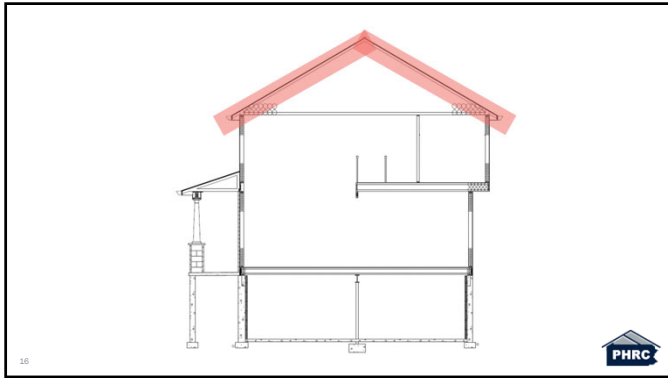
Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club Hill, IL



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Vented vs. Unvented

- “If they are carefully detailed, either vented or unvented roofs perform well—but whether vented or unvented, poorly detailed roofs can fail quickly, especially in a cold climate.”
 - Martin Holladay
 - <https://www.greenbuildingadvisor.com/article/all-about-roof-venting>

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Design for the Assembly

- Cathedral ceilings vs. roofs with attics
- Four types of roof assemblies:
 - Vented attics
 - Vented cathedral ceilings
 - *Unvented attics*
 - *Unvented cathedral ceilings*

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So, Why Do We Vent Roofs?

- It is required
- Ventilation can help remove moisture*
- Ventilation can help prevent ice dams*


- NOTE: In new homes, the details of the roof ventilation design are much less critical if the ceiling is airtight.



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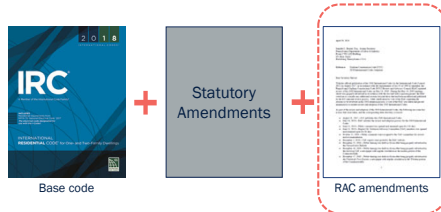
What is Required?

PA Uniform Construction Code amendments must be considered.




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Reminder: PA Uniform Construction Code



Base code + Statutory Amendments + RAC amendments




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2015 IRC Section R806.2
Minimum Vent Area

- The minimum net free ventilating area shall be **1/150** of the area of the vented space.

22 Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club Hill, IL




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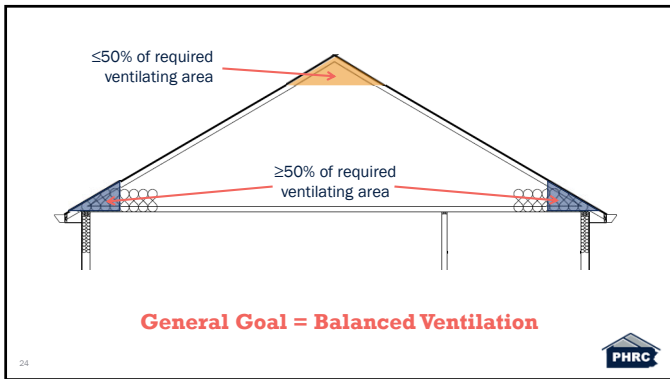
2015 IRC Section R806.2
Minimum Vent Area

- Exception: The minimum net free ventilating area shall be **1/300** of the vented space provided one or more of the following conditions are met:
 - In Climate Zones 6, 7, and 8, a Class I or II vapor retarder is installed on the warm-in-winter side of the ceiling.
 - Not less than 40 percent and not more than 50 percent of the required ventilating area is provided by ventilators located in the upper portion of the attic or rafter space. Upper ventilators shall be located not more than 3 feet (914 mm) below the ridge or highest point of the space, measured vertically, with the balance of the required ventilation provided by eave or cornice vents. Where the location of wall or roof framing members conflicts with the installation of upper ventilators, installation more than 3 feet below the ridge or highest point of the space shall be permitted.

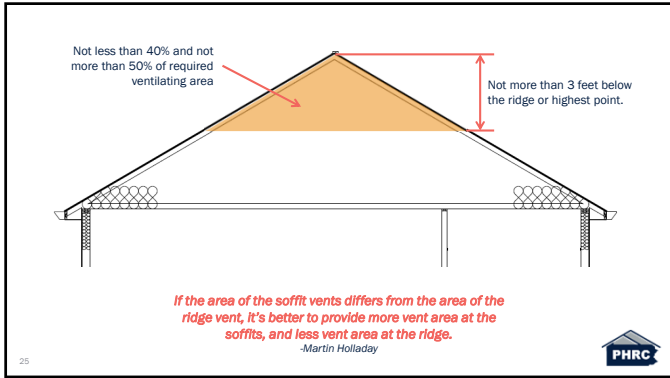
23 Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club Hill, IL



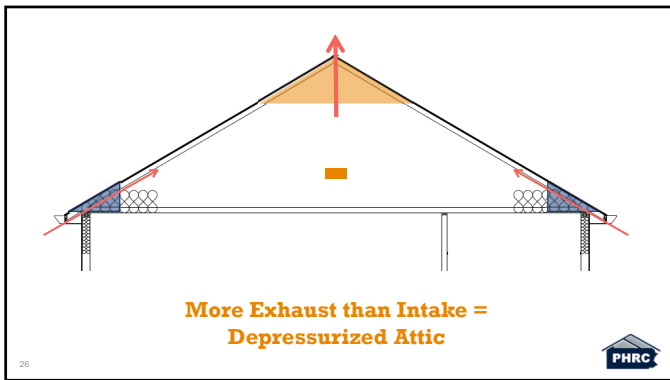
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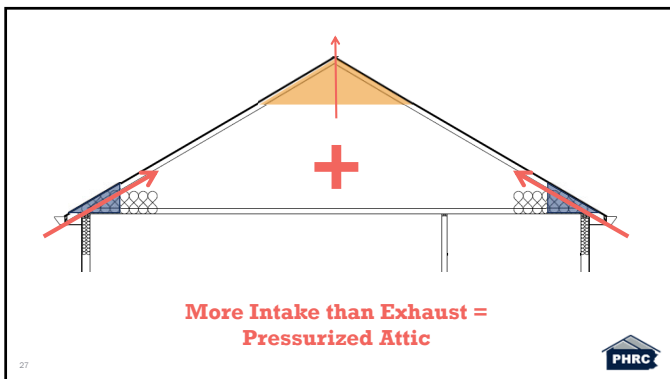
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Product Examples

NOTE: Product ratings require proper installation.
Improperly installed ventilation products may result in varying levels of exhaust or intake, depending on the situation.



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Product Examples: Ridge

- Benjamin Obdyke Roll Vent Ridge Vent
- NFA = 18 in² / LF




Source: <https://benjaminobdyke.com/product/roll-vent/>




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Roll Vent Ridge Vent Instructions

- **“Step 1: Snap chalk line and cut a slot 3 1/2 inches wide (1 3/4 inch on each side of ridge beam). Allow for a closed area of sheathing 18 inches at both ends of ridge.”**



Source: https://benjaminobdyke.com/wp-content/uploads/2020/11/roll-vent-installation-instructions_092817_web.pdf




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Varying Installation Instructions

- “Vent will look better if it extends the entire length of the roof and therefore blends in with the roof line.”


- Is this appropriate?



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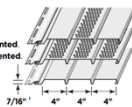
Product Examples: Soffit

- Certainteed Universal Soffit – Triple 4” Fully Vented




Universal Triple 4”

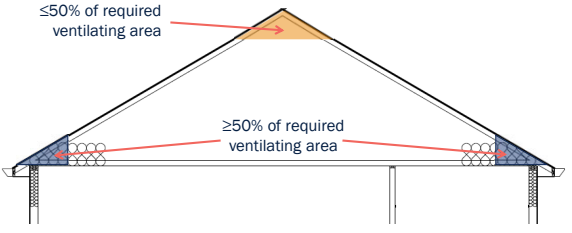
- ◆ 29 low-gloss colors.
- ◆ .040” thickness.
- ◆ 5.9” of net-free air per sq. ft. – fully vented
- ◆ 2” of net-free air per sq. ft. – center vented
- ◆ Solid, fully vented and center vented styles.[†]
- ◆ Matte finish.
- ◆ Designed for vertical siding, porch ceiling and soffit applications.
- ◆ Post-formed lock design helps provide secure installation.




Source: <https://www.certainteed.com/resources/html/documents/soffit/2201cna-1.pdf>



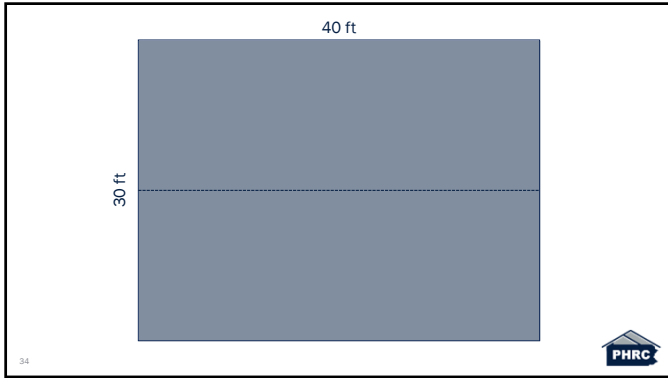
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General Goal = Balanced Ventilation



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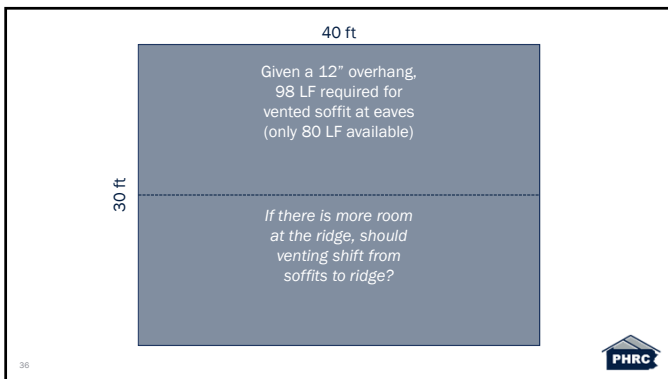
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Example Calculation: 1/150

- **Roof area in plan view = 30'x40' or 1,200 SF**
 - Required vent area = 1,200 SF/150 = 8 SF or 1,152 in²
- **Vent area at ridge = 1,152 in² / 2 = 576 in²**
 - Using Benjamin Obdyke Roll Vent (18 in²/LF), total ridge vent required = 576 in²/18 = **32 LF**
- **Vent area at soffit = 1,152 in² / 2 = 576 in²**
 - Using Certainteed Universal Soffit Triple 4" Fully Vented (5.9 in² / SF), total vented soffit = 576 in² / 5.9 = **98 SF**

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Example Calculation: 1/300

- **Roof area in plan view = 30'x40' or 1,200 SF**
 - Required vent area = 1,200 SF/300 = 4 SF or 576 in²
- **Vent area at ridge = 576 in² / 2 = 288 in²**
 - Using Benjamin Obdyke Roll Vent (18 in²/LF), total ridge vent required = 288 in² / 18 = **16 LF**
- **Vent area at soffit = 576 in² / 2 = 288 in²**
 - Using Certainteed Universal Soffit Triple 4" Fully Vented (5.9 in² / SF), total vented soffit = 288 in² / 5.9 = **49 SF**


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40 ft

30 ft

What if the ridge is too small to satisfy all the upper venting?

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Alternative Venting Products

- Static roof vents
- Power roof vents

Specialty Item: 750 is also available in Copper.

Model	Overall Size (in.)	Opening Size (in.)	NRG (in. ²)
750	16 x 20 1/4 x 5	8	50
750-G Galvalume Steel	16 x 20 1/4 x 5	8	50
750-E	23 x 27 1/4 x 5	8	50
750-S	16 x 20 1/4 x 5	8	50
750-GS Galvalume Steel	16 x 20 1/4 x 5	8	50
750-ES	23 x 27 1/4 x 5	8	50

Available Colors: 


 402-9950 

39 Source: https://www.lomancovents.com/nt_access/tables/Static%20Roof%20Vent.pdf

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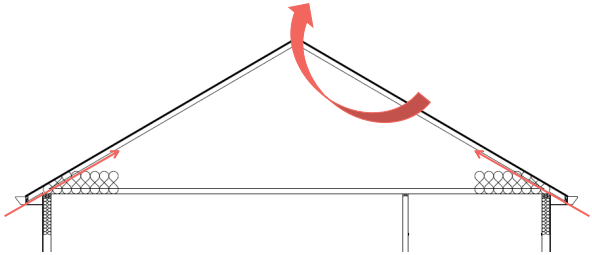
Can You Mix Ventilation Products?

- If an intermediate ventilation opening is provided between the lower intake and the upper exhaust, you may be introducing a bypass.




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Introducing vent product (mushroom, etc.) to supplement the ridge may in fact be introducing new intake location




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Overall Product Recommendations

- Size your ventilation based on the specific products you intend to install
- Install products based on specific manufacturer instructions
 - Instruction may depend on roof structure (truss vs. rafter)
- Reflect ventilation design as needed on construction drawings (e.g. length of ridge vent)




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**2018 IRC Section R806.3
Vent and Insulation Clearance (Amended)**

- Where eave or cornice vents are installed, nothing shall block the free flow of air. Not less than a **1-inch space** shall be provided between the insulation and the roof sheathing and at the location of the vent.

43 Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club Hill, IL




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Common Challenges

- Many existing roof assemblies suffer from one or more of the following issues:
 - Ice dams
 - Condensation and mold growth

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The Reality

- Providing appropriate attic ventilation is infrequently the **primary** solution to these challenges.
- Many common roof & attic moisture issues are due to air leakage and inadequate air sealing at the ceiling below.

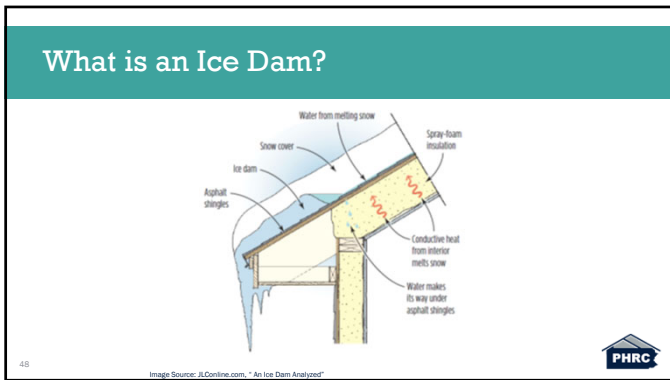
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What Causes Ice Dams?

- **Necessary Conditions:**
 - Snow on the roof
 - Higher portions of the roof above 32°F and lower portion (typically the overhang, if present) below 32°F
 - Average outside temperature is below 32°F
- **How does it happen?**
 - Heat from conditioned space below warms the roof sheathing and melts the bottom portion of the snow
 - Water runs down to toward the eaves and freezes at colder surfaces
 - Ice dam builds and can lead to moisture intrusion

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Ice Dams & the Building Enclosure?

The diagram illustrates the process of an ice dam forming on a roof. It shows a cross-section of a roof with insulation, a ceiling, and a floor. Heat loss is shown as red arrows pointing from the interior space through the ceiling and roof into the attic. Air leakage is shown as red arrows pointing from the interior space through the ceiling and roof into the attic. The diagram also shows icicles hanging from the roof edge, which are labeled 'ICICLES'. Other labels include 'HEAT LOSS BY CONDUCTION', 'AIR LEAKAGE CONVECTION', 'STAINED CEILING (Galls for growth of mildew)', 'ICE DAMS', 'DETERIORATION OF DECKING', and 'PHRC' logo.

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Ice Dams & the Building Enclosure?

• Causes:

- Insufficient insulation
 - Lower levels of insulation will increase the amount of heat flowing from conditioned space into the attic
- Air leakage at the ceiling plane
 - Penetrations
 - Interior partitions with utility runs
- Lack of adequate roof ventilation?

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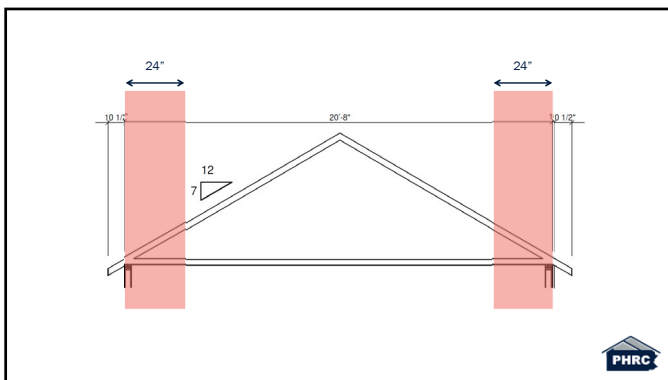
How to Prevent Ice Dams

- *Air seal the lid*
- Seal the hatch
- Avoid recessed lighting
- Design and install appropriate ventilation

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Challenging but Common Assemblies


- Shed roofs that meet a wall at the ridge
- Cape cods
- Complex roof layouts

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Decisions to Make

- There may be assemblies, layouts, & configurations that are simply too difficult to vent properly.
- In these instances, unvented assemblies or alternative strategies, such as ventilation on top of the primary roof sheathing, are worth considering.




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General Recommendations

- Know the code
- Calculate and design roof ventilation
- Understand the products being used
- Air sealing matters!



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Questions?

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Resources

- <https://www.greenbuildingadvisor.com/article/all-about-roof-venting>
- <https://www.greenbuildingadvisor.com/article/all-about-attic-venting>
- **BS & Beer:**
 - <https://youtu.be/TXaFg-aBDIE>



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