

To vent or not to vent, that is the question:

Question 1: I've been looking into insulating my attic with spray foam insulation. When I asked a sales rep about ventilation, he told me that it is not needed in attics where the underside of the roof is insulated -- in fact, he says it is counterproductive.

While this makes a certain amount of sense to me, I can't help but think of all the warnings I've heard about making sure an attic is well-ventilated. Can you help reconcile these competing recommendations?

Answer:

The purpose of roof ventilation is to allow any moisture that collects on the underside of the roof to dissipate to the atmosphere.

Warm air can hold more water than cold air. If you take a sample of air at 70 °F and 50% Relative Humidity (RH) and cool it to 40 °F without adding or subtracting any air molecules or water molecules there will be condensation happening because at 40 °F the relative humidity (RH) of that sample has risen to 100%. That means for a sample of air at 50%RH and 70 °F, the dew point temperature is 40 °F. This can be shown with a psychometric chart.

In a house, if air can leak from the house into the attic, it will bring water vapor with it. If the roof deck is cool enough to be at or below dew point, then condensation will form on the underside of the roof. If there is air movement from outside through the attic, there is a chance the moisture will evaporate or be diverted outside the attic before it condenses. That requires a carefully balanced ventilation system that allows air to enter the attic from the roof edge and escape through the ridge. With a simple ranch style house roof, this is reasonably easy to do, but with the complicated roofs we find on newer houses today, there is frequently too little vent space either in the ridge line or along the roof edge. Cathedral ceilings and cape cod structures further complicate the ventilation schemes, and typically do not work. People try to adapt the insulation system to allow ventilation, and it doesn't work. That is why it is frequently too hot in summer and too cold in winter in these structures in the upper level.

If a ventilation system allows too much exhaust (high vents) and not enough intake (low vents), then that attic will continuously suck on the house, which can pull excessive amounts of heated, wet air into the attic and leave owners with a wet roof that eventually rots.

To complicate this further, a majority of roofing manufacturers are requiring roof ventilation. If there is no roof ventilation, then they will not honor their warrantee. There are product lines from CertainTeed and Elk that allow non vented applications.

The real solution to this is to make the ceiling airtight, or make the roof insulated so it cannot get cool enough to cause condensation to happen. In a typical attic, it is better to use the belt and suspenders approach, and make the house ceiling (attic floor) airtight and insulated, but still install roof vents anyway so the roofing manufacturer's warrantee is not in question. In cathedral ceilings, cape cods, and complicated cathedrals with several valleys and hips, installing appropriate ventilation is not practical. In those applications, it is better to use closed cell foam as the insulation product and delete the roof vents.

Closed cell foam insulation is a vapor barrier in this type of application. It is spray applied, so interior moisture cannot get through it and start creating condensation. The ICC codes were amended recently to say that if the insulation product has a perm rating below 1, it is not necessary to install roof ventilation where that insulation is applied. (ICC R806.4) The foam does not allow interior moisture to get to the roof and begin to condense, so it negates the need for roof ventilation.

This does not allow us to amend the roofing manufacturers requirements, but scientifically it is reasonable to assume it actually will make the shingles last longer they will not be exposed to interior moisture, that means the rood deck will be more stable.

People think roof ventilation will keep a roof cooler. They actually call an unvented roof a 'hot' roof. Studies have shown that roof temperature is most affected by color, not ventilation. It is known that a roof of similar color and sun exposure that is vented compared to the same roof that is unvented will show a temperature difference of 5 to 8 °F. where as a white roof vs a black roof will show a temperature difference of 20 to 30 °F. The shingles are made the same no matter the color.

Installing roof ventilating in a foam roof can lead to limited moisture problems because there will be days in spring and fall when snow is on the roof, but it is relatively high humidity outside with outside temperatures in the high 30's to low 50's. that air gets pulled into the roof vent space and condenses because the roof vent space is much colder due to the snow cover. The water runs out roof the vents and forms icicles in the soffit and/or it runs between the exterior finish and the wall sheathing. If it is trapped in the soffit or between the sheathing and finish, it can cause rot in those areas. Since the ventilation is not necessary either by code or science, and it can cause this rot phenomenon, we recommend you do not vent a foam roof.

The Spray Polyurethane Foam Alliance web site has technical documents you can use for your reference. http://www.sprayfoam.org/index.php?page_id=242 (look for tech paper AY-141) You also could Google the work of William Rose to document the roof temperature information I have provided, and www.buildingscience.com is a web site that you can look over for more information.

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