Roof & Attic Ventilation 101

So much information has been devoted to the subject of roof ventilation that it's easy to become confused and to lose focus. Let's start by stating something that might sound or can be interpreted as controversial. A properly vented attic where insulation is placed on an air-sealed attic floor, is one of the most underappreciated building assemblies that exist in the history of building science. A fully functional vented attic works in hot climates, cold climates, and mixed climates. They work in the Arctic and Amazon climates or absolutely everywhere when functioning properly.

Unfortunately, we tend to overlook the importance of a properly ventilated roof system, and a poorly constructed attic or roof assembly can lead to excessive energy losses, ice dams, mold**,** rot, and an abundance of unnecessary stress for the homeowner.

Here, we'll explain how to construct a properly vented attic. It's very important to understand why it makes sense to move the thermal, moisture, and air-control layers to the roof plane, and how to detail vented and unvented roofs correctly.

Theory behind proper ventilation

The intent of roof venting varies depends on the climate, but it's identical if you're venting the entire attic or if you're venting only the roof deck. In cold climates, the primary purpose of ventilation is to maintain a cold roof temperature to avoid ice dams created by melting snow and to vent any moisture that travels from the conditioned living space to the attic. In hot climates, the primary purpose of ventilation is to expel solar-heated hot air from the attic or roof area to reduce the building's cooling load and to relieve pressure on air-conditioning systems. In mixed climates, ventilation serves either role, depending on the season.

Ventilating the attic

A key benefit of venting the attic is that the process utilized is the same regardless of the design complexity of your roof. Since the roof isn't associated here, the number of hips, valleys, dormers, or existing gables is irrelevant. It's also easier and often cost effective to install fiberglass or cellulose insulation between the attic floor joists to increase target R-values, than to achieve a comparable R-value in the roof plane.

The success of these proper ventilation practices, hinges within the ceiling area at the highest level of the house being absolutely airtight. It's also important to ensure that your attic is free of clutter with the exception of adequate insulation and air flow. The storage of Christmas decorations etc., is allowed, but it's highly recommended that you build an elevated platform above the insulation. The raised platform will eliminate the insulation from being compressed or moved around which can alter the R-value.

Don't think you're finished once the HVAC ductwork system is installed in your unconditioned attic. Even though the system is insulated and sealed, duct insulating and sealing is faith-based work which one can only hope the process was done correctly. Despite if you're really diligent about air

sealing, a system with 20 percent air infiltration can be reduced down to possibly 5 percent which isn't quite 100 percent efficient.

With regard to recessed lights and other ceiling penetrations, it would be great if you could rely on the builder, remodeler, and or electrician to air-seal all the penetrated areas. Unfortunately, you can't be sure they will adequately air-seal or even offer air-sealing at all. So, you must take some of the responsibility out of the builder's etc. hands and think of other options.

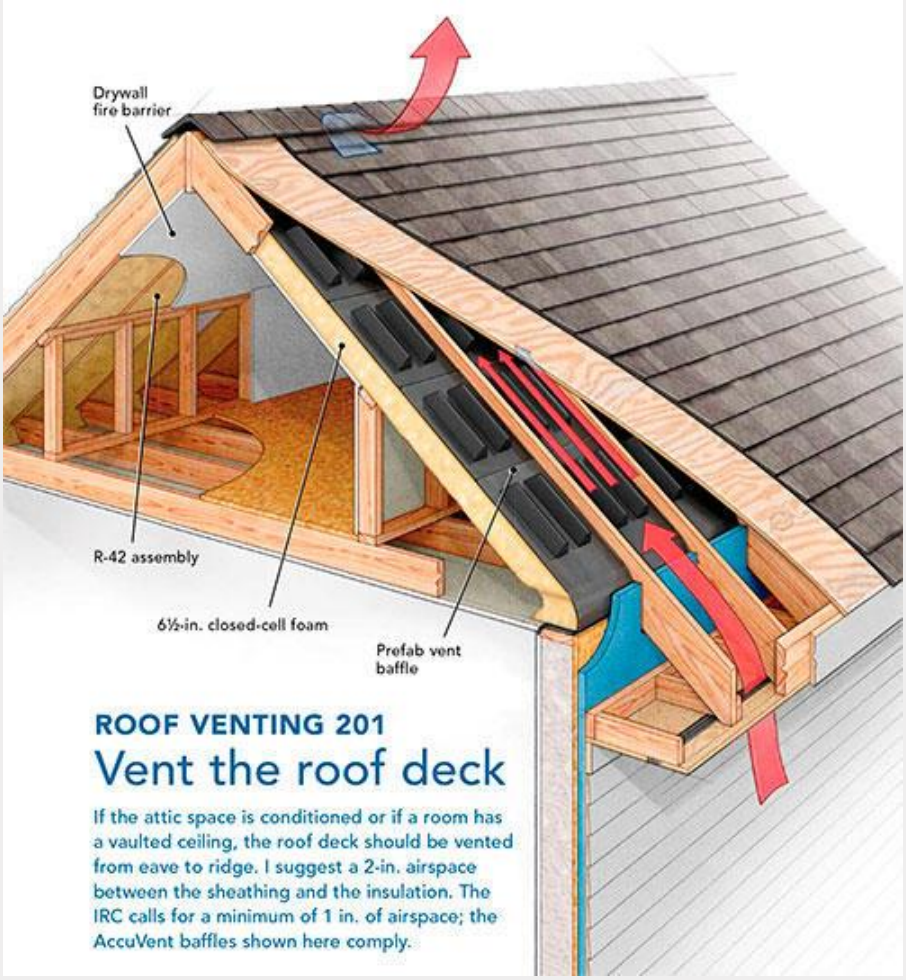
The air infiltration from these holes and systems is a major cause of ice dams in cold climates and a major cause of humidity problems in hot climates. In addition, an unbelievable amount of energy loss escapes through the various unsealed penetrations.

In situations where mechanical and or ductwork systems are installed in the attic space, typically there are numerous penetrations in the ceiling below the attic. It's highly recommended to encompass the entire attic area inside the thermal envelope. Once this is completed, it's not a serious concern if the ceiling infiltrates air or if the ductwork is uninsulated or sealed.

Ventilating the roof deck

If the attic space is going to be conditioned, either for living or mechanical purposes, or if a home design calls for a vaulted ceiling, provision R806.3 in the International Residential Code calls for the roof deck above the space to be fully vented from the eave to the ridge. The installation process is easy to conduct in simplified designed roofs, but somewhat challenging to accomplish in complex designed roofs that consist of hips, valleys, dormers, or skylights that interrupt the rafter bay channels.

If you choose to vent the roof deck, most building codes call for a minimum of 1 inch airspace between the top of the insulation and the underside of the roof sheathing. To achieve optimum performance, the airspace in the vent chute should be a minimum of 2 inches deep unless you're bulk-filling between 2x10 or 2x8 rafters with closed-cell spray foam. This method will likely require you to fur out the rafters to accommodate additional insulation to achieve certain desired R-values. That can be challenging, but you certainly encounter problems associated with having too little air circulating under the roof.



Beyond the decreased capacity for insulation when venting the roof deck, venting the roof deck or the attic has some other drawbacks worth considering. In cold climates, snow can enter the soffit and ridge vents, melt, and potentially cause deterioration issues. Similarly, in coastal environments or in regions with an abundance of rain and or wind, moisture will be forced into the vents and also the roof assembly. In hurricane-prone zones where frequent high-wind events occur, vented-soffit collapse can pressurize a building, which can cause windows to blow out and the roof to be blown off.