

IAQ IQ Winter 2014-2015
Worries at the Top: The Attic
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As far as homeowners go, the attic is a forgotten place. For most home inspectors, however, it is an essential part of an inspection, because it is precisely in such forlorn spaces that evidence of problems can be found.

Pests: Many of you have seen evidence of squirrel infestations, bees, and even raccoons in attics. I heard of one property that had been abandoned for some time, and then extensively renovated without the attic being addressed. Grey squirrels are quite fastidious and typically defecate outdoors. Raccoons, on the other hand, are more private. In this property, there was so much raccoon waste in the attic that soon after occupancy, the bedroom ceiling collapsed under its weight.

I was a home inspector before I focused on indoor air quality. In one older property that I inspected and which had been unoccupied for a few years, an attic window had been left open. My Spanish speaking client followed me into the attic eaves. As we crouched along on the floor joists, I looked down at what I thought was rather crunchy insulation. I suddenly realized that the substance consisted of feathers and pigeon droppings. The buyer screamed “Caca de pajaró,” turned around, stumbled out of the eaves, and ran away from the deal.

Make sure that all the gable-end vents are screened. Check to be certain that there are no openings in the screens, as gable-end vents are often pest-entry points. Hardware cloth over screening is preferable to screening alone.

The possible presence of mice is another reason to wear a NIOSH N95, two-strap mask in an attic. My in-laws’ 1780 home in Vermont always had an “old house” odor at the second floor. And periodically, there were bursts of dozens of house flies in the middle of the winter. The flies used to cluster and buzz at the windows. This was before my home inspection career began, so I never made the connection between the flies and the odor. It turned out that the house had many more mouse inhabitants than human inhabitants. Over the years, carcasses accumulated in the insulation in the attic.

A female fly would find a carcass and lay her eggs. Larvae (maggots) would hatch from the eggs, and feed on the carcasses. Then the maggots would transform into pupae, from which adult flies would emerge. When all the insulation was HEPA vacuumed away, the entire house smelled fresher.

If you are in an older home, and you see a lot of mouse droppings and burrows in the attic insulation, it might be worth mentioning that replacement of the insulation makes sense. For families with allergies, after remediation I always recommend that the exposed floor framing and back of the ceiling be lightly spray-painted to seal in residual allergens.



Mouse burrow and droppings in attic insulation

Not great subjects for the holiday season! Let’s move on to less messy attic issues, like mold!

Mold: Mold in attics concerns prospective buyers. Typically, buyers are told that inadequate ventilation results in mold growth. I’m going to go against the tide here by stating that this is rarely the case. Excessive moisture leads to mold growth in attics; even the best ventilation may not solve this problem.

The conventional theory about the operation of ridge and soffit vents suggests that warm attic air rises out of the ridge vent, and is replaced by cooler air entering through the soffit vents.

Temperature differences and density differences drive air convective flows. Warmer air is less dense than cooler air, and thus the warmer air rises. I prefer gable-end vents to soffit and ridge vents, but ventilation companies often suggest that gable-end vents be closed when ridge and soffit vents are installed. Regardless of the type of vents present, they work to cool down the attic in summer, because the roof is warmed by the sun (the darker the roof shingles, the greater the absorption of heat). The attic air close to the sheathing is heated and rises out of the ridge vent (if the roofer happened to remember to cut the slot for the ridge vent!). Warmer attic air also flows to the exterior and cooler exterior air enters into the attic through gable-end vents.

This air movement does not occur in the winter. I have tested ridge vents and soffit vents in the winter, and on windless days, there is barely any airflow into or out of the vents; there is not enough of a temperature

difference between the exterior air and attic air to drive convection. Rather than convection, the only thing that drives airflow in such conditions is air pressure differentials generated by wind flows. Sometimes the air flows in at the vents, and sometimes out, depending on wind direction.

In the summertime, the sheathing temperature can be as high as 140°F in the sun, and there can be no condensation under any circumstances. In the winter, however, the sheathing temperature can be close to the temperature of the exterior air: in other words, cold. If house air containing moisture rises up into the attic, the moisture will condense on the cold sheathing. It's too cold under those conditions for much mold to grow, but in the spring and fall, the nights are still cool enough for condensation to occur on the sheathing, and then mold can grow – usually heaviest on the north- or east-facing side, where there is the least sun.

Black stains around roofing nails that penetrate the sheathing is a sure sign of condensation, but the dark color is not due to microbial growth; rather, the color is due to a chemical reaction of iron from the nails with the tannins (a chemical in wood).



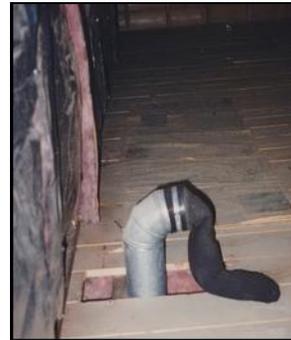
Black stains at nails from condensation are not mold

The sheathing in the summer is so hot that it kills most mold growth, but enough survives to fuel more growth in the fall. In any case, mold may remain potentially allergenic when dead.



Truss mold inhibited by zinc run-off from nails

The biggest indoor sources of attic moisture are bathrooms vented into the attic or soffit, dryers vented into the house, furnaces with humidifiers, or excessive use of portable humidifiers in the winter. Pathways for airflow must be present and include leaky pull-down stairs (often located in hallway ceilings outside bathrooms), ill-fitting hatch covers, old leaky recessed lights, and leaky attic ductwork or an open filter slot in an attic air handler (when the air handler isn't operating, air flows passively out of the slot).



Great idea to keep the attic lint free

Mechanical equipment: One of my big pet peeves is inaccessible mechanical equipment in the attic. I recommend that you always note when such equipment can't be accessed safely for inspection and maintenance, either because the equipment is placed in a tight spot, or because there is not adequate attic flooring.

Lastly, when a house has baseboard or radiator heat and a separate (attic) air conditioning system, I always recommend that the ceiling returns and supplies be sealed in the winter to prevent the passive flow of moist house air into the ducts and condensation within the system. This, too, can lead to mold within the duct system.



Rust stains on attic AHU from nail drips

A Happy New Year to All