

Rising Damp Dilemmas

by Michael Lennon



There are few building theories I can accept as absolute gospel. While I understand most of them, I often find the theories cannot fully explain the range of problems I see in the field.

Some theories are expressed in black and white, while real situations are often a matter of degree. Theories, by necessity, are simplified, while reality is complex: Often a variety of forces are at play and interact in ways the theories don't predict. For example, theories of convection, vapor diffusion, and condensation are undoubtedly useful in explaining observations made in houses and attics, but some of the symptoms I've observed still leave me perplexed.

A variety of observations I've made have led me to supplement the more academic theories with a few rules of thumb of my own?

- First is the observation that moisture in the air is pretty lazy and won't diffuse around very much unless there are air currents at work.
- Second, I have found that moisture will frequently rise almost directly upward and affect only those areas directly above the moisture source.
- Third, very similar houses with similar conditions will often display very dissimilar moisture/condensation characteristics.
- Fourth, condensation problems or occurrences may vary enormously with only a few degrees of temperature difference, or a dew point difference of a degree or two.
- Fifth, a surprising amount of moisture may condense out of the air in spite of there being no readily apparent moisture source.

Many of you may have already made similar observations, but you may find reflecting on these bits of information useful while attempting to diagnose some future moisture problem. The following cases from Virginia and Maryland illustrate the elusive nature of moisture in buildings.

Case One: Ghost Lines

Asked to assess the damage in a ten-year-old two-story frame house that had experienced burst pipes on the second floor, I marveled at what I observed in the attic. The house had second-story baths backed up to each other and the chase wall between the two had never been sealed at the top. Cold attic air poured down into the chase and froze and burst the water-supply pipes. The owners had lowered the thermostat to 50°F and departed for a winter vacation. I arrived after the leaking water had been turned off and the spillage had been mopped up. The floors and ceilings were dry to the touch. It was still cold out but the thermostat was now set at 65°.

Everything appeared ordinary until I entered the attic. The attic floor was evenly covered with gray cellulose insulation to a depth of 6 to 8 inches. The gray blanket was neatly crossed by 31/2-inch-wide darkened areas, which exactly mirrored the partitions below. There were breaks in the darkened strips exactly positioned

over every door opening below. The bottom plates of those partitions must have gotten quite wet, and now moisture was transpiring up through the partitions, into the insulation, and off into the attic air. The baseboard trim was not wet to the touch. I would have expected the transpiring moisture to spread out a bit during its travel through the cellulose insulation, but it did not.

Case Two: Frosty Sheathing

A recent inspection client called to complain about a missed roof leak near his plumbing back-vent. The original home inspector was sent out to check and reported a very interesting sighting. White frost was on much of the roof sheathing adjoining the masonry party walls of the three-story frame townhouse. The frost covered most of the sheathing between the two truss chords nearest the masonry party wall. The frost extended up the front slope of the gable roof and down the back. The inspector reported this to the owner, theorizing that melting frost trickled down the back-vent pipe and into his bathroom. This did not satisfy the owner who felt his roofer's suggestions of a \$300 repair was more in order, and that our home inspection company should pay the \$300.

Failing to satisfy the former client with a verbal explanation, the inspector and I returned with a long ladder and some "dew tabs" the next day. Dew tabs are an English product (available from PRG Industries, 5619 Southampton Dr., Springfield, VA 22151; 703/323-1407) that can be readily adhered to a surface and will display the word "dew" if condensation occurs on them. The telltale frost was not there the second day. Finding nothing wrong on the roof itself, we entered the attic and stuck several dew tabs to the now dry roof sheathing. We made some quick observations within the living space, noting the heat-shrink plastic the owner had applied across the drafty windows and how the drywall was attached to the masonry party walls on furring strips. We informed the owner we would return after more cold weather or if any additional leakage occurred.

Sure enough, upon returning, the little dew tabs displayed the word "dew" for the world to see. Apparently the household moisture was entering the cavity between the finished wall material and the masonry party wall and was leaking straight up into the attic. It didn't distribute itself around the attic much at all, and more condensation occurred than I ever would have expected.

Case Three: Crawl Space Surprises

The owner of a custom-built one-year-old home was upset about the moisture found on his water lines in his crawl space. The crawl space was purposely built unvented, he stated, because it was open to the utility area and he did not want the cold air



Condensed moisture rotted the floor sheathing in the band joist area of this Virginia crawl space. The rest of the floor sheathing, as well as the band joists, was unaffected.



Basement moisture rose to the attic and condensed on the underside of the roof sheathing, causing black mold. The scuttle-type roof vent succeeded in protecting an area about one foot in diameter.

getting there. There was no vapor barrier over the dirt in the crawl space of the masonry house.

My glasses fogged when I entered the crawl space and water pipes were dripping wet. But worse, about 4 inches of floor sheathing between the first inboard joist and the outside wall was blackened and wet. This was difficult to see unless you looked straight up from against the foundation wall. Much more moisture was moving up out of the soil than one would have guessed from its appearance. The need for ventilation and a ground cover was confirmed. The moisture had wetted the floor sheathing only in the cavity formed by the last joist. Although the soil moisture had diffused throughout the crawl-space air, only the cold portions of the perimeter condensed it out. I was shocked at the advanced state of wood rot in such a short period of time.

My glasses fogged when I entered the crawl space and the water pipes were dripping wet.

Case Four: Puddles and Rot

A 23-year-old split-level house in otherwise pristine condition had water standing on the concrete slab of the crawl space. At some point in the past, an interior perimeter drain and sump pump had been installed, apparently to accommodate previous seepage. Downspouts emptying near the foundation were the apparent source of the water on the floor. The owner had insulated the floor but had blocked up the crawl-space vents. In one wet corner, the band joist and sill plate immediately above the seepage

were blackened with rot and fungus was growing on those joists. Another area displaying a very shallow puddle about 4 feet in diameter was showing fungal growth immediately above the puddle but not nearby. The fungus growth was in a mirror pattern about 4 feet in diameter. A double-glazed window in the kitchen immediately above a shallow puddle was displaying considerable condensation on the inner surface. In this case, most of the damage was localized to areas directly above wet spots.

Case Five: Icy Gables

From the eave section of the attic, I could see frosting on the underside of the gable roof. The frost had built up to the point where ice formed on the sheathing in a thick layer. Water leaked dramatically into the house when rain warmed the roof surface, melting the ice. The condensation and frost buildup occurred directly above a dampened section of basement wall a full story below. The dampness in the wall extended about 10 feet and the condensation on the underside of the roof sheathing extended about 10 feet directly above. Given that the attic was ventilated and the seepage through the foundation seemed minor, I was shocked at the degree of frost buildup.

While current theories offer insight into why these problems occurred, the specific nature and degree of the problems elude prediction. Ah moisture mysteries, will we ever fully understand you? ■

Michael P. Lennon owns Homepro Systems Inc., a leading inspection/survey business in the Washington, D.C. area, and has developed a widely-used "packaged" inspection system. He is also founder of the Professional Home Inspection Institute.