BY GEORGE TSONGAS

Sheathing Damage From Using Wide, Impermeable Flashing

In cold climates, interior moisture can condense and saturate the sheathing from inside. Wide, impermeable flashing inhibits the drying that usually happens in the warmer months, and the wet sheathing is prone to rot. This photo shows a clear line between the rotted sheathing that was covered with flashing, and the sound sheathing that was able to dry properly.

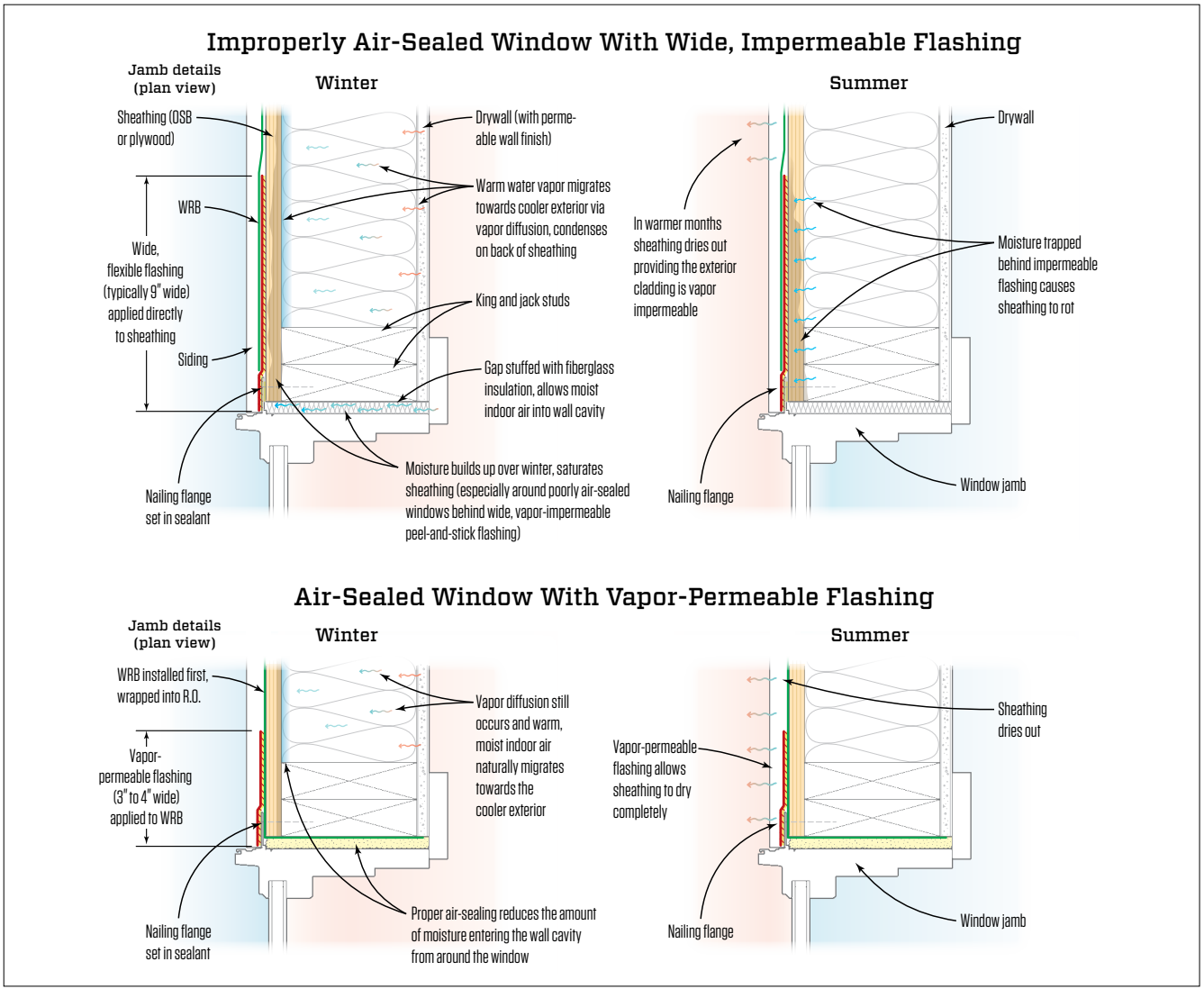
Photo by George Tsongas

Self-adhered, so-called "peel-and-stick," flexible flashing materials are now used commonly throughout the country to prevent water penetration around exterior windows and doors. These flashings cover the joint between the window or door frame and the adjacent wall sheathing or WRB. For many years, non-stick, mechanically-attached flexible flashings, such as asphalt-impregnated kraft paper, have also been used. Both the non-stick and the self-adhered flashing materials are vapor-impermeable and do not allow water vapor to pass through them.

TRAPPING MOISTURE

The problem is that using any vapor-impermeable material on the outside of a wall cavity in a cold-weather climate can trap moisture in the OSB or plywood sheathing behind it and lead to serious mold and decay damage. Here's how that can happen.

During the winter months, when the air outside the house is colder than the air inside, warm water-vapor molecules move through the walls toward the cold via diffusion. In addition, interior air leaks into the wall cavity through various openings, particularly



In the top scenario, interior moisture migrates into the wall cavity and condenses on the sheathing during the winter months, especially around poorly air-sealed windows. In the summer, sheathing covered with wide, impermable flashing cannot dry out and the sheathing rots. In the bottom scenario, proper air-sealing minimizes moisture migration in the winter, and narrow, vapor-permeable flashing allows the sheathing to dry properly in the summer.

gaps around poorly sealed windows and doors, carrying water vapor with it. The sheathing is the first cold, condensing surface that this moisture reaches, so it's where the water vapor condenses. Over the course of the winter, the moisture content of the wall sheathing slowly builds up.

Then, in the warmer months, the vapor migration stops, and the sheathing slowly dries to the outside as the sun warms the walls—if the exterior cladding is vapor-permeable. But where impermeable flashing has sealed the outside of the sheathing, it can't dry out, and the moisture content in the sheathing continues to increase as the seasons cycle.

Winter temperatures are too cold for decay to occur (decay in wood is optimized at temperatures of 75°F to 90°F and doesn't happen below 50°F), but when the weather warms the wet sheathing behind the impermeable flashing, decay fungi can grow and damage the sheathing (see photo, previous page). Such damage occurs most often on north-facing walls, which are the coldest in winter and experience the least amount of solar drying in the summer.

Illustration: Tim Healey

SOURCES OF MOISTURE

I've examined more than 1,500 wall openings from the outside looking for failures—during research projects that I've directed, as well as during inspections for court cases where I've been called in as an expert witness. These observations were done in 17 states as well as in Canada. In my experience, the type of damage I describe above can occur anywhere that the sheathing becomes cold enough for condensation to take place, causing the moisture content in the sheathing to build up.

Condensation of warm, moist interior air is the most common way for moisture to be introduced into the sheathing behind impermeable flashing. And in most cases, more water vapor moves into and through walls because of air leakage than diffusion, so poor air-sealing around windows and doors from the interior (which seems to be rampant in all parts of the country) definitely makes the situation worse. This is not the only source of moisture, however.

Another way that wall sheathing gets wet is from exposure to precipitation during construction. Applying impermeable flashing before the sheathing has dried completely can seal in that moisture and lead to sheathing damage behind the flashing. Self-adhered flashing should never be installed over wet sheathing, although it is often done in the name of maintaining building schedules.

Yet another source of sheathing moisture is water leaking through improperly detailed flashings and WRBs around window and doors. As with the other examples, this wet sheathing will not readily dry out if covered with impermeable flashing material. However, the primary purpose of the flashing is to prevent the sheathing from becoming wetted from the outside, so water leaks are not a common cause of moisture build-up in sheathing behind flashing.

It's also possible for more than one of these wetting scenarios to happen at one time, but again, in my experience, the biggest source of excess moisture in sheathing is from normal vapor diffusion and exfiltration of warm, moist indoor air. Any external wetting just makes it easier for the damage to occur.

MISLEADING INSTALLATION ADVICE

Wood decay typically takes many months, and often years, to become visible. And unlike decay caused by water intrusion from the outside—for which there's often visual evidence of damage within the walls—the damage behind impermeable flashing usually isn't seen unless the wall cavity is opened up, delaying detection even longer.

Many installers think that the ASTM recommendation also applies to self-adhered flashing, so it's not unusual to see wide, impermeable flashing materials used around windows and doors.

One problem is that the ASTM E 2112 *Standard Practice for Installation of Exterior Windows, Doors and Skylights* recommends the use of 9-inch-wide flexible flashing around openings. What's lost in the reading is that this recommendation is for older, mechanically attached flashings that are no longer widely used and that do not trap moisture as readily as self-adhered flashing. Many installers, however, think that the recommendation also applies to self-adhered flashing, so it's not unusual to see wide, impermeable flashing materials used around windows and doors. Ironically, the wider the flashing material, the greater the sheathing area that's not allowed to dry properly. When it comes to window flashing, bigger is not always better.

AVOIDING THE PROBLEM

To minimize the chances of damage occurring from trapped moisture around windows, you should always seal around windows with the narrowest possible self-adhered flashing. The American Architectural Manufacturers Association has released an updated voluntary standard, AAMA 711, that establishes minimum requirements for self-adhered flashing around windows and doors. AAMA 711 specifies a 4-inch minimum width, which puts just over 2 inches of the flashing on the actual sheathing (or WRB) after it is integrated with the window. Given the concerns expressed in this article, that 4-inch flashing width should never be *exceeded*, and the practice of covering entire walls with impermeable membrane is a surefire recipe for disaster. The 711 standard also specifies that the flashing not be applied to surfaces that are damp or wet, advice that is often not followed when construction occurs in wet weather.

Fortunately, there are numerous flashing products on the market that are 4 inches wide and a few that are only 3 inches wide. Using narrow-width flashing greatly reduces the potential for damage to the sheathing behind it. Furthermore, I think it is best to attach the flexible flashing to the WRB rather than directly to the sheathing, except at the head. That way, a thin air gap is maintained between the flashing and the WRB that allows some lateral drying of the sheathing behind them.

A better alternative is to seal around windows and doors with one of the vapor-permeable flashings on the market. Most manufacturers of these flashings recommend that their materials not be applied to wet surfaces. Yet another option that is gaining popularity is applying vapor-permeable fluid-applied flashing material, which is troweled onto the surface (see "Fluid-Applied Window Flashing," Jun/16). AAMA 714 covers such products and permits installation onto "damp" but not wet surfaces if the flashing material exhibits a permeability level of at least 10 perms at the recommended thickness.

Finally, regardless of what is used to seal the outside, contractors need to properly air-seal walls—especially window and door openings—from the inside. Doing so can minimize interior-moisture migration into the wall cavity and reduce the possibility of sheathing damage from trapped moisture.

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