AVOIDING MOISTURE PROBLEMS IN Cooling Climates

Energy detailing in Florida and the Gulf Coast breaks some of the "rules"

by Peter L. Pfeiffer, AIA

To build long-lasting, energy-efficient, healthy houses in the Florida peninsula and Gulf Coast regions of the United States, builders must take into account the unique climatic conditions of the area. Code guidelines are not always helpful, since the CABO *One & Two Family Dwelling Code* and the *Model Energy Code* are mostly written for heating climates and advocate construction practices that often are the opposite of what should be done in cooling climates.

In the summertime along the Gulf Coast and Florida, the outside air is hot and moisture-laden, so most homes are air conditioned (see Figure 1). Under these conditions, code-approved building practices such as ventilated crawlspaces or the use of vapor diffusion retarders on the interior side of exterior walls can be disastrous. In this article, I'll focus on the moisture-control techniques my company has learned during 18 years of building and designing homes in hot, humid Texas.

Concrete Slab Foundations

The soil is a constant source of moisture, so we use a sturdy vapor barrier such as 6-mil poly or visqueen beneath slabs to prevent ground-based moisture from migrating up through the concrete by capillary action or diffusion. We lap the joints liberally and use tape on any tears and around pipe penetrations. We also use a minimum 1 1/2-inch sand base under the slab to further reduce water problems (see "Sub-Slab Vapor Barriers," 5/94). In addition, the poly helps reduce mineral efflorescence on the slab surface, a common cause of discoloration on stained and patterned concrete floors.

Unvented Crawlspaces

Despite what the code books say, in our geographical area I strongly recommend against ventilating crawlspaces unless I suspect there is an underground water source

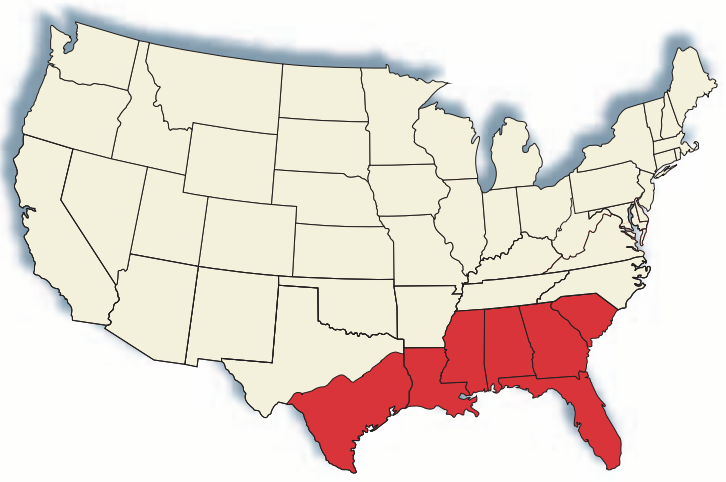

Figure 1. Moisture control practices for hot, humid climates (shaded area) are almost the exact opposite of recommended building practices for cold climates, because moisture is more likely to enter wall cavities from outside than from inside.

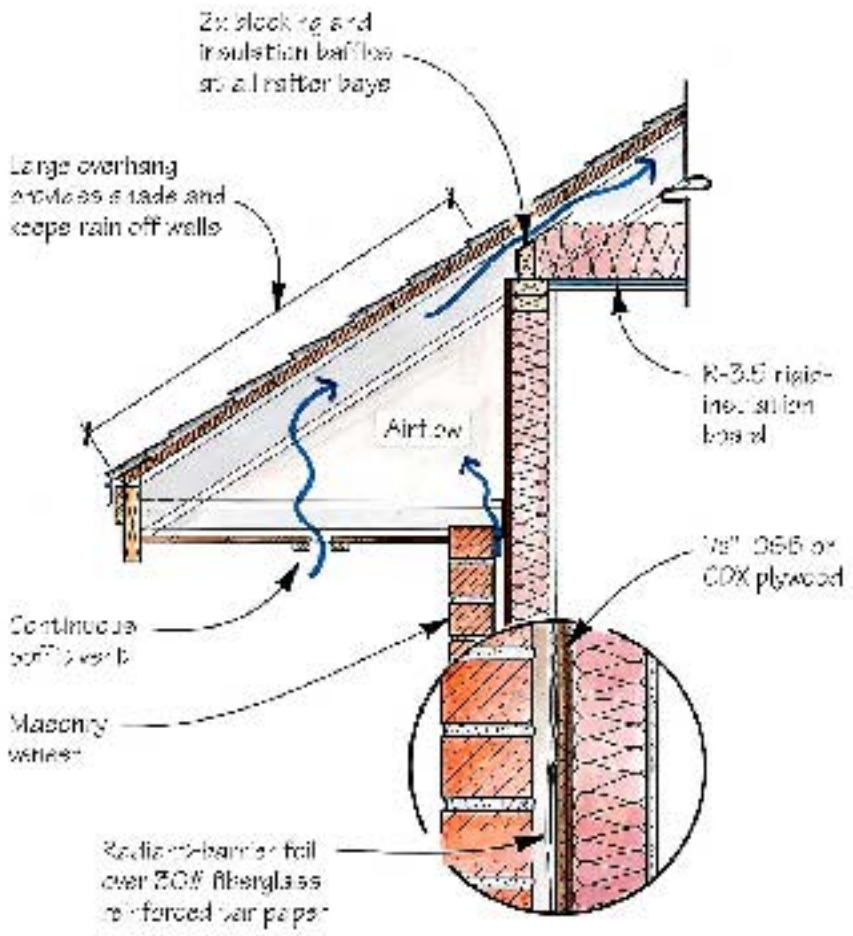

Figure 2. For exterior sheathing, the author prefers to use plywood or OSB rather than rigid foam. A carefully lapped and tightly sealed layer of 30-pound building paper over the sheathing creates a drainage plane that directs water down and away from the wall. In addition, all cracks and wall penetrations are sealed on both sides using expanding foam and caulk.

Figure 3. Foil radiant barriers can reduce unwanted heat gain by up to 40%. The foil barrier should be installed on the underside of the sheathing and should be cut at the ridge vent to allow heated air in the attic to escape.

beneath the foundation. If you think about the goal — keeping the crawlspace dry and inhospitable to mold — the last thing you want is to encourage the infiltration of warm, moist air into a cool, dark space. This would lead to condensation on all crawlspace surfaces, making them vulnerable to decay.

We do not specify vents for crawlspaces, and we make any access doors fit snugly. We also recommend carefully installing a 6-mil poly vapor diffusion retarder over the entire dirt floor. Spreading a few inches of gravel over the poly helps to keep it in place and protects it from damage. A sealed crawlspace also stays warmer on the few cold winter days we have here, minimizing the chance that warm, moist household air will create a problem when it finds a condensing surface within the crawlspace.

With a sealed crawlspace, it is imperative that standing water be kept out. This means that the finish grade must slope away from the building at a minimum of 1/4 inch per foot. Avoid sites where the seasonal water table is above the elevation of the crawlspace.

Wall and Framing System

In the hot, humid South, by contrast to other areas of the nation, we cool our houses and buildings more than we heat them. Because the warm outside air usually has more moisture in it than cool inside air, moisture most often migrates from the outside of the structure to the inside. If you have a vapor diffusion retarder on the underside of the gypboard (a common detail in cold climates), or an impermeable vinyl wall covering over the gypboard, there is a good chance that warm, moist outside air migrating through the wall system will condense once it hits the relatively cool gypboard. This trapped moisture not only reduces the thermal performance of the wall insulation; it creates potential problems in the wall cavity — from unhealthy mold and mildew to structural wood decay.

Contrary to code, do not use a vapor diffusion retarder on the interior of the wall system, because walls in the hot,

Roof Ventilations Details

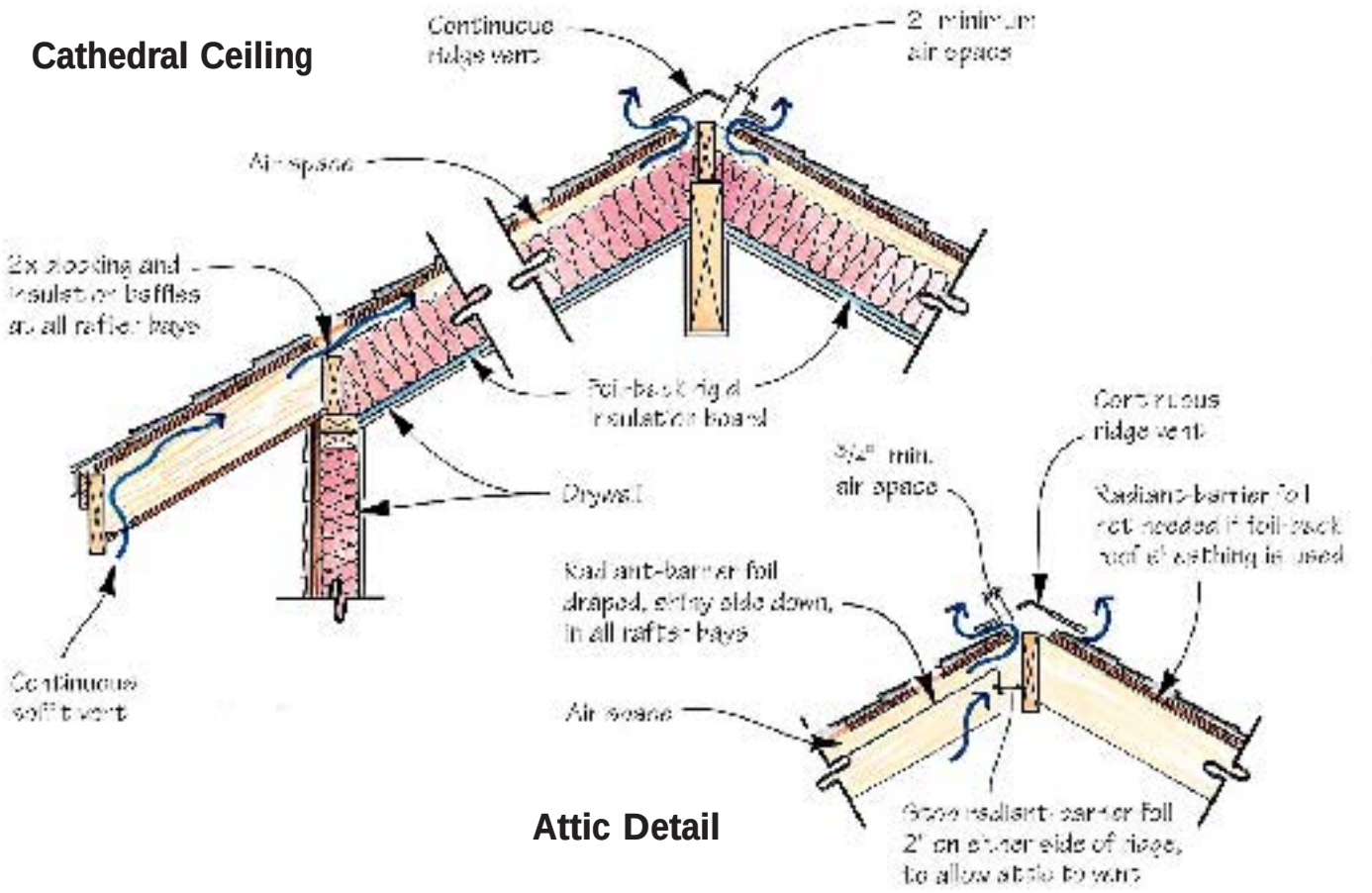

Figure 4. The author recommends doubling the net ventilation area in both attics and vaulted roofs. He prefers passive venting to power vents, which may draw conditioned air out of the living space.

humid South dry to the *inside*, not to the outside. Especially avoid placing a sheet of poly under the gypboard, or covering the gypboard with vinyl wallpaper. The only place where we use poly is on the interior side of walls around tub and shower enclosures that do not abut an outside wall. In these localized areas, we feel it's prudent to protect the partition wall cavity from the high humidity generated in the bathroom.

Exterior sealing. Houses in humid cooling climates do need to be sealed on the exterior, but careful detailing is critical. I am wary of tightly sealed exterior cladding systems, such as synthetic stucco, that are applied over impermeable rigid foam sheathings. These stucco systems are never perfect, and rain water eventually penetrates through cracks around windows and doors. Even when the foam is well taped or covered with housewrap or building paper, the surface is often accidentally punctured during installation, allowing rain water and water vapor to penetrate the foam and eventually find its way into the walls.

Whether a building is clad with stone, brick, traditional stucco, wood, or synthetic siding, we prefer to use plywood or OSB sheathing covered with 30-pound building paper and a layer of heat-reflecting foil. This provides a sturdy drainage plane behind the cladding that sheds water down and away from the wall cavity (Figure 2). Where the exterior cladding stands away from the wall, as with masonry veneers, use weep holes and flexible "moist-top" flashing at the base to direct water out of the cavity.

Use common sense when installing sidewall flashing and housewrap or building paper. Because water drains downward, always lap the uppermost layers of flashing or housewrap over lower layers (see "Making Walls Watertight," 12/95). Finally, provide ample roof overhangs: They not only shade windows and walls, but they help keep rain water off as well.

Infiltration control. To create a barrier to airflow, seal all holes, cracks, and other penetrations through walls, ceilings, and floors after framing is com-

plete, then again after the drywall work is done. Use expanding foam and a good-quality caulk to seal around window and door frames. I also insist on using foam-rubber or neoprene gaskets under all electrical switch and outlet plates mounted in exterior walls.

At the joint between wall plates and the foundation, I find that using a continuous roll of foam sill sealer does a better job of sealing than simply caulking the joint. In our experience, concrete tends to reject the caulk over time.

Roof Systems

In our area, attic spaces can heat up to 130°F or more on a hot summer day. Eventually, that heat transfers through the ceiling insulation into living spaces below, increasing the cooling load. To counter this problem, we not only suggest twice as much roof ventilation as most codes recommend, but we also use a radiant barrier, such as Insul Foil (Advanced Foil Systems, 820 S. Rockerfeller Suite A, Ontario, CA 91761; 909/390-5125) to keep the attics cool. You can also use Kool-Ply (Louisiana-Pacific, 111 S.W. Fifth Ave., Portland, OR 97204; 800/299-0028), a labor-saving roof sheathing with foil laminated directly to it. The radiant barrier blocks the transfer of heat from the hot roof to the attic. Apply the radiant barrier to the underside of the roof, not on the attic floor, and make sure to cut open the radiant barrier along the ridge and below the low-profile vents so that attic air can exhaust (Figure 3).

We use continuous ridge and soffit venting wherever possible. I double the FHA code formula for attic venting (1:144 instead of 1:300), providing one square inch of net venting area at both the ridge and the soffits for every square foot of attic or vaulted ceiling area (Figure 4). Where this can't be done with continuous ridge venting, such as on hipped roofs, I supplement the ridge venting with low-profile vents on the roof itself. These should be located on the side of the roof opposite the direction of prevailing summer breezes. Don't substitute power attic vents for the passive venting techniques just described. They not only consume power, but often draw conditioned air from the living space by depressurizing the attic.

Duct Sealing

Mechanical air distribution systems, including ducts and air handlers, must be installed with minimum air leaks. Otherwise, a vacuum can occur in the living space, creating an imbalance that will draw in moist outside air. Consider this scenario:

The air handler is pulling air from the house through a short return air duct or well-sealed chase. But because not all the supply-duct joints and seams are equally well sealed, not all of that air gets delivered back into the living areas of the house. Rather, it gets lost to the attic or someplace other than the building's occupied zone, creating a negative air pressure, or vacuum, in the conditioned zone. As a result, moisture-laden outside air from the attic — or worse yet, moist and chemically laden air (from insecticides and rat poisons) from the crawlspace — is drawn into the house through cracks and poorly sealed pipe penetrations.

To eliminate the imbalance that creates this negative air pressure, we seal all duct joints and transitions with fibrous mastic rather than duct tape (Figure 5). We use Versa Grip (Hardcast, P.O. Box 1239, Wylie, TX 75098; 800/527-7092) or RCD #7 Mastic (RCD Corp., P.O. Box 1020, Eustis, FL 32727; 800/854-7494). Sealing ducts this way is important both to maintain indoor air quality and to minimize moisture and mildew. I even suggest setting up the hvac system to provide slightly positive pressure in the house. This can be done in a controlled way via a small outside-air intake duct to the return-air chamber of the air handler. It will provide outside makeup air and create a positive pressure difference between the inside and outside. Positively pressurizing the interior also keeps unwanted moisture from infiltrating the living environment. In addition, this outside air is dehumidified by the air handler before it reaches the home's interior.

Figure 5. Properly sealing ductwork with mastic will prevent hvac systems from creating negative pressure in conditioned living space, which could draw unwanted moisture from the outside.

Educate the Homeowner

Using a little common sense, homeowners can keep humidity levels down inside the house, which will decrease the chance of molds and mildew growth during the summer and minimize condensation on windowsills during the winter. Builders can help by explaining why clothes dryers and kitchen exhaust fans must be vented directly to the outside, and by providing bathroom fans with timer switches so the owners won't have to remember to turn them off.

Homeowners will "buy into" these preventive techniques if you explain how they will prolong not just the hidden structural elements, but the interior paint job, windows, drywall, and other finishes as well.

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