Rain Screen Siding RETROFIT

Creating an air space behind wood siding is the best way to prevent rot, mold, cupping, and paint failure

by Henri de Marne

I have seen an increase in the number of problems related to wood siding over the course of my experience in the construction business — especially since I have become a home inspector and construction consultant. If caught in time, these problems may be confined to buckling and splitting boards; they may be far more serious, however, if regular maintenance, flashing, and other details have not been given the attention they require.

I first noticed the increase in wood siding failures in the late 1970s, just as insulating foam sheathing was gaining popularity. It's true that most rigid foam sheathing is so effective that it prevents the dissipation of moisture and heat into the underlying materials, and can cause additional stress on the siding itself. But I have noticed similar failures in many cases where there was no rigid insulation directly behind the siding.

Causes of Wood Siding Failures

The frequent wood siding problems and the resulting damage to underlying wood structural members and sheathing I have witnessed stem from several causes:

Improper caulking. Caulking is often hastily applied to the surface of joints where materials butt. Backer rod is usually omitted, and the expansion and contraction of the joint tears the caulk apart in short order.

Lack of back-priming. Back-priming, which was common practice just a few decades ago, prevents wood from absorbing water by capillary attraction. So does coating all cuts and butt ends before installation. When the back and edges of the siding are left raw, moisture works its way deep into the wood, result-

Figure 1. Years of sun and rain on the south-facing gable-end of this 17-year-old house (left) had caused delamination in the rough-textured T1-11 cladding (middle). Clapboards in the central feature strip had also cupped badly, exposing the underlying structure to moisture damage.

ing in swelling, cupping, checking, and splitting of the boards. This moisture seepage can also cause discoloration, paint failure, and rot, as the wood cycles from wet to dry to wet again.

Where rigid insulation is installed directly behind the siding, the drying cycle is lengthened. As heat from the sun drives moisture deep into the siding, the foam prevents the water from dissipating into the plywood sheathing, where it ordinarily can be temporarily stored. Instead, the siding remains saturated and rot is accelerated.

Poor flashing. This is a critical problem at doors, windows, and other wall penetrations. I have seen metal flashing installed directly over wood sheathing, with no protective layer of felt or housewrap. In cases where felt or housewrap has been used, the flashing is not tucked under the protective layer, so moisture running down the sheathing finds its way behind the flashing and into the wall. In other cases, the flashing has been omitted altogether, or it is so poorly installed that it actually leads water behind the siding and into the building. It's as if the carpenters forgot to consider the way water normally moves (see "Making Walls Watertight," 12/95).

Poor maintenance. To retain its water-repellent properties, siding needs the protection of one of the many coatings available. If coating is not applied, deterioration can eventually set in regardless of all other precautions taken.

These mistakes in siding installation can cause severe structural damage. I have inspected several projects, for example, where roof water splashing onto the ground or decks had worked its way several feet up the walls behind the siding by capillary attraction. The housewrap was soaked and had turned black with mold, and the sheathing had begun to disintegrate. Water had also run down the wall to the foundation, rotting the sill plate and the bottom 2 feet of the studs. The repair costs were horrendous.

As I learned from talking with manufacturers about that case, housewrap is not meant to be subjected to constant wetting. In any case, had the siding been back-primed, water would not have worked its way 3 to 4 feet up the back of the siding and kept the housewrap wet. This is an example of how one oversight can lead to serious problems.

Rain Screen Solution

There is a way to minimize these kinds of problems, and it is gaining popularity both for new construction and for repair and replacement of failed siding. It's called a rain screen, and simply put, it provides an air space between the siding and the underlying foam or wood sheathing. The air space not only equalizes pressure behind the siding, which prevents penetration of wind-driven rain, but it also allows any moisture that makes its way behind the siding to escape.

Using a rain screen will not eliminate the need for proper flashing and regular maintenance, but it will protect underlying building elements from some of the potential damage that can occur when siding is installed conventionally.

Recently, I had the opportunity to put a rain screen into practice during the repair of gable-end siding on a 17-year-old residential building. In this case, some of the mistakes described above were made, including the installation of spruce clapboards without any back-priming. The exterior wall was sheathed with rigid foam and clad with rough-textured T1-11 plywood. The exception was a "feature strip" at the gable, which had been sheathed with CDX plywood in plane with the T1-11 and clad with spruce clapboards. The bottom ten or so courses of clapboards suffered from severe cupping and warping, but had not rotted, despite the fact that they still bore only the original coat of dark solid stain (see Figure 1). The exposed T1-11 siding had also begun to delaminate.

The solution was to remove the damaged materials and re-side the gable end with clapboards using the rain screen principle. This entails installing vertical furring strips to hold the clapboards off the sheathing, and providing for ventilation behind the siding. To make the repair, I worked with R.C. Volk Construction of Hinesburg, Vt.

Furring and ventilation. Because the clapboards had cupped so severely, I expected some damage to the plywood sheathing behind. But after removing the clapboards that formed the feature strip, I was surprised to find both the plywood and the 15-lb. felt that covered it to be in excellent shape.

To create an air space for the rain screen, the carpenters screwed 1x3 furring strips vertically at 12 inches on-center across the entire gable (Figure 2). They held the tops of the strips 2 inches below the existing rake boards to provide for ventilation. The air space between furring strips reduces heat buildup and allows any moisture to escape from behind the siding.

The bottom of the gable triangle received a short shed roof, which ran the full width between the eaves. This overhang was needed both to shelter the windows and to protect roll-down exterior shades, which the owner was installing to prevent overheating during the summer months. The top of the 2x4 ledger onto which the rafters of this short roof were fastened was chamfered, and the rafters deliberately held high (Figure 3), to allow air entering through the continuous metal soffit vent strip to pass freely into the bays between furring strips.

The original gable had been built without an overhang, which, coupled with its southern exposure, contributed to the weathering of the siding. The final step before applying the new clapboards was to attach rake ladders at the roof line (Figure 4). For support, we used two heavy-gauge steel brackets on each side – one near the lower end of each rake and the other at the midpoint; at the peak, the rakes supported each other.

Figure 2. When re-siding the building, the author created a rain screen using vertical 1x3 furring strips 12 inches on-center. The resulting air space reduces heat buildup, and the equalized pressure on both sides of the siding prevents moisture from reaching the sheathing. The air space also permits any moisture that does accumulate behind the siding to drain freely.

Figure 3. To protect both the windows below and the exterior shades, a shallow shed roof was built between eaves across the full width of the gable. The rafter tops were fastened high against a chamfered ledger to allow air entering through the soffit to flow into furring bays.

Figure 4. Because lack of an overhang contributed to the siding failure, the final step was to extend the rakes, which were supported at the bottom and midpoint with heavy steel angle brackets.

Clapboards. Prior to installation, the cedar clapboards were primed on all surfaces with one coat of TWP 101 (Amteco, P.O. Box 9, Pacific, MO 63069; 1100 Jefferson Dr. 800/969-4811), a water-repellent and wood preservative stain with UV protection. The rough side, which was to be exposed, received two coats. The stain was also brushed onto all field cuts prior to application — admittedly a tedious task but one that would eliminate extractive bleeding caused by water absorption. The clapboards were fastened with stainless steel nails in the usual manner. We left a small screened triangle open at the peak to exhaust the rain screen.

Construction Details

While this case study illustrates the rain screen principle, the need to add rakes and a protective awning determined many of the construction details. In more conventional applications, both

Rain Screen Details

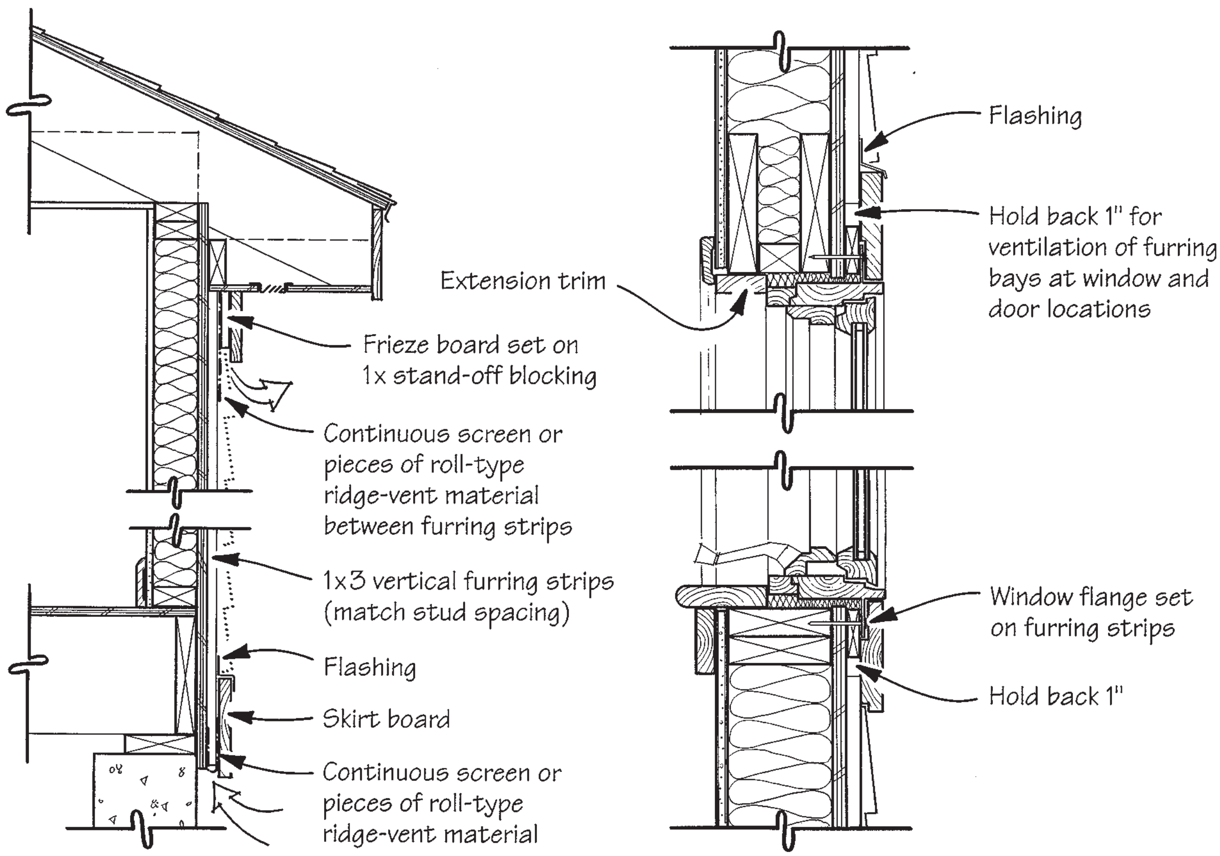

Figure 5. In new construction, install windows after applying a double-wide band of furring around the perimeter of door and window openings. Use screen and hardware cloth, or roll-type vent material, between furring strips at the top and bottom of rain screen walls to prevent insects and rodents from entering. Adjust frieze, corner board, and skirtboard details to accommodate the extra thickness of the rain screen furring.

repairs and new construction, I have handled certain details differently.

Window and door openings. When using a rain screen on a conventional wall, the additional thickness of the furring strips creates some problems at door and window openings. In new construction, you can install the windows and doors over a double-wide band of furring attached to the sheathing (Figure 5).

In a retrofit, flat, square-edge trim can be left in place, since it is in the same plane as the furring; before applying the siding, add a second layer of trim around the window or door. Profiled trim may have to be removed. In this case, add extension jambs around the window, bringing them flush with the surface of the furring; apply new trim over a double-wide band of furring, leaving a reveal on the extension jamb. Similarly, at cornerboards and other vertical trim, you will need to use double-wide furring to provide a proper nailing base. In all cases, apply caulking to joints that are vulnerable to water intrusion.

When rigid foam is used on the exterior, it can be applied either before or after the plywood sheathing. To achieve adequate resistance to shear when $1/2$-inch plywood or OSB is applied over foam, use 8d common nails 12 inches on-center in the field and 6 inches on-center at all edges (use 10d nails for sheathing thicker than $1/2$ inch). Apply the plywood vertically or provide blocking at all edges. Ring the opening with a double band of furring as described above for conventional sheathing.

When foam is installed over plywood, add solid blocking at the perimeter of the openings, flush with the foam. In this case, all furring should be $1\,1/4$ inches thick to ensure solid nailing for the siding.

Venting. In a standard rain screen wall, air will enter behind the skirtboard. To keep insects and rodents out, close off the bays created by the furring strips using screen and hardware cloth. An alternative is to insert pieces of roll-type ridge vent material between furring strips. Seal the top in the same way, but use a stand-off to hold the frieze board away from the siding.

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