

Painting Exteriors

Surface preparation is the name of the game

by Robert Dufort

It happens time and again. A simultaneous cheer and sigh of relief go up in the neighborhood when the funkiest house on the block finally gets a new paint job. And then within a couple of years, the seams start popping, the paint starts peeling and ugly stains run down the façade: the face-lift has fallen.

It doesn't have to be that way, but in order to forestall the effects of sun and moisture on painted exterior wood surfaces, we need to first understand the difference between jobs that succeed and those that fail. In this article I'll talk about the products and techniques we use to prepare and restore wood siding and trim as a prelude to repainting. The photos here document a job we did on a redwood Queen Anne Victorian house located in the Pacific Heights district of San Francisco (photo right), but most of the principles involved also apply to newer homes.



Almost a century old, this Queen Anne Victorian house is decorated with redwood trim and plaster garlands. A job of this scope begins with a thorough cleaning done from a scaffold that allows access to every exposed portion of the building.

Extensive preparation—An older home in need of a paint job often requires a good bit of work first. What we call a "painting restoration" involves not only cleaning, sanding and painting the building, but also removing rusted nails and resealing loose trim; replacing decayed moldings; making windows operational; treating non-structural dry rot with epoxy consolidants; inspecting gutters, downspouts, flashings, and chimney caps for rust; and scrutinizing all exterior surfaces to establish any possible areas of future concern. Although this Queen Anne had been given a face-lift eight years before that included extensive paint removal, patching and repairs, the work had not held up very well. Why?

Believe it or not, the first culprit was the use of oil-base paints, both for primer and some of the finish coatings (more on this subject later). Second, the pervasive dry rot was not effectively treated. Many of the decay cavities

had been patched with polyester resin auto-body putty, which failed quickly. Third, many areas that should have been stripped of old paint were not—typically a function of budgetary constraints.

To scrape or to torch?—There are three primary causes for paint to fail, and they can occur singly or in combination.

First, most paint failures are caused by loss of flexibility of the paint film. Wood buildings are subject to enormous stresses from heat, cold, humidity changes, rain and ultraviolet light. In response to these stresses, the wood expands and contracts. Most older buildings are covered with several layers of oil-base paint, which is relatively inelastic. The wood flexes,

the paint film does not, and surprise—the paint peels, cracks, crazes or craters.

Second, paint applied to a dirty, chalky or glossy substrate can't get enough of a grip on the building to last very long. And third, paint over wood that has moisture trapped inside it will soon pull away from the wall. Other culprits are rusting nails and sheet metal, loose moldings, caulk and putty failures, splitting wood, dry rot and salt accumulations. None of these conditions is unusual to find on an aged Victorian façade. In fact, we are pleasantly surprised when we do not find them.

A good manual that can help you to identify types and causes of paint failure is *The Paint Problem Solver* (Painting and Decorating Contractors of America, 3913 Old Lee Highway, Suite 33-B, Fairfax, Va. 22030; 703-359-0826).

Analysis—All paint jobs should begin with an analysis of the existing conditions. From the symptoms of paint failure we determine the underlying causes and then decide upon the proper cure. Some areas may require total paint-film removal, and the method of re-

moval will have to be decided—torching, heat gun or belt sanding (we've experimented with chemical paint removers, but so far we haven't found any that are as effective as heat removal). Other areas may need only a light scraping and hand-sanding. These decisions are made by balancing the solution to a problem against the budget. For example, while in many cases it may be preferable to completely strip a given surface (expensive and time-consuming), it is sometimes possible to perform an adequate job by scraping and sanding. How do we decide whether to scrape and sand or to torch? Like many things in the trades, the right call is a combination of past experience and intuition. If half the paint on the siding of a building that faces the weather

is alligatored, bubbled and crazed, then it is a safe bet to assume that the other half is questionable and should be removed as well. If there are a few areas of peeling paint caused by dry rot or rusty nails, it's probably okay to leave the paint film intact. It is also less likely that paint on sheltered portions of the house will need complete removal.

Our analysis of the Queen Anne was pretty straightforward. On the northern corner, alligatored and peeling paint resulting from heavy accumulations of paint and lax preparation needed to be stripped off. On the south and east street sides, in addition to symptoms similar to the rear, most of the peeling was on the siding and bay windows—areas that had been torched last time. There were several causes. For one, untreated dry rot, especially around rusted nails, caused the paint to fail because "punky" wood is not a good substrate for paint. Second, patches made with auto-body filler failed because of its relative rigidity. As the wood expands, the patch does not, causing the paint to crack. Then water enters the crack, gets behind the paint and causes it to peel (while further feeding the dry rot). Another cause of the premature paint failure was the use of oil-base primer and trim finish. This may come as a surprise to some, but acrylic-latex technology has progressed to the point that one can now say that the use of oil-base paints actually contributes to the premature failure of many exterior wood paint jobs. I feel like I've just started an argument, so I had best try to support this near heretical position.

Oil versus acrylic latex—On this Queen Anne many of the surfaces that had been stripped last time were nonetheless checked and blistered. This was caused primarily by hairline cracks in the wood. When wood ages, particularly on exteriors, it dries out a little, deforms, bends, gets hairline checks and splits, and sometimes even pops nails out. If the paint film can't flex with the wood, it has to crack too, and if the peeling paint is cracking along the line of the wood grain, you can bet that the paint is brittle. Heavy accumulations of old paint crack and peel for the same reasons, but the cracks often do not follow the wood grain—instead they have a "crazed" or "alligatored" look with lines running in a reptilian scale pattern. In either case, removal is the only long-term solution.

We knew that the building had been primed and partly finish-coated with oil-base paints. We also know from research literature that oil-base paints are relatively inelastic. Our conclusion: oil-base primers and finishes are to be avoided whenever possible on exterior wood surfaces because they simply do not move with the wood.

I realize that my conclusion is not going to be readily accepted by a large group of both casual and professional painters, and I agree that on surfaces subject to direct abrasion and cleaning, such as handrails, cabinetry and kitchen walls, oil-base paints will often outlast their acrylic counterparts. I will also admit that oil



A torcher at work. The quickest way to remove failing paint from wood siding is to scrape it off after softening the paint with a propane torch. When doing this work, it's imperative to wear safety gear and to have fire-fighting equipment nearby.

primers seem to do a better job of displacing chalk, especially on houses that have been painted with marine paints (which are designed to slough off). But given a soundly prepared surface, an acrylic resin binder provides superb adhesion, as well as the needed flexibility to move along with the wood without cracking. Not only has my personal observation convinced me of this, but there is also a large and growing body of research work and experi-

ments by organizations such as the American Plywood Association and the Forest Products Laboratory that verify these conclusions.

Scaffolding—Although ladders or rope-and-pulley "falls" may seem less expensive initially than renting pipe scaffolding, they are simply not as safe, nor as easy to use. Most jobs can be done faster from pipe scaffolding, especially those requiring aggressive surface preparation



Failure. Once paint has started to blister, you can be sure that the bond between the first layer of paint or primer and the wood has failed. When this happens, it's best to take the surface back to bare wood.



A heat plate is an electric paint remover that softens paint without an open flame. This method avoids the hazards of burning paint scrapings falling around the base of the building.

and repairs. Purchase and storage of pipe scaffolding, especially in the amounts required for our larger jobs, is simply uneconomical. In addition, the ability to safely erect scaffold is a trade unto itself, and should not be underestimated; we sub it out. For the last 11 years we've used City Scaffold to erect all of our jobs.

The initial cost for scaffolding on the three sides of this building was \$2,595 for the first month. A second month's rental, necessary because of the amount of prep work and repairs, was charged at 30% of the base fee—\$780.

Washdown—The first step on every job is to clean the building to remove accumulated dirt, mildew, fungi, chalking and rain salts—pollution residues that are borne on the backs of raindrops. Power washing with a compressor is the preferred method, particularly on larger jobs. These compressors can be rented, usually for about \$75 per day. A garden hose is attached to the compressor, which in turn sends the pressurized water through another hose and out a hand-held "gun." The gun has several tips that vary the spray pattern, or fan, from 0° (a fine, very intense spray) to a wide 60°. Only the

widest tips should be used on wood buildings. The power washer can develop pressures up to 3,500 psi, so it is very important to avoid bodily harm: be careful not to shoot yourself at close range with the pressurized water.

If the building has a lot of mildew and fungi, it's a good idea to first spray the affected areas with a 5 to 1 solution of water and household bleach. A "chemical injector" attachment can sometimes be rented with the power washer to add the bleach. Detergent can also help. We use one called Simple Green (Sunshine Makers, Inc., Huntingdon Harbor, Calif. 92649; 714-840-1319) that can be applied with the power washer. We don't use TSP (trisodium phosphate) any longer—we've found it to be overkill for our purposes and harmful to landscaping. Additional hand-scrubbing may be required for heavily soiled areas. Even though the power washer can remove some peeling paint, remember that its function is to wash, and that you can damage your building by forcing water into the wood. Also, somebody needs to keep an eye on the windows from the inside. They will often leak, even though we avoid spraying them directly.

A towel at the bottom of each window keeps leaking water from causing a problem.

Taking off the old paint—Many professional painters in San Francisco remove deteriorated paint films on wood buildings, using propane torches with a live flame (bottom photos, facing page). This method is dangerous, and the risk of fire is real. Compounding the hazard is the possibility of lead poisoning as old paints are vaporized. So why torch? Professional painters use this method because it's the fastest way to take off old paint. We discourage amateurs from using flame-producing tools, and suggest instead that they use heat guns or heat plates (good versions of both are available from Master Appliance Corp., 2420 18th St., Racine, Wisc. 53401; 414-633-7791). While safer, these alternatives are still a fire risk and must be used with care and respect.

With any of these methods it is necessary to wear a respirator (not just a safety mask), heavy gloves, long sleeves, and safety goggles. Prior to applying heat, one should lightly hose down the area, aiming especially in cracks and joints, as this is where most fires start. Be-

fore moving on to another area, or before taking a break, hose the same area down again.

The heat plate is placed against the surface being stripped (right photo, facing page), and held there from 10 seconds to over 30 seconds, depending on thickness and types of paint being removed. When the paint becomes soft and bubbles a little, you scrape it off.

A heat gun resembles a souped-up hair dryer, though it's a little bigger, heavier duty and much hotter. I think the best brand on the market is the MASTER HG-501 heat gun (also from Master Appliance).

Propane torches come in two basic formats. A small hand-held propane canister with a screw-on nozzle and flame-head is commonly available, and best suited for beginners. The flame stays small, but is effective for most surfaces, particularly moldings. The setup we use is a 5-gal. refillable propane tank, and attached to it is a regulator, 20 feet of hose and a handle that can accept a variety of flame-heads depending on the size and shape of the surface being torched. Rigs like these are typically available through propane refill stations and professional plumbing-supply stores.

The heat gun and propane torch are used in similar fashion. The nozzle is held from 6 in. to 18 in. from the surface being torched, and is moved back and forth—it is rarely held steady in one place. The object is to heat the paint, not burn it up. Scorching the bare wood is to be avoided, and is usually caused by overlapping the flame onto previously stripped areas or by using a flame that is too large or too hot. Usually, we'll heat up a flat area about 6 in. square, though the area is less with intricate moldings. Work always proceeds from the bottom of the house up. The size of the flame and the distance from the work can vary according to weather conditions, and a pro will alter the variables as necessary.

Our painters use shaped scrapers that are pulled instead of pushed (top photo). They are designed specifically for torch work, but they're also ideal for "dry" scraping. The different shapes of the scraper heads fit many moldings, and we often customize them with a file that is also used to keep the blades sharp. We get our tools from American Paint Scrapers (distributed by Bill Majoy, 183 Clearfield Dr., San Francisco, Calif. 94132; 415-664-2440). Regardless of the tool used, some paint residue is usually left on the surface after the first pass. It is lightly heated again and scraped off.

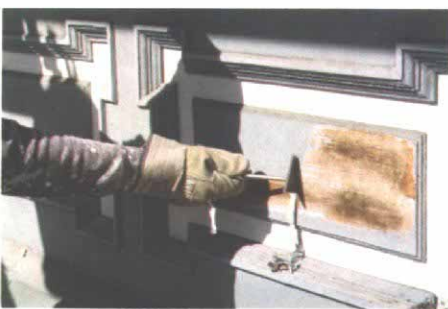
Safety—Many precautions need to be taken when stripping by heat, regardless of the technique. Fire regulations require that the contractor be licensed and properly insured for the work, that a garden hose be within reach of the "torcher," and that a watch be maintained for at least one hour after all burning activity has ceased for the day. In San Francisco, the painting contractor has to acquire an annual permit from the fire department, and then has to register each job site with the local fire station. Often the fire marshall will drive by a job site to check on progress, and we welcome the visit.



Painters need a variety of scrapers to correspond with the nooks and crannies that distinguish Victorian detailing.



Using a propane torch, a painter heats the old paint until it blisters (above). Using a scraper, he pulls the softened paint off the wall (below).



It's worth repeating: most fires are started by a small spark or ember that gets started in a crack or an open seam. Sometimes old rags or newspapers have been stuffed behind boards, and they can ignite easily. That is why we always hose down an area just prior to starting work, and also immediately afterwards. We also keep a crowbar, a hammer and a fire extinguisher nearby in case fire starts in a crack that water can't reach. Paint scrapings usually fall straight down, but they are sometimes still burning so we're careful to keep combustibles such as drop cloths out of the way. We clean up the scrapings with a broom and rake, and bag them for disposal.

Sanding—After torching, we sand down all areas with 50- to 80-grit production open-coat paper. We use finer sandpaper (120-grit) around entries and on eye-level surfaces. Any areas that have been scorched need to be sanded down to good wood. Also, glossy surfaces need to be etched or dulled so that the new paint has something to grip—some "tooth." Both of these operations can be done either by hand or with a small electric orbital sand-

er. The orbital sander is a painter's mainstay, and we use ones made by Makita and Porter-Cable. The Makita fits the hand better, but we find the Porter-Cable to be more durable.

Orbital sanders are relatively light, can fit into all but the smallest flat spots and can even handle most larger trim work. We use them to sand down imperfections and paint residue, and to soften the line where stripped wood meets a line of paint that is good enough to leave on the wall. Orbital sanders are not, however, very effective at removing loose or deteriorated paint.

An electric belt sander can be used for removing loose paint from large flat surfaces like siding. We use 3-in. by 21-in. belt sanders, fitted with dust bags, from Makita and Hitachi. These machines are very powerful and fairly heavy, and must be used with care. A fatigued operator can easily do surface damage to the work.

I don't recommend circular sanders and rotary-drill attachments because they are difficult even for professionals to control. We have tried grinders specifically designed for paint removal. They definitely remove paint, but surface damage is unavoidable with these tools, and I think they are best suited for rust removal on metal surfaces.

Regardless of what kind of sander you use, protect yourself against potential poisoning from old lead paints. One study in which our company participated suggested that higher levels of exposure to lead resulted from sanding rather than from torching. Wear a respirator, long-sleeve shirt and gloves while sanding. Change your clothes before heading home and be sure to wash up thoroughly before eating.

Under the old skin—On this project we had to get rid of virtually all of the paint exposed to the weather on the front (south) side of the house to uncover the problems causing the paint failure. Remember, much of the paint in these areas had been stripped at the time of the last paint job. These surfaces included siding and ornate trimwork, requiring us to use every scraper in our bags.

As expected, our torching revealed extensive dry-rot cavities, some of which had been patched in the last go-around. None of the patches had held up. On the front and east side, we stripped the lower panel band (much of which was new redwood installed during the last restoration), window sills and the bottom rails of window sashes.

In areas where 80% to 90% of the paint was sound, we decided not to remove the entire paint film. Instead, we used our putty knives and paint scrapers (without the torch) along with sandpaper to remove loose paint. Then we used the orbital sanders to feather the edges of the scraped surfaces.

At this stage we had a building that was clean, with deteriorated paint removed, glossy surfaces etched, imperfections sanded and the mess cleaned up. You might think it was about time to get some paint on the walls. Well, not yet. Next, we inspected the building, looking for the paint-related problems that inevitably show up. This includes a check of loose and



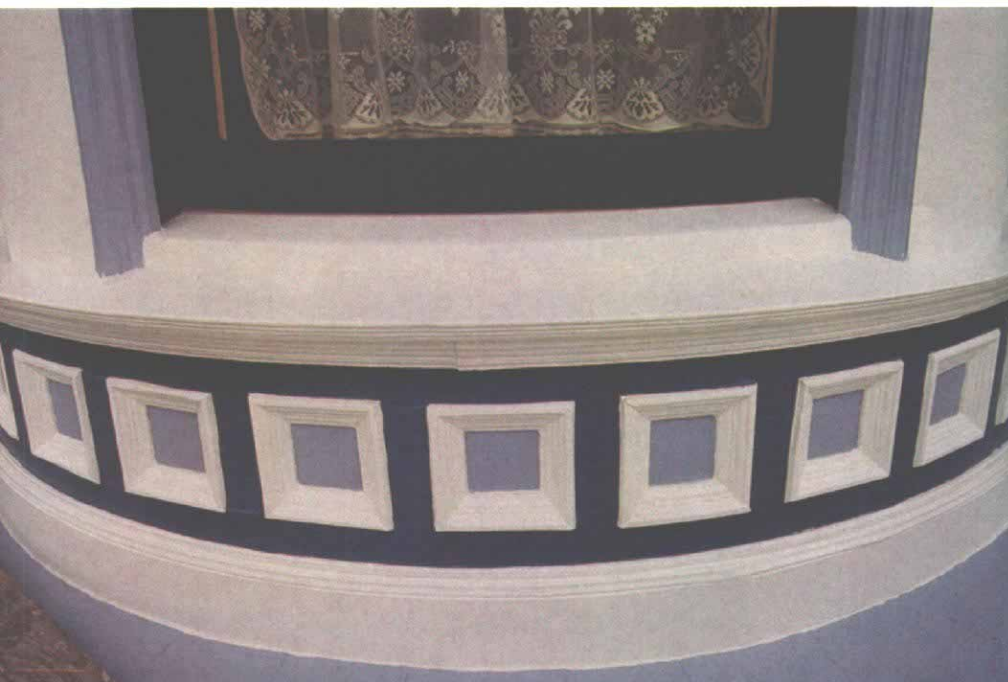
missing trim, sheet-metal flashings, gutters, chimney caps, window putty, rust spots, dry rot, the condition of any plaster details and the condition of the roof. Looking from the inside can often uncover valuable clues to roof problems. Leaks, stains and crumbling wall plaster all hint at defects that will also affect the integrity of the exterior paint job. These fixes are out of our realm, so we call in the right expert to correct the problems. On this job we were fortunate that Winans Construction Company was already in the building doing a kitchen remodel—we only had to holler whenever we came across a questionable condition. Contrary to popular opinion, painters and general contractors can actually work side by side in near harmony.

Loose trim should be resecured, and missing pieces replaced. Care should be taken in re-nailing, as older wood trim is often very fragile and will split easily unless predrilled. Often, it is best to remove a complicated trim section, carefully take it apart and strip and repair it before reattaching it as a unit. Less complex trim pieces are often easier and less expensive to replace than to repair. Our torching uncovered several small sections of siding that were badly split, so replacement made sense.



Epoxy patching—Chances are good that a hundred-year-old wood building will have some loose, rusted nails as well as pockets of soft, deteriorated wood. Often the wood is soft enough to stick a pencil into. We refer to this condition as dry rot, even though in some cases it is caused by a chemical reaction between the wood and the rusting nail. The condition can also be found on window sills (top photo) and at the joints between pieces of trim. In any of these situations, the treatment is the same.

The first step is to dig out the loose, punky wood fibers and rusted nails—we usually do this with our scrapers. We don't worry about cutting back to 100% sound wood, because the two-part epoxy consolidant that we use as a primer helps rebuild weaker areas. After excavating the deteriorated fibers and resecuring any trim pieces, small holes are drilled into the surrounding wood to allow the injection of the epoxy. We often use plastic catsup and mustard squeeze bottles to apply the consolidant. On larger, flat surfaces like window sills, we just brush it on. The epoxy consolidant is absorbed by the wood, killing any fungi and encapsulating and stiffening the wood fibers



Dry-rot repair. Areas of dry rot often occur at the intersections of trim pieces, atop window sills and adjacent to rusty nails. To repair them, the painters first remove the punky wood and rusty nails. Then holes are drilled into neighboring areas to allow a clear epoxy consolidant to be injected into the wood (the dark stains in the top photo show where it has been applied). The next step is to fill the cavities with epoxy fillers, which are white in the middle photo. After two coats of primer and a finish layer of paint, the restored window and trim take on a new look.

to allow acceptance of the epoxy patching material that follows.

The two-component epoxy patching material is mixed thoroughly and then applied with a putty knife to fill the hole completely. Before the epoxy starts to harden (usually only a matter of minutes) we "blade" over it with a putty knife dipped in lacquer thinner. This shapes and smooths the exposed surface somewhat and minimizes the need for subsequent sanding. If the excavated area is very large, we will often fill the hole partly with epoxy, slip in a redwood plug shaped to fit, and then fill the remainder with our patching material. The epoxy fillers shrink very little, if at all, so most holes only have to be filled once.

After it cures (bottom photos, facing page), the epoxy patch can easily be sanded, filed or shaped with edge tools. This stuff produces a nearly permanent repair, as it literally fuses with the surrounding wood and flexes at a similar rate. About the only things we can do wrong are mixing the wrong ratio of the two components together, or mixing them inadequately—in either case the material might not cure. The epoxy consolidants and fillers we use are available by mail order from Abatron, Inc. (33 Center Dr., Gilberts, Il. 60136; 708-426-2200) and Smith & Co. (5100 Channel Ave., Richmond, Calif., 94804; 415-237-6842). These companies produce epoxies specifically designed for use with wood and are glad to send out informative literature to anyone who asks. Other epoxies can sometimes be found in marine-supply stores. For more on the subject, get a copy of "Epoxies for Wood Repairs in Historic Buildings" by Morgan Phillips and Dr. Judith Selwy (Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402; 202-783-3238).

Priming—Now that the building has been prepared, we finally get to do some painting. The initial coat of paint, the primer, serves as a foundation. It is intended to ensure good adhesion between old paint, bare wood, and the finish coats of paint. Usually, a full prime coat on all surfaces is recommended for best results. In some cases, however, it may be possible to "spot prime" the areas of concentrated scraping if the remaining surfaces are in good condition and have been painted with latex acrylic within five years.

We have two favorite acrylic primers: Lucite Exterior Latex Wood Primer-#51 (Olympic, PPG Architectural Finishes, Inc., 2233 112th Ave. NE, Bellevue, Wash. 98004; 206-453-1700); and Sinclair Paint's StainLock Acrylic Latex Primer (Sinclair Paint Co., 6100 S. Garfield Ave., Los Angeles, Calif. 90040; 213-888-8888). Both are tenacious primers suitable for new and old work, and both do an excellent job of sealing redwood and cedar tannins. Lucite is substantially more expensive, but it levels out better than the Sinclair primer. These primers also adhere just fine to oil-base finishes already on the building, as long as the old finishes are sound, clean and deglossed. They can even be applied on slightly damp—but not wet or



Filling wide cracks. Backer rod is a compressible foam rope that can be squeezed into a crack too wide to caulk. Once in place, the remainder of the crack is filled with caulk.

soaked—surfaces. Two coats of primer are recommended for all stripped and new wood. One coat of primer is generally sufficient on existing painted surfaces in good condition. We strive for good, full thick coverage because a thick flexible film stretches more than a thinner flexible film does. The converse is true for inelastic (oil) films—the thicker it is, the less it flexes.

I do have to confess that there is one oil primer we use frequently—for rust spots. Our choice is called "Rust Destroyer" (Advanced Protective Products, Inc., 187 Warren St., Jersey City, N. J. 07302; 201-435-6166). We've found it to work better than the traditional films that merely cover-up the rust with an inhibitor.

It is a rare job where the primer (and at least one of the finish colors) is not applied initially with an airless spray gun. The reason is simple economics—it is faster. We do, however, always "brush-in" the primer right after it is applied by gun. After spraying the primer onto an area, we go back over it with our brushes, evening it out and getting it into all cracks, seams and hard-to-reach surfaces.

Spraying outdoors does create one big problem—overspray. This nemesis is especially troublesome in windy locales such as San Francisco. As one client (years ago) said to me, "I didn't notice that painting my neighbor's car was in the contract. I hope you're not going to charge me extra for it." Nowadays we drape large burlap canvas sheets on the outside of the scaffold if we think overspray is going to be a problem.

We have never had any problems painting with acrylics in the fog or in direct sunlight, but in each case the drying time changes. With higher temperatures, the primer can get gummy, sticky and not brush out very well. Below 50° F, the acrylic resins will not properly bond with one another as the paint dries.

The second coat of primer, if needed, is usually applied after the caulking, puttying,

and repairs have been performed. This not only ensures that the putty and repairs have a prime coat over them (a good idea), but also cleans up the building, making it easier to spot areas that still need attention.

Caulking and puttying—We use caulk to fill areas that are subject to movement, particularly cracks, seams, and joints. As a consequence, we need a caulk that can flex without losing its grip. We primarily use VIP Waterproofing System's #5710 (Flood Company, 1213 Barlow Rd., Hudson, Ohio 44236; 216-650-4070). It's made with a 100% acrylic terpolymer resin that allows the caulk to stretch 5¼ times its thickness before breaking. After initial application it is usually smoothed out with a finger, and then lightly wiped with a damp cloth (for more on caulks, see *FHB* #61, pp. 36-42).

Not all seams should be filled with caulk, however, because it's important to leave passages for moisture inside the house to escape. The seam found between each siding board and the one above is a good example of where not to caulk. But any seam that appears to let rain enter the building should be caulked. Generally, we will do extra cosmetic caulking on the front of a house and be concerned only with waterproofing on less visible sides.

Larger seams often need to be filled initially with something other than caulk—we use backer rod or rope caulk. Otherwise, you can shoot a whole tube of caulk into a joint and still not fill anything. Backer rod is pushed into the seam with a putty knife until it is ¼ to ½ in. past the outside edge of what you want caulked (photo above). The difference is then filled with the caulk. The brand we use is available in a variety of diameters from ¼ in. to 1 in. (Sashco Sealant, 3900 E. 68th Ave., Commerce City, Colo. 80022; 303-286-7271).

We use painter's putty to fill the basic nail hole. The rule here at Magic Brush is: dime-sized holes and larger are filled with epoxy; smaller holes are filled with putty. The brand we use, "Lead Free Putty," (Crawford Products Co., 419 S. Park Ave., Montebello, Calif. 90640; 213-721-6429) is made with linseed oil, and it's not very sticky. To apply it, hold a golf-ball size gob of putty in one hand and push it on top of the hole. With the other hand, push a putty knife into the ball; then draw it back over the hole, leaving a flush, nicely filled hole. No excess is left, and no sanding is required.

By the way, when you buy supplies for painting, you generally get what you pay for. For instance, acrylic resins are more durable than vinyls, and they also cost more. Considering that the difference in cost between the best and second-best materials amounts to but a tiny fraction of the overall cost of a job, it's false economy to skimp on your paints and primers. □

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