Stripping Exterior Paint

John Leeke

Painters George Wellington and Stephen Bragg remove heavy paint buildup with heat plates and guns.

Before bidding to remove paint, use a test to tell whether mechanical, chemical, or heat techniques are right for the job

by John Leeke

If a client wants you to remove most or all of the paint from a building, you have several alternatives—mechanical removal, heat stripping, or chemical removal. The method you choose depends on the paint build-up, the building material, your budget, and safe disposal requirements.

With mechanical and heat stripping, you can rely on your eyes to tell you whether you're doing a good job and not damaging the building. But with chemical stripping, you don't have any visual clues. Neutralizing and eliminating residual chemicals requires extensive testing during and after removal.

To Strip Or Not

You're generally forced into paint removal when the paint layers build up to more than 1/16-inch thick (16 to 30 layers). You'll know the paint has reached that point when you see alligatored paint layers, cracks, and peeling. You may see evidence of earlier attempts to spot scrape and repaint, and the owner will tell you stories of how the last painter just didn't do a good job. But owners often don't realize that it's risky to apply a new paint layer over heavy build-ups.

If you see a heavy paint build-up that is "crazed" (fine hairline cracks like a cracked eggshell), you know the paint is getting thick. While your painting sub may be able to handle this by careful sanding, the final paint layer could be the one that causes failure. Old, thick paint becomes brittle and may not withstand the shrinkage and pull of another coat. Thick paint fails where the bond is weakest—where the paint bonds to the wood.

Identify where the paint problems are occurring and whether they are localized or widespread. Sometimes the building will have only localized problems. This allows you to choose removal methods that work well in selected areas, but these methods shouldn't force you into the more expensive alternative of an all-over removal.

One common problem that can affect just part of the building is intercoat peeling. You usually see this in the soffits, under the eaves, and within enclosed porches. Rainfall doesn't wash these areas, and if a previous painter wasn't absolutely scrupulous about washing down the surface, environmental grime can accumulate and prevent good paint adhesion.

A second problem leading to localized paint failure is vapor drive through the exterior walls. With a little detective work, you can find the source—usually an unvented bathroom with a shower or a laundry area. Moisture coming from the inside of the building causes the paint to curl off in a limited area. The paint may have built up enough so that moisture can no longer pass through it. Before repainting, get back to bare wood to ensure a good bond, and correct the moisture problem by putting in a vent fan so you won't be blamed if the paint fails again.

A third problem arises from incompatible paint layers. If a previous painter put an oil paint on top of latex, the oil

Testing Removal Methods

When paint build-up makes removal a necessity, do tests to see how much material and labor is involved before you bid. One removal technique won't fit all jobs. To show you in detail how this testing phase goes, I'll use an example from my own work up in Maine. The project was a large two-story Victorian house built in the 1880s.

Costs for touch-up painting were rising each year, and the owner was tired of the uneven, scraggly look of the exterior finish, though skeptical about finding a paint removal method he could afford. Nevertheless, he agreed to spend $2,000 of the money he had budgeted for touch-up so I could test removal methods and find the most economical one. He stipulated that I use the painting contractor the family had used for years, and he didn't want any chemicals used because of his valuable landscaping.

The painter hadn't done exterior removal, beyond the normal scraping and sanding, and was reluctant to get into it. However, he had a good handle on costs for scaffolding and recoating, and he left it to me to plan the test program.

I planned to do the testing in three stages. I would start with small 1x1-foot test patches; then I would move to larger 3x3-foot test panels; finally, I planned to test a 20x20-foot section from the foundation to the cornice. I figured I could complete these tests for $1,700, and we would then have enough information to accurately bid the whole job. The painter didn't trust my removal figures, but with $300 still in the budget in case I was wrong, he agreed to go ahead.

Test patches. The first task was to determine which removal methods should be tested more extensively. We started with 1x1-foot test patches, enough for all the materials and methods we wanted to try. This preliminary stage is the time to try the widest variety of removal techniques possible, including mechanical, chemical, and heat removal.

The head of the paint crew wanted to try sanding the paint off with a disc sander. I agreed, if he would let the crew participate in the decision about which removal method to use. We also decided to try two different kinds of heat plates and two heat guns, and the painters had their choice of putty knives and scrapers.

Sanding was the first alternative eliminated because the worker who tried it got a shirt full of dust. This was just as well since the sander left deep circular gouges in the clapboards.

The heat plates worked faster than the heat guns, and were most efficient on the broad surface of the clapboards. The heat plate we liked best had a top edge that flipped up on a hinge; the edge radiated heat toward the narrow reveal of the clapboard. This melted the paint on the broad surface of the clapboard and the reveal at the same time.

Heat guns were slower, and the workers' arms got tired faster; but the guns worked well on decorative details and moldings. The crew also found that when they got down to the original layer of primer, the heat gun gave them a more subtle control of temperature so that they didn't scorch the wood.

Test panels. After trying out removal techniques on small patches, we used larger test panels to refine the removal methods. (With these we could figure our overall time estimates as well.) These panels have to be at least 3-foot-square; a 4-foot-square panel would be even better. On panels this size I keep track of the time down to the minute, and I calculate costs in tenths of a square foot. I use this information to develop unit-cost figures in hours per square foot. Then I can multiply the hours by the labor rate of the crew to give the dollar cost per square foot.

On two panels on this project, we tried different heat plate and gun combinations (see Figure A). We also experimented with different ways to sharpen the putty knives, and we discovered that knives that were slightly rounded on the corners worked best. The eased edges kept the blade from lifting the grain.

When the painters had removed most of the paint, they switched to scrapers to remove the original primer. On this job, putty knives removed several layers at a time, were easier to push, and didn't clog. But the final layer of paint and the nubby residue left from heat removal were easier to take off with a sharp 3-inch scraper with a fairly stiff blade.

We did two more panels to check how much to sand. Later, if the crew had questions about how much paint needed to come off or how well the work should be sanded, they could check their work against the sample panels. On these panels we also pinned down our time figures (see Figure B).

Paint removal and prep on the clapboards and flat trim took .152 hours per square foot, with the heat gun only. Using the heat plate for most of the removal, with heat gun cleanup, reduced the time to .146 hours per square foot.

The test section. You could use the labor figures from the test panels to develop bid prices for the whole job, but I wouldn't rely on these limited panel tests alone. I always check these estimates with a still larger test section—a piece of the building that represents every condition you're likely to find.

To figure out how much we would be spending for the final, and largest, test section, we projected our hour per square foot costs from the 3-foot-square sections and discovered that we would exceed the budget the owner had agreed upon if we did a 20-foot-wide section as originally planned. We reduced the width of test section from 20 to 16 feet. With a test area this size, we could be confident of our overall costs.

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Figure A. *Two 3x3-foot test panels show the results of different removal methods. The panel on the left, marked "A," was cleaned up with a heat gun. The 3x3-foot section to the right, marked "B," had paint removed using a heat plate with heat gun cleanup.*


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Figure B. *Additional test panels, shown in the stripped area at the bottom of the wall, were used to refine methods and to help calculate unit costs for the complete job.*

On this larger test section, we proceeded with the clapboards and flat trim, carefully noting how long it took to strip the molded window trim, and we did a 2-foot-wide test section of the cornice. (On jobs like this, I always handle the sash work as a separate job because the number of windows varies and the work is more time-consuming.)

The total cost for doing the test section was $1,570, or $3.74 per square foot, well within the owner's initial budget. I used this figure to estimate the cost for the whole project.

While the work was too expensive to complete in one year, we found we could phase the project over six years, starting the year after our test section, and still stay within the owner's budget. The next year the painters stripped one facade and did all the window work. They'll do the remaining facades—one every year.

As more and more of the stripping is completed, the owner's maintenance costs will begin to drop. My figures show that in ten years, he'll be spending 20% to 30% less on maintenance than he spends now.—*J.L.*

becomes harder and less elastic and may peel as it ages. Likewise, a latex on top of old, chalking oil paint may peel because the latex can't penetrate the surface and bond to the existing layers.

Where paint failure is localized, choose removal methods (such as heat) that work well in selected areas. Make sure you protect other parts of the building from debris. On wood clapboards, you may be able to scrape and sand the peeling areas, recoat with a high quality oil primer, and use either a latex or oil topcoat. But if the peeling problems are widespread and the paint buildup is already thick, you're better off considering total removal. Plan a testing strategy that will help you bid the job and establish the quality of work expected of your crew or a subcontractor (see "Testing Removal Methods").

Bidding Jobs

For remodelers, commercial rehabbers, and painting contractors, knowing how to remove paint for a reasonable cost can mean the difference between a job that brings in a profit, and one that sends you into a black hole. Contractors who do this work all the time claim that prebid testing is critical. Jim Lucas, of J.N. Lucas, Hammond, Ind., explains that the amount of testing you do depends on the complexity of the job: "On one job, the competing contractors did test panels on the first floor at the front of the building, and the unlucky guy who got the job discovered that the first floor had only three coats while the second story had fifteen." Take samples wherever you're likely to find different conditions—check the stone trim, and the front, sides, and back of the building on all floors.

Joe Dascenzo, manager of Kenneth Duncan Painting, Nashville, Tenn., told me: "On each stripping job we do field tests, study the situation, take measurements, then price the job accordingly. There's no such thing as a ballpark bid."

General contractor Tom Clark, of Leeds & Clark, Midlothian, Texas, who specializes in Mainstreet restoration (see *JLC*, 12/89) says contractors should "Do test spots on several parts of the building, or you may find old windows and doors were filled in with brick of a different color. This looks terrible when you start stripping, and the owner will often call a halt to the job."

Testing will tell you whether mechanical or heat removal is cost-effective. And if you have to call in subs for chemical removal, which is usually the case, the testing will tell you what sequence of strippers works and whether the chemicals will have to be neutralized.

If you are a general contractor deciding which sub to use, you should be on the job site during the testing phase to see which subs know what they're doing. Otherwise, you may find you've handed over your project to a sub whose specialty is cleaning industrial boilers; some chemical stripping companies have never touched a building. A sub who is conscientious about prebid testing will most likely be careful in testing to make sure the removal chemicals are properly neutralized and disposed of. If you're the general, however, you're probably going to have to make some educated guesses about what kinds of removal methods are likely to work best on your building. Then you can decide which subs will get a chance to bid the job.

Jacob Arndt

Figure 1. *A rented pressure wand can be used to remove peeling or loose paint.*

Marylee MacDonald

Figure 2. *The worker in the bucket truck sprays a water rinse on a building that has been cleaned with caustic stripper. Unfortunately, the caustic runoff discolored the brick chimney. To avoid this, test the effects of chemical cleaners on all nearby materials.*

Mechanical Removal

When you're taking all the paint off a whole building, scrapers and belt- or disk-sanders have drawbacks. The work is labor intensive and tedious, and the dust hazardous. Also, scrapers and sanders don't work at all on masonry. Contractors removing paint from masonry or stone will often turn to the closest sandblasting contractor, but in my work, I've found that sandblasting does more harm than good.

Depending on the skill and attention span of the operator, sandblasting can take just the paint off, or it can dig out the mortar, remove the protective hard-fired finish from the brick, and remove tool marks from stone. It also frequently doesn't remove all the flecks of paint that can get stuck in masonry. Because it costs money to correct problems caused by sandblasting, I don't favor it as a paint removal method.

Finally, on buildings where the paint is about to fall off anyway, you could use a pressure water sprayer that operates off a garden hose. You can usually rent a pressure wand at a rental yard for under $50 a day, but you've got to make sure you don't blast water into the front parlor (see Figure 1). Also, make sure you leave enough time for wood to dry out before you paint it. On masonry buildings, do the work early in the season so the masonry dries out before winter. Water blasting is only effective if the paint is already peeling. With a heavy paint buildup that is alligatored but still attached to the building, you'll be better off turning to chemical or heat removal.

Chemical Strippers

For masonry buildings, chemical strippers are the way to go. Most manufacturers provide chemicals, testing kits, application equipment, and on-site technical advice. Unless you have years of removal experience, stick with one system on a project.

If you aren't familiar with the products, you can begin to get a handle on the terminology by understanding that most paint strippers fall into two categories—caustic and solvent-based.

Caustic strippers work best on large buildings with simple removal requirements; they'll cut right through layers of alternating latex or oil-based paints. It's not a good idea to use caustic strippers on wood, especially weathered wood, because the stripper will raise the grain and attack the wood. But caustic strippers, because they're much less expensive than solvent strippers, are often used on masonry buildings, and if that's the case, you might end up taking the paint off wood windows or cornices rather than changing over to a different method of removal.

Solvent strippers work well for removing graffiti or specialty coatings, like epoxies or urethanes. You might have to switch back and forth between different formulations to get good removal.

Caustics. What is a "caustic?" One caustic you'll recognize immediately is lye—the same stuff that's in Drano. If something is caustic, it could also be described as a *base* (as opposed to an acid).

If you had a high school science class, you'll probably remember the term "pH." The pH scale is used to describe how acidic or basic a solution is. At pH7 a solution is neutral. Numbers from 1 to 7 are acidic, numbers from 7 to 13 are basic.

All caustic strippers need to be neutralized, or paint won't stick to them. On masonry buildings that aren't neutralized, you could also get a bloom of efflorescence. You neutralize a caustic stripper with acid to bring the building material back in the neutral range (close to 7). Solvent strippers are neutral to begin with, so you don't have to neutralize them.

On large jobs, cleaning contractors typically spray on the caustic chemical, but if you have a small project and you want your own crew to handle the work, you could also use a nylon brush or roller. Have a bag full of cheap brushes on hand, because you'll eat up two brushes every 1,000 square feet. If you recoat the surface you're working on to keep it damp, the stripper will cut through ten layers at a time. Pressure rinse with hot or cold water.

A hot-water power wash is the best rinse, because the stripper is more soluble in hot water than in cold (see Figure 2). You can apply it at 600 to 800 psi of water pressure at three to seven gallons/minute of volume. Volume is actually better than pressure in this case. Jim Lucas says "A good rule of thumb is that you'll need seven gallons of water to remove one gallon of stripper."

After rinsing, Lucas tests for neutrality by taking a pocket knife and scraping some of the surface material from the wall into a small paper cup.

"Put in a drop of water then drop the litmus paper in. The litmus paper I use has a range of 1-11, with neutral at 7," says Lucas.

Litmus paper changes color according to the pH level: Yellow-green is acid; blue-green is alkaline. Many cities have water that is slightly basic, and the water may have a pH below 7. Lucas says it may be hard to get a completely neutral

Al Staehli

Figure 3. *Ed Bell & Sons crews work quickly using light, hand-held torches fed from an LP tank. A rigorous safety program safeguards against fire.*

Al Staehli

Figure 4. *Bell manufactures its own contoured scrapers and tool belts. A file is carried to keep the tools sharp.*

reading, but close to neutral is good enough.

ProSoCo is one of the larger companies selling caustic strippers, such as their "Heavy Duty Paint Stripper," and they provide training and technical advice for contractors who use their products. A widely advertised product, "Peel-Away I" (Diedrich Chemicals), is also a caustic, but it goes on in paste form. Peel-Away I dissolves the paint layers from the outside in, and as the stripper hardens again, it attaches to a paper coating which can then be peeled off and thrown away.

I was curious about how the product performed on larger projects than the ones I've used it on, so I talked with an architect in Nashville who had experience stripping over a hundred wood windows on one of the city's major landmarks.

"Before we began the complete job, we worked on one window and had one person document the procedures, such as how thick a layer we put on, how long we left it, and how we neutralized it. When we put litmus paper on the surface we found we had not neutralized the surface enough. Then we over neutralized. Testing was strictly trial and error, and it took time, but we got it to work well. It took 20 to 30 layers off at one time."

On one job I did, liquid oozed out from beneath the Peel-Away paper and stained some granite steps. On another job it dribbled down, damaging painted areas that were supposed to be left intact, but eventually had to be stripped too. Peel-Away I is more expensive than other strippers, and it's supposed to be easier to work with, but whenever you're using chemicals, be careful, because there's no such thing as a free lunch.

Solvent-based. The main ingredient in most solvent-based strippers is methylene chloride, one of the most carcinogenic chemicals the EPA has ever tested. Many solvent strippers act within 30 minutes; they won't damage wood or masonry; but they do contain paraffin, and you have to make sure to rinse thoroughly to get the paraffin off.

Both BIX and ProSoCo make solvent strippers and provide technical assistance. Because the companies train their contractors, you might want to contact them to get a list of likely subs. "Peel-Away II and III," used on commercial jobs, is a methylene chloride stripper.

Non-methylene chloride strippers can be used on exteriors, but they are slower and probably better used on interiors. ProSoCo makes a new product, "T-1072 Paint Stripper," that is methylene-chloride free. Nu-Way Industries and QRB Industries also make methylene-chloride-free strippers.

Organic esters are solvents that have not been widely used in strippers until recently, and these are the least toxic solvent strippers available. Savogran has just developed a new product named "StrypSafer." Mark Monique, at Savogran technical services, describes it as a solvent type stripper that works slower than the hydrocarbon solvents. Its main advantage is its low toxicity; it also won't burn. (Organic esters, used by printers to clean ink off their hands, are the active ingredients.) Organic esters work by swelling the paint film; wetting agents help it penetrate.

Heat Stripping

Heat stripping can be one of the quickest ways to remove paint from wood, but it can set the building on fire. The safest approach is to use heat guns or plates. Radiant heat applied with heat plates is the safest method because the heat only goes on exposed surfaces. Heat guns may blow hot air into crevices and ignite dust. Also, they cause lead in the paint to vaporize. Some heat guns limit the temperature to 850˚F so the lead won't vaporize. Of course, lower temperatures mean slower stripping.

The contracting firm of Ed Bell & Sons, in Portland, Ore., takes a slightly different approach. They combine an open-flame heat removal system with a safety program and crew training. They use LP bottled gas, generally feeding several torches from one tank (see Figure 3). The light, hand-held torches are easy to control, and when they're on standby, they have just a small pilot flame. The torch produces an intense broad flame that allows the crew to move rapidly across the surface. Bell manufactures a holster of special scrapers that match any curved or flat surface (see Figure 4). Costs in Portland range from $150 to $180 per hour for a crew of five, and the crew can complete one elevation per day, including all trim and sash.

Bell's safety features are what make the system work, and they're a good idea even if you're skeptical about open-flame removal. The crew inspects each building before beginning and corrects any fire hazards. They remove debris from eaves and insist that repair work be done before they begin work. Then each crew member uses a caulking gun to seal cracks and openings in the building skin as their work proceeds. Each crew member keeps a spray water bottle close by for wetting any small sparks or wetting cracks, and they have fire safety equipment on every job, though they rarely need it.

With any heat removal method, you should do an "arms-length" inspection one to four hours after stripping operations end to catch smoldering fires. The advantages of heat removal are that you have a clean surface ready to paint without worry about chemical contamination, and you don't spend money on chemicals. Also, you have a minimum volume of waste, and it's in the form of dry chips.

Waste Disposal

Before cities took a dim view of lead in the landfill, contractors used to throw the paint debris in the truck along with the rest of their construction refuse. Contractors using chemicals gathered their waste by digging a trench around the building 6 inches wide and 1 foot deep. They lined the trench with poly and collected 90% of the waste. What was left could be wet vacuumed into a container. Many jobs now require lead abatement, and for this, you may need gutters and pumps if you're doing chemical removal. The chemicals themselves generally aren't a problem because the wash-off that reaches the sanitary sewer is dilute, but you must still dispose of the lead properly.

Whether you use chemicals or heat, make sure you won't get caught with an expensive abatement procedure. Test paint-waste prior to bidding, and be sure your sample is representative of the waste you will be generating. The EPA requires that the waste have no more than 5 parts per million of lead. If you have 2 parts, you don't have to worry about it. Often, even an old building will surprise you by not having as much lead as you suspect. Exposure to the atmosphere or interaction with later coatings may have broken down the particles. Try to find a local chemical testing lab that can tell you whether the pigment contains lead or not.

Your next step is to contact your state EPA. They should give you a list of licensed carriers. It may not be legal in your state for you or your paint-removal subcontractor to take a bucket of chips home for disposal; you must use a licensed carrier. The company that handles the disposal will provide barrels and tell you how to package the material. They'll also want to do their own testing of the material to be hauled. On one job, I faced a minimum $650 disposal fee for two five-gallon pails of lead paint chips, but I could have had up to 50 pounds for the same price. And get a *written* bid. I've had problems with carriers doubling their price after a firm phone bid. You'll also need to factor in time for finding a carrier, filling out paperwork, and arranging pick-up.

Problems, Problems

A painter I know reduced all of these issues about paint buildup and removal to a simple formula:

P + P = P (Pride + Paint = Problems)

The pride some owners have in their buildings leads to over-painting and paint buildup, which causes problems. By paying strict attention to prebid testing, and choosing the right removal system, many contractors have converted this formula to:

Pride + Paint = Profits. ■

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