

Barrier Coat Breakdown

Armed with scrapers, sanders, and strippers, PS editor attacks decades-old epoxy barrier coating.



After two weeks of sanding, scraping, and stripping the bottom of his Ericson 41, Practical Sailor Technical Editor Ralph Naranjo needed only two days to build his bottom back up with barrier coatings and bottom paint.

Peeling off bottom paint is a miserable job, but tackling five coats of barrier coat can make a root canal something to look forward to. Last year, Practical Sailor Technical Editor Ralph Naranjo took on this unenviable task to rid the bottom of his Ericson 41, Wind Shadow, of antifouling and decades-old Interlux InterProtect.

SIZING UP THE JOB

Barrier coating was a new concept in 1982, and by the time *Wind Shadow's* retrofit after an around-the-world cruise was complete, the bottom had been scraped and sanded down to bare gelcoat, some minor blistering had been repaired with an epoxy filler, and five coats of Interlux's first rendition of InterProtect had been applied.

Since then, antifouling paint layers, like geological strata, have ranged from Interlux Micron 22 and 44 to Micron CSC—each product happily stacked on top of an enduring InterProtect barrier coat.

Twenty-five years later, the paint

began to blister, and it was time to roll up my sleeves and tackle a challenge dreaded by every boat owner.

A bit of poking and prodding revealed blistering between barrier coats only, rather than deeper blistering between the laminate layers. Only a few blisters penetrated the still intact gelcoat, and for the owner of a 39-year-old Ericson 41, this was as good as bad news could be.

The project was a good candidate for grit blasting. Soda blasting would likely not be abrasive enough to remove the epoxy barrier coat, and a coarser aggregate would have to be chosen. The cost estimate would be in the \$50- to \$100-per-foot range. Unfortunately, the

blasting process would eliminate the evidence I was looking to investigate. And so, like some sort of coatings archaeologist, I diligently began exploring the blistered and flaking regions of the hull.

My evaluation found that the failure mode with 98 percent of the blistering was uniform and manifested itself as a loss of adhesion between the first and second layers of barrier coat. In this strata, the blisters ranged from pea to quarter size, and many had been torn open under the pressure of the washdown that followed the haulout.

The artillery: Paint strippers tested on the epoxy coating were: (from left) Franmar Soy Strip and Peel Away's Marine Safety Strip and Smart Strip.



Photos by Ralph Naranjo

PS VALUE GUIDE PAINT STRIPPERS vs. EPOXY BARRIER COATING

PRODUCT	SIZE	PRICE PER GALLON	SOURCE	ACTIVE INGREDIENTS	COVERED					NOT COVERED				
					3 hrs.	6 hrs.	12 hrs.	24* hrs.	36* hrs.	3 hrs.	6 hrs.	12 hrs.	24* hrs.	36* hrs.
PEEL AWAY MARINE SAFETY STRIP ★	1 gallon	\$57/gal	defender.com	Dibasic Ester, N-Methyl-2-Pyrrolidone, Aluminum Silicate	1	2	3	4	4	1	2	2	1	1
PEEL AWAY SMART STRIP	1 gallon	\$55/gal	paintremoval.com	2-Pyrrolidone, Aluminum	1	2	2	3	3	1	1	2	1	1
FRANMAR SOY STRIP	1 gallon	\$78/gal	greenboatstuff.com	Soy Methyl Ester, N-Methyl-2-Pyrrolidone	1	2	2	3	4	1	2	3	1	1

★ Best Choice

1. Minimal effect, 2. Loosened bottom paint, 3. Began to soften epoxy, 4. Epoxy scrapable, 5. Epoxy easily removed; *The heat dried and hardened stripper.

The majority of the others easily flaked open with the prodding of a scraper, causing me to think that manual removal of the coatings would be an easy task after all.

As soon as I moved from the blisters to the area immediately adjacent—which was still intact—epoxy reasserted its reputation as an enduring adhesive. The intact barrier coat stuck to the hull like a thumb and forefinger bonded with Super Glue. After some misleading easy scraping of flaking barrier coat, the epoxy paint proved to be immune to assaults with a scraper. This meant that 75 percent of the paint removal process would be anything but a walk in the park.

STRIPPER SHOWDOWN

Modern non-toxic, eco-friendly paint removers do a wonderful job of removing antifouling paint, one-part enamels, and varnish, but when it comes to epoxy, all bets are off.

So, with a good selection of chisels, a penchant for keeping them sharp, and no aversion to hard work, I prepared to do battle with the pock-marked barrier coat. The first

dry-scraping resulted in some slow progress—the effort seemed a sequel to sawing through jail-cell bars with a fingernail file. As my shoulders and arms grew weary, the thought of using a chemical stripper grew more and more appealing.

I had three popular products to test, Soystrip by Franmar, and Dumond Chemicals’ Peel Away Marine Safety Strip and Peel Away Smart Strip. The ensuing comparison led to a better understanding of how to put these products to best use.

Practical Sailor previously tested Marine Safety Strip and the Soy Strip on antifouling paints in the April 2008 and November 2006 issues. Past tests suggest both work well on various paints, and that temperature can affect their performance. But overall, testers’ favorites were the Soy Strip and another product made by Dumond, West Marine Paint Remover.

The paint strippers in this test weren’t as quick to take off the epoxy barrier coating as they had antifouling paints. The dwell times to remove bottom paint in past tests and this evaluation ranged from 30 minutes to 24 hours. But against the epoxy coating, dwell times stretched up to 36 hours.

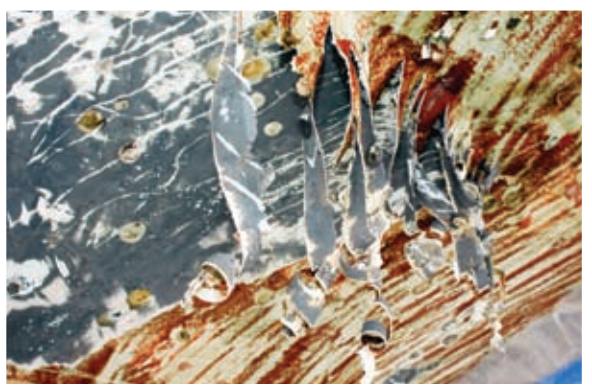
Because of the longer dwell times needed to soften the epoxy coating, we tried testing them

with and without a covering—Peel Away’s proprietary paper for the Dumond products and a 1-mil clear plastic for the Franmar stripper. The coverings helped reduce solvent evaporation and kept the coating moist and chemically active. (See “How We Tested,” page 29.)

The table above shows how each product fared against the barrier coat at certain dwell times. Note that none made the barrier coat easy to remove, even after 36 hours. However, all of these products were superb antifouling paint removers. In just a few hours, the bottom paint softened and the residue could be scraped easily from the surface. But at that point, the epoxy barrier coat remained as hard as a rock.

At 12 hours, it was still resistant to being scraped, and at the 24- to 36-hour point, the uncovered paint stripper had gone rock hard and barrier coat removal was nearly as arduous as it was on the untreated surface. The good news was that the covered strippers fared much better, and at the 24- to 36-hour point, the epoxy paint had begun to soften, allowing a scraper or sharpened chisel to peel the coating from the surface.

Bottom line: Peel Away Marine Safety Strip nudged ahead of Soy Strip and Smart Strip to take line honors as the chemistry of choice when it comes to heavy-duty epoxy paint removal. Its creamy consis-



Dry scraping before you apply paint stripper removes the blistered and flaking paint.

Strippers: A Waiting Game

After picking equivalent areas of boat bottom for testing, I set up a grid to evaluate how well each of the paint removers worked against the bottom paint, Interlux Micron CSC and the epoxy barrier coating, the original 25-year-old Interlux InterProtect, on the hull of my Ericson 41.

I tested 3-, 6-, 12-, 24-, and 36-hour “cook” periods (dwell times), and followed the manufacturer’s recommendations for coverage and sheathing procedures. The Peel Away Paper was used on the Marine Safety Strip and Smart Strip, but the water-based Smart Strip can be used without a covering. Soy Strip, another big player in the eco-friendly, non-toxic paint removal business, is more often than not used without a physical cover. Its gelatinous consistency is intended to keep the surface chemically active for a protracted period. But in my case, mid-Atlantic summer heat tended to bake out the solvents, and the best performance was gained using 1-mil plastic sheeting over the Franmar Soy Strip to keep chemicals active for the prolonged period necessary to loosen the epoxy barrier coat.

Because the project was carried out on a warm day, the heat exacerbated the “dry out” problem. The window of time during which the “peeling edge” of the barrier coat remained soft was very narrow, and a bit-by-bit peel and scrape procedure paid off. As Peel Away Marine Strip’s directions suggested, scraping under the leading edge of the covered surface works best.

tency was least likely to splatter when layed on with a thick-nap roller. Its color showed up clearly on the surface, and the Peel Away paper covering was easy to use. The paper costs about \$20 for 110 square feet. Less expensive covering options are clear plastic sheeting or butcher paper, shiny side up. We do not recommend using the strippers without a covering when trying to strip an epoxy barrier coat. If you have plenty of time to wait it out, the Franmar Soy Strip will eventually soften the epoxy paint to a point where it is easily scrapable, but the Marine Safety Strip was a bit more fast-acting.

SANDING vs. SCRAPING

On nonblistered portions of the hull, the barrier coat was more immune to the strippers, even after 36 hours of treatment. The solution in these areas was abrasive removal rather than chemically expedited scraping.

Recognizing that less is more when it comes to how vigorously one cuts away at the surface of a fiberglass

hull, I started with modest-grit sanding disks (50 and 80 grit), and in the most stubborn areas, I resorted to the 36- to 16-grit disks, aka gravel glued to paper. The final sanding just prior to barrier coating was done with 36-grit discs and followed up with a 50-grit second pass.

I also used a variety of sanders to find the right combination of user friendliness and aggressive action. There has been a revolution in sanders, and boatyard pros have flocked to the Fein (www.feinus.com) vacuum-assist electric sanders. The soft-pad Fein orbital we field tested was a DIYer’s dream come true. Its combination action and powerful high-RPM motor moved the 150-millimeter soft pad enough to get the final sanding job done in a hurry. The “hook it” type disc attachment system made disc changes easy and eliminated the danger of “thrown” discs.

In stubborn areas, where the barrier coat just didn’t want to let go, I tackled the challenge with a conventional medium-duty 9-inch Hitachi ([\[hitachi.com\]\(http://hitachi.com\)\) disc sander and 36-grit 3M “stick it” sanding discs. The soft pad helped to prevent gouging. Before resorting to such heavy-duty sanding equipment, be sure you’re familiar with it. Little things like moving the disc across the surface before pulling the trigger, and keeping the pad as flat as possible can add up to a more even surface.](http://www.</p>
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In one spot just below the turn of the bilge, I turned to the “big gun” in my sanding arsenal: a powerful, high-RPM Bosch grinder (www.boschtools.com). Armed with a stiff center-hole, hard-rubber flex pad and a 16-grit disc, I had a tool that could reshape granite, and—if I wasn’t very careful—could take much more than barrier coat off the bottom of the boat. On one hand, it made the ultra-adhered barrier coat fly off the surface. However, there was no room for a mistake—a slight twist of the wrist could result in a hull divot or the exposure of raw FRP laminate. It was like whittling with a chainsaw, and despite a deep desire to have at



A 1-mil sheet of plastic was used to cover the Soy Strip to keep the chemicals from drying out. Peel Away recommends its own paper or regular butcher paper.

A word of caution: With extended dwell time comes the chance of chemically impacting the gelcoat. In the case of *Wind Shadow's* paint peel, the very first layer of barrier coat had not blistered, and the chemical stripping only needed to get to that layer. A scuff sanding followed to expose the gelcoat in about 50 percent of the surface. If one’s intentions are to chemically remove all coatings external to the gelcoat, careful dwell time testing should be done in small patches to determine just how much chemical reaction the gelcoat will tolerate without softening.

Is the Challenge Worth It?

At the conclusion of the paint removal ordeal (two full weeks), I asked myself, “Is this scale of commitment really what your typical DIYer should tackle?” The answer? An uncertain “maybe.”

The job certainly can be turned over to pros and is a prime candidate for media blasting, but many yards don’t want the airborne residue associated with the process. Tenting the boat or moving it into a building adds expense. And when all is said and done, the epoxy barrier coat is pretty immune to baking soda and may require blasting with a more aggressive grit that can tear into the gelcoat as well as remove the barrier coat. The slow and arduous combo of chemical stripping and sanding used to rid *Wind Shadow* of 26-year-old barrier coat left the gelcoat intact and provided an even surface over which to reapply the same epoxy system that had endured for over two decades.

Now that more and more barrier-coated boats are reaching the end of the paint’s lifespan, owners will be looking for answers about what to do next. If there is a significant amount of interlaminar blistering in addition to barrier-coat blistering, it may be time for a “peel.” This even more aggressive approach cuts all the way down to FRP laminate, removing barrier coat, gelcoat, and the pocked first layer of FRP laminate. Once the offending surface has been cleared away, the remedy is to re-laminate whatever schedule of material was removed. The new composite skin incorporates vinylester or epoxy resin, and the complete job includes re-fairing the surface, barrier coating, and finally bottom painting the underbody—a job that dwarfs the efforts bestowed on *Wind Shadow*, and one that will require professional intervention.

Those considering such a project as removing barrier coats

it and clean off the surface with my “big dog” grinder, I let restraint prevail and later was glad to have kept the mega-grinding to a minimum. For more on the tools and materials used to strip *Wind Shadow*’s barrier coat, check out “Weapons of Choice” on page 31.



RECOATING

Having many times applied barrier coat and bottom paint to other boats using an airless spray system, I was disappointed to discover that the yard where I had hauled had stipulations prohibiting outside paint spraying. However, once I had rolled on four back-to-back coats of epoxy barrier coat and three coats of bottom paint, I changed my opinion. By using foam-roller

sleeves and a vertical pattern of paint application, I found that the material spread smoothly and evenly.

By following the manufacturers’ guidelines on over-coating times, all four barrier coat passes and a layer of bottom paint were applied in one day. Two more coats and a jack-stand shuffle to access the bare spots filled the schedule on the second painting day. Extra antifouling was applied in a band just below the boot top, zincs were replaced, and what took over two

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PS DIY		
ESTIMATE		
HULL STRIPPING & RECOATING		
ITEM DESCRIPTION	ITEM AMT	SUB TOTALS
EQUIPMENT		
TOOLS (IF RENTED)	\$200	\$ 200
MATERIALS		
SANDING DISKS/SAND PAPER	\$125	
STRIPPER + PAPER/ COVER	\$420	
TAPE / PLASTIC	\$46	
BARRIER COATING	\$720	
BOTTOM PAINT	\$730	
LABOR		
MAN HOURS	140	140 hours

should first evaluate their skill level, and then weigh the man hours and cost of the project versus what it would cost to have a professional do it. In my case, removal options included subcontracting a soda blasting, which would cost \$2,500 and would only rid the hull of antifouling paint, not the failed epoxy barrier coat. A heavy- grit media blasting to remove the epoxy—along with much of the gelcoat—was considered too aggressive. Leaving the whole job to the pros would’ve been pretty costly: A “peel” or blast approach and the followup fairing, resurfacing, epoxy barrier coats, and bottom paint would run about \$10,000-\$15,000. By doing it myself, the bill ran about \$2,500 for tools and materials (excluding boat yard use) and cost me two weeks of my time and sweat. (See DIY bill above for price breakdown.)

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We'll be monitoring the long-term performance of barrier coatings Interlux InterProtect 2000E and Sherwin Williams' Sea Guard 5000 HS Epoxy. Interlux Micron CSC was applied over both on Wind Shadow's bottom. We'll be looking for any differences in adhesion.

Weapons of Choice

Paint removal is a little like dental work in that there's no one perfect tool and getting the job done usually requires a tray full of devices—from multiple scrapers to sanding tools and sanding discs.

My arsenal of hand-scraping weapons ranged in caliber from a lightweight, extra-thin and narrow scraper sharpened to a knife's edge to what old shipwrights referred to as a "slick." This heavyweight king of the chisel family was kept sharpened with a whetstone and had the mass to plow into thick paint buildup and peel the substrate evenly. Drag scrapers utilize a pulling motion, and the key trick-of-the-trade is keeping a file handy to regularly sharpen the blade.

The downside of scraping paint from a surface goes beyond the drudgery and sore arms and shoulders associated with such toil. The real drawbacks are the nicks and gouges that result from even a slightly misaligned scraper. When the paint removal is completed and the surface has been thoroughly washed and inspected, it's time to repair the scraper damage with an epoxy filler. This is done at the same time blisters penetrating the laminate are repaired, and the extent of this endeavor can be kept to a minimum by rounding scraper edges and being very careful when a chisel is used for heavy-duty paint removal.

SANDERS

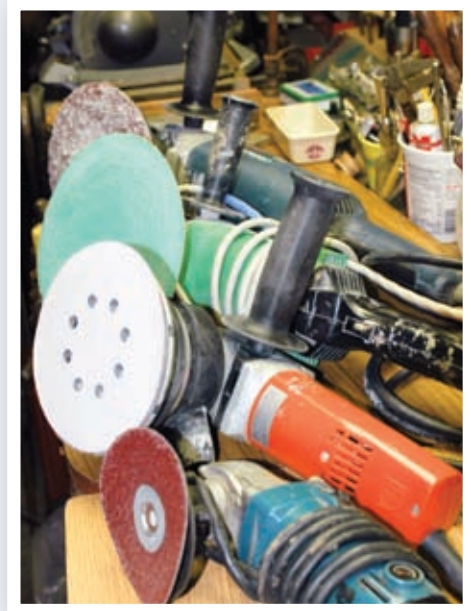
Fein's 120-volt AC random orbital vacuum-assist sander is a double-barrel winner. Not only is it a vigorous, efficient sander, but the dust and residue collection system is superb. Even so, I did need a conventional disc sander to tackle the really tough stuff, and not

having Fein's version of this tool, I was more than satisfied with my medium-duty, two-speed Hitachi sander/polisher, a tool for many occasions.

The heavy and powerful Bosch grinder had to be used with a left hand and would be good for removing coatings from a steel hull.

SANDING DISCS

Heavy-duty sanding discs used on soft pads transmit considerable torque, and conventional "Stikit" type adhesive-backed discs often fly off soft pads like sharp-edged Frisbees. To solve this problem, 3M (www.3m.com) and others have switched to backing discs with an attachment system called "Hookit." This three-dimensional securing system provides a Velcro-like connection between the disc and pad. Even 36-grit "paint buster" abrasive discs stay stuck to the pad. When it comes to less abrasive grits, the product from 3M was a favorite. Fein offers 150-millimeter diameter discs with a hole pattern matched to its soft pad. These abrasives are expensive, but they allow the vacuum system to work at its optimum level.

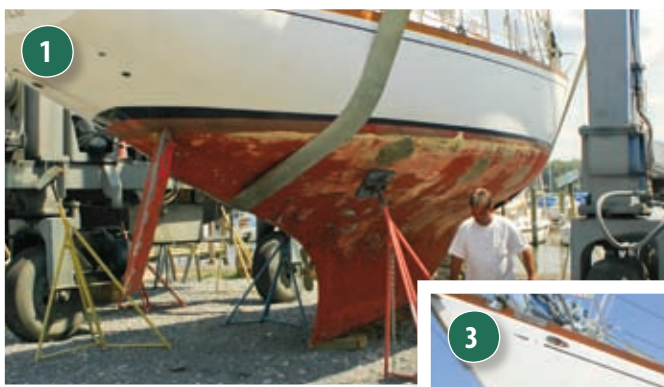


PS VALUE GUIDE SANDING DISCS FOR REMOVING BARRIER COAT

PRODUCT	TYPE	PRICE*	SOURCE	PERFORMANCE RATINGS			
				CUTTING	CLOG FREE	DURABILITY	ATTACHMENT
3M ★	Hook	\$73 / 25 pack	westmarine.com	Excellent	Excellent	Excellent	Excellent
FEIN	Hook	\$94 / 50 pack	jamestowndistributors.com	Excellent	Excellent	Good	Excellent
NORTON	Stick on	\$46 / 50 pack	jamestowndistributors.com	Good	Excellent	Good	Good

★ Best Choice

* Prices for 6-inch discs, 40-60 grit



Breaking it down and building it up: The bottom 1. post haulout and pressure washing; 2. after two weeks of scraping and stripping; and 3. the final product after barrier coats and bottom paint are applied.

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weeks to remove was reapplied in two days.

Not being able to resist the opportunity to do some additional testing, I applied Interlux's InterProtect 2000E (\$82 per five-quart kit) to half of the hull and Sherwin Williams' Seaguard Epoxy 5000HS (\$57 per two-gallon kit), an industrial epoxy coating system and a prime candidate for underwater use as a barrier coat, on the other half. The long-term evaluation will see how well each holds up and if there are any adhesion problems between the coatings and the Interlux Micron CSC bottom paint that was applied.

Bottom line: High marks have to be given to Interlux InterProtect for keeping *Wind Shadow's* solid FRP hull free from interlaminar blistering for over two decades. The difficulty in removing the barrier coat is a testimony to its adhesive quality.

Sherwin Williams Sea Guard was easy to apply and formed a smooth surface, but the InterProtect was even more user friendly. Time will tell which barrier coat holds up better in the long run.

InterProtect 2000/2001.

Although this lab test did not consider ease of application or adhesion, testers came up with two top picks: WEST System and InterProtect.

For more on this test, "The Blistering Truth," and other free blister-related articles, visit www.practical-sailor.com and click on Tools and Techniques. The Aug. 1, 2004 issue offers a former

boatyard professional's adventures with a DIY blister fix, and the July 15, 2001 issue, in "Hull Blisters: Know the Enemy," gives an update to the 1991 tests as well as a crash course on the anatomy of a laminate. ▲

THE PS VAULT

For its last comparison of barrier coatings (June 15, 1991), *Practical Sailor* commissioned fiberglass-analysis lab Comtex Development (Bridgewater, Mass.) to test a variety of products. Eleven coatings underwent the water transmission of materials (similar to the ASTM E 96-80 standards test) and overcoat exposure tests. The test products were Ashland 7241 isophthalic polyester, Aristech 12262 general purpose polyester, Pettit Polypoxy, Awlgrip 545, Courtaulds Coatings' VC Tar, Devco Coal Tar, CopperClad, System Three epoxy, WEST System epoxy, Interplastic VE8117 vinyl ester, and Interlux's

CONTACTS

DUMOND CHEMICAL,
212/869-6350, www.peelaway.com

FRANMAR,
800/538-5069, www.franmar.com

INTERLUX YACHT PAINTS,
908/686-1300, www.yachtpaint.com

SHERWIN WILLIAMS,
800/4-SHERWIN,
www.sherwin-williams.com

LESSONS LEARNED

Some Sage Advice from One DIYer to Another

- A file and a whetstone for sharpening scrapers are the bottom stripper's best friend.
- Heavy-duty rubber gloves, leather work gloves, and disposable latex gloves are a must. A hat, eye protection, and particle mask round out the safety gear.
- The choice of drag scraping or push scraping depends on the hull contour and your body position.
- A small stool and step ladder can make the job easier.
- Roll on the paint stripper using a thick-nap roller and a wide dabbing brush.
- Use masking tape to help hold the stripper covering, paper or plastic, in place.
- Remove blistered and flaking paint by first dry scraping, and then attack more reluctant areas with stripper.
- Lightweight back-vented coveralls effectively balance the need for heat dissipation and skin protection.