

Browse more than 1,300 woodworking project plans, DVDs, back-issue collections, videos, tool reviews, books, & more.

Thank You!

Thank you for ordering this *WOOD*® magazine download. We hope you enjoy being part of our online experience and that you have fun expanding your woodworking skills.

Please remember that this copyrighted material is for your use only. It is unlawful to share this file with someone else or to reprint it in any form.



Dave Campbell
Editorial Content Chief, *WOOD* magazine



Adobe Acrobat Reader Troubleshooting Guide

If you can read this page, your Acrobat Reader program is working correctly! But you may still have problems or specific issues, such as printing and saving your downloadable file.

My printer won't print the text correctly

Almost all printing problems are due to not enough free system resources memory. The files are very memory intensive because they include graphics, text, and photos. Close all other programs/applications and print directly out of the Acrobat Reader program, not your Web browser.

Patterns are not printing full-size

Make sure your printer is set to print at 100 percent, "print to fit" is not checked and "page scaling" is set to "none". These settings are selected in the printer setup or printer options.

I can't find my file now that it's downloaded

Rather than viewing the plan in your browser, you must save it to your hard drive. Download the file again, except this time try right-clicking on the red download button. A menu window will open. Select "Save target as" or "Save link as" to save the file to your hard drive. Once saved, you can open it up with Adobe Acrobat Reader.

For more details on using Adobe Acrobat Reader please visit our online help section at:

woodmagazine.com/adobe

WOOD Store

Customer Favorites

Shop Tools & Accessories



Indoor Furniture



Outdoor Furniture

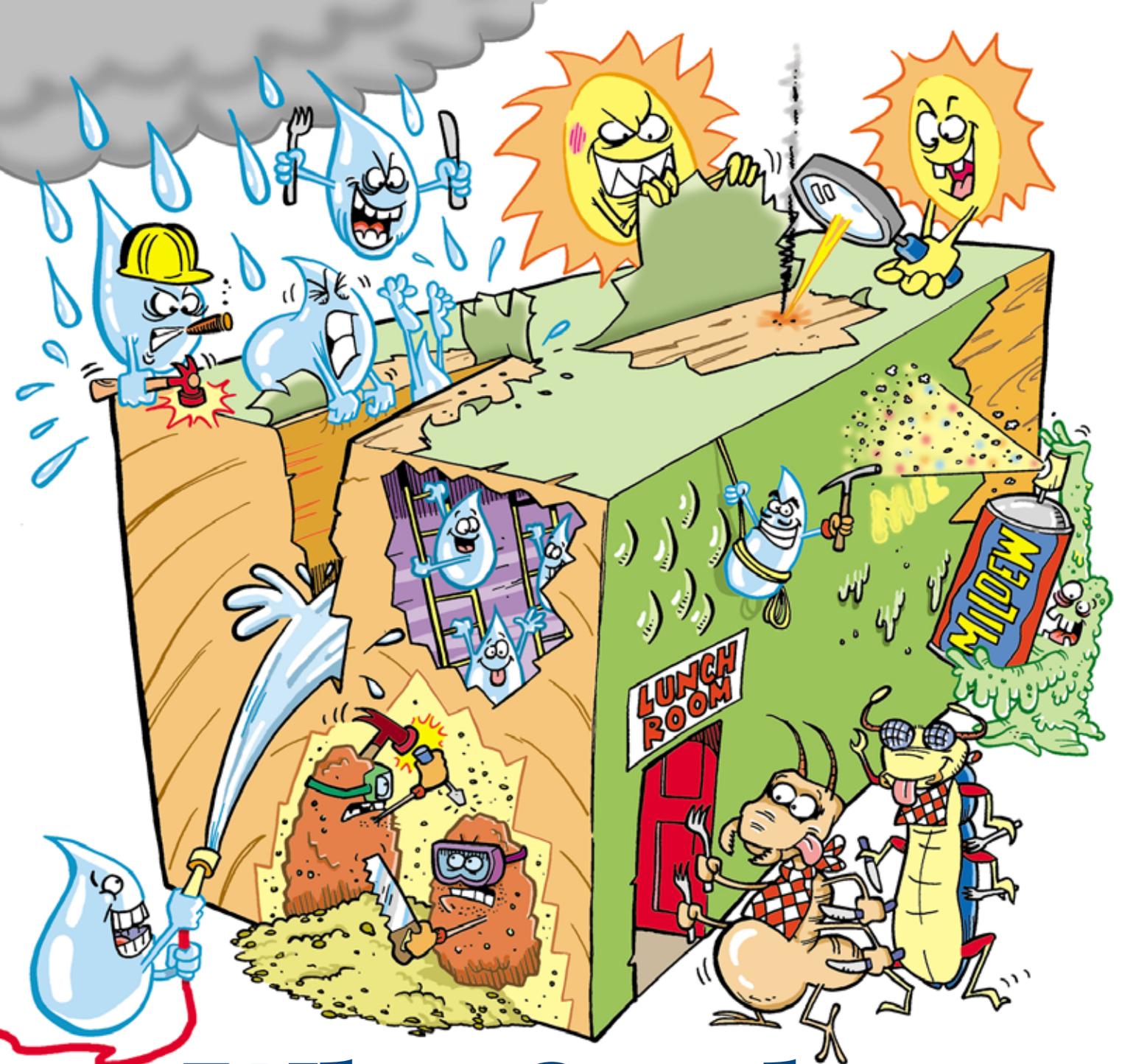


Mission Furniture



Visit the WOOD Store at:

WOODStore.net



Why Outdoor Finishes Fail

(And How to Prevent It)

Left to the elements, bare wood quickly falls prey to everything under—and including—the sun. To ward off the brutal elements, we apply finishes and other protections to our outdoor projects.

Thing is, once we store our brushes and sprayers, too often we forget that these finishes require periodic maintenance. As seasons pass, the paint on the garden arbor cracks and peels, the patio furniture splits and spalls, and colonies

of mold form a forest of black dots on decks and planters. If you've witnessed these signs, you may wonder why these outdoor finishes failed. We'll tell you, and provide a prevention and fix-it program to boot.

Outdoor Finish Selector and Schedule

FINISH TYPE		APPLICATION METHOD (1)	REAPPLICATION FREQUENCY (2)		DURABILITY (3)	NEED PRIMER?	NO. OF COATS (4)	WELL-SUITED FOR (5)	ADDITIVES/COMMENTS (6)
			H	V					
PENETRATING	WATER SEAL/REPELLENT/PROTECTANT	GS	6-12 MO.	3 YR.	P	NO	1-2	D	WP in the water seal products; M, UV, WP in water repellent/protectant products. Water seals let wood gray; repellent/protectant products help keep wood's natural color if frequently applied.
	PENETRATING OIL	B,S,W	1 YR.	2-3 YRS.	P	NO	1-2	D,L,S	Soaks into grain to keep wood from drying out. If it contains linseed (vegetable) oil, will serve as food for mildew colonies. Requires occasional cleaning with a water/bleach solution to stem mold/mildew growth.
	SEMITRANSSPARENT OIL STAIN	B,W	3-5 YRS.	3-8 YRS.	F	NO	1	D,L	M, UV, WP; adds some color while still allowing wood grain to show. If the previous finish was water-based, strip surfaces before reapplication. With oil-based stains, apply after thorough cleaning.
FILM-FORMING	MARINE SPAR VARNISH	B,S	1½ YRS.	2-3 YRS.	F	NO	3-4	B	UV, WP; offers excellent gloss retention, though it can yellow with time and multiple coats. Boatbuilders swear by it, but often strip and reapply spar varnish every year. Reapply with at least two coats.
	POLYURETHANE WITH UV INHIBITORS	B	2 YRS.	2-3 YRS.	G	NO	2-3	S	UV, WP; offers good gloss retention. To penetrate end grain during first coat, thin polyurethane with 25% solvent. Like spar varnish, this finish may yellow over time.
	SOLID-COLOR WOOD STAIN	B,S	3-5 YRS.	5-15 YRS.	G	YES	2-3	L	M, UV, WP; excellent ultraviolet protection, but not durable for high-traffic areas. Protects wood surface while enhancing wood texture. Stain-blocking primer needed on tannin woods, such as redwood and cedar.
	OIL*/LATEX EXTERIOR PAINT	B, R, S	3-5 YRS.	7-15 YRS.	G	YES	2	D,L,S	M, UV, WP; disguises wood with color, reducing texture. Excellent ultraviolet protection and wear. Use enamel for outdoor projects—furniture and garden structures—to avoid chalking issues.

* Many states have banned oil-based paints for environmental reasons; all states may ban oil-based paints over the next three years.

1. (B) Brush
(GS) Garden sprayer
(R) Roller
(S) Sprayer
(W) Wipe on

2. (H) Horizontal surfaces
(V) Vertical surfaces
Note that exposure to direct sunlight and excessively rainy climate shortens finish life.

3. For surfaces that receive a lot of abuse, such as a deck:
■ G Good
■ F Fair
■ P Poor

4. For bare wood; otherwise, one coat.

5. (B) Boats, and other applications where wood flexes
(D) Decks
(L) Large structures, furniture
(S) Small projects

6. (M) Mildewcide
(UV) Ultraviolet inhibitors
(WP) Waterproofer
Insect protection, such as an insecticide, can be an additive you mix in with the paint or stain for protection against crawling or flying insects.

Brush up on finish choices

Outdoor wood finishes fall into two groups: penetrating and film-forming. (See the chart *above*.) As the name suggests, penetrating finishes soak into the wood's fibers. Many contain water repel-

lents and preservatives that work to prevent mold and mildew and ward off invasions by insects.

Film-forming finishes, which include paints, solid-color stains, and varnishes, lie on top of wood surfaces. These shed

water while providing various degrees of protection from the sun. Pigmented films best shield wood from the elements. Through wear and abuse, though, all outdoor finishes weaken over time, regardless of their properties.

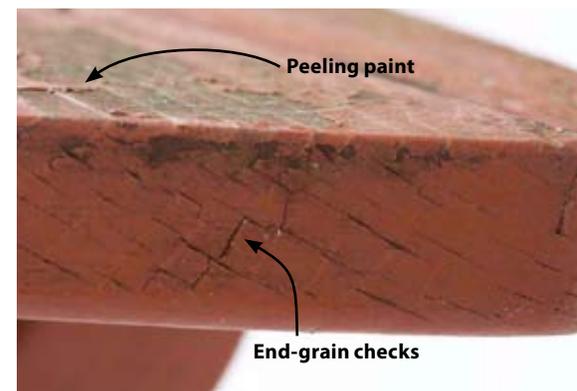
A dirty rotten shame: Meet wood's enemies

So what happens when a piece of finished wood sits outside? It gets beaten up, as if struck by the ol' one-two punch. The first blow is a pounding by the sun's ultraviolet (UV) rays, causing the protective finish to degrade. Film finishes may crack and peel open, as shown at *right*. With clear finishes, the sun's rays attack the lignin that holds wood fibers together, causing them to loosen and flake off with the finish.

Penetrating finishes also erode due to photochemical degradation. This leaves a degraded, gray surface that won't bond

with film-forming or latex stain finishes. However, oil-based semitransparent stains actually bond better to a slightly weathered surface.

With the breakdown of the finish, the second punch, in the form of moisture, delivers a much deeper blow, especially through end grain. It saturates the wood's fibers, making them swell, much more in width than in length. In colder climates, this moisture can freeze, prying fibers apart. During warm, dry periods with exposure to direct sunlight, the wood gives up moisture and contracts unevenly. The result of these swelling and contracting cycles: The

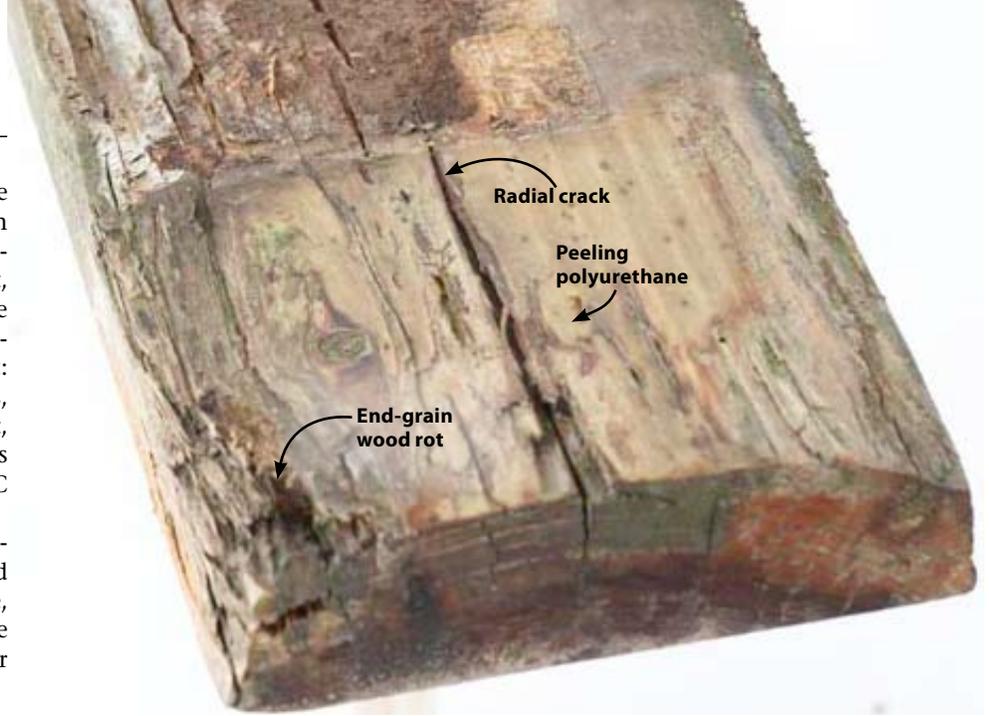


end grain splits and checks, as shown *above*; and radial cracks appear along

the length of parts, as shown at *right*—particularly in non-kiln-dried wood.

Also, when moisture spreads on the underside of a finish, it makes the finish lose its grip, causing film-forming finishes, such as polyurethane and paint, to flake or blister. But the worst-case scenario occurs when the wood's moisture content (MC) exceeds 30 percent: Microorganisms break apart wood fibers, create sponginess, and lead to total rot, as shown at *right*. (Note that 12–19 MC is typical of kiln-dried softwoods, 6–8 MC for kiln-dried hardwoods.)

Finally, we can't talk about failed finishes without touching on poor wood preparation, inadequate finish coverage, moisture penetration via hardware holes, mildew, and critters. We'll cover those next.



Planned maintenance for guys hating repair work

If you turned over a finished project to Mother Nature in the last few years, and haven't yet detected any telltale signs of wear—flaking, exposed graying wood, cracks in the finish and wood—check out the chart on the *previous page* to see if it's about time to renew that finish. If so, first wash the surface. Keep the water pressure low and the nozzle 15–18" away from the wood to avoid "fuzzing" the surface, as shown at *right*. Let the wood dry out for at least two days before sanding with 50- to 80-grit paper. Finally, reseal end grain with a water-repellent preservative, even if you plan to paint the piece.

If you've never built an outdoor project but are on the verge of doing so, make sure you use a wood capable of giving the project a fighting chance. (See "Woods that say 'nay' to decay," *below*.) Then apply a finish that best suits your needs. For best results, keep the bare-wood project out of direct sunlight prior to finishing. Even a little bit of exposure can harm the finish-to-wood bond.



Pressure-washing this deck railing raised wispy wood fibers, a process called "fuzzing."

One final note: Project hardware, particularly fasteners, provides inroads for moisture into a wood part's interior. If dealing with bolt or predrilled screw holes, coat these with a penetrating finish before installing the hardware. Seal the heads with an exterior putty; counterbore and plug screw holes.

Unfortunately for those who love wood's rich look, its grain and natural color, you may find that love costly in terms of time. Clear penetrating and film-forming finishes do a less-effective

job than semitransparent penetrating stains and paint at combating destructive UV rays. That means more frequent reapplications. When choosing a finish, decide up front how much work you want to do down the road, and then stick to the maintenance schedule for that choice. Once applied, reduce finish deterioration by keeping the project out of direct sunlight, if possible, and covering or storing it away during nonuse months. Also, avoid placing outdoor projects where standing water collects.

Woods that say "nay" to decay

Though all wood eventually decays, some species take longer and prove more resistant to rot and insect invasion. These include pressure-treated pine, redwood, cedar, cypress, ipe, white oak, mahogany, and teak. The last two are pricey, so reserve them for small projects. If using

treated pine, apply water repellent to all exposed surfaces upon project completion. If painting or staining treated pine, wait one or two weeks for the wood to dry before application. On the flip side, avoid untreated pine, poplar, maple, and red oak, as they lose the rot race every time.

Hands-on fixes for your most weather-worn projects

Don't feel bad if an outdoor project or two has gotten nasty-looking on you. It may not be too late to salvage both the project and your pride as a woodworker. Try these strategies to right the wrongs in your past.

ROT REQUIRES REPLACEMENT



Inspect your wood outdoor projects by poking and picking at them with an awl. If you detect soft, deteriorated, and crumbly surfaces, or severely split project parts, replace them.

PRIME TIME FOR FAILED PAINTED SURFACES



Treat flaking or peeling finishes by sanding the damaged areas down to bare wood before reapplying finish. If you're dealing with a painted finish, apply an exterior primer before repainting.

CHECK MATE: SEAL THE DEAL WITH GLUE



Seal checks in end grain by pressing an exterior-grade wood glue into them using a pliable putty knife or piece of flexible plastic. A hotel room card key or old credit card works well.

MAKE WEATHERED SURFACES EVEN-STEVEN



As shown in the *inset* photo, early- and latewood rings weather at different rates, leaving ridges. Flatten them by sanding with 80 grit (working up through 150 grit only for furniture).

BID ADIEU TO MOLD AND MILDEW



Scrub mold or mildew into oblivion with a nonchlorinated "oxy"-type cleaner containing sodium percarbonate (available at home centers). Wear gloves and eye protection. Rinse after scrubbing.

RENEW GRAY AND DISCOLORED WOOD



A commercial wood brightener and conditioner can restore some color to a grayed surface, especially within the first year or so. Brush or spray it on; then wash it off. After drying, sand and refinish. 🌿

Visit the **WOOD**[®] family of helpful Web sites!

WOODStore.net

Browse more than 1,300 woodworking project plans, DVDs, back-issue collections, videos, tool reviews, books, & more.



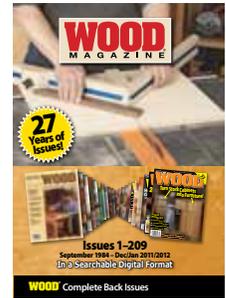
Plans



"Complete Guide" DVD-ROM's



Videos



Back-Issue Collections

WOODmagazine.com/videos

DVDs or downloads



The biggest names in woodworking help you build your skills with affordable videos (up to 2 hours long). Save money by doing the download.

FREE magazine support 24/7



WOOD magazine editors provide videos that enhance the content in the magazine. New videos added regularly.

By woodworkers, for woodworkers



Watch free videos of other woodworkers showing their stuff, from shop tips, to favorite jigs, to... well, just about anything!

Watch a demo before you buy



Don't spend a penny on a tool until you learn how it works. Tool School is like having a free woodworking show on your desktop!

WOODmagazine.com

A wealth of information just a click away.

WOODmagazine.com speaks to woodworkers of all skill levels with free woodworking plans, helpful forums, hundreds of articles, and more services to help you become a better woodworker.



toolreviews.woodmagazine.com

Everybody's a tool critic. Now it's your turn!

Readers rely on WOOD magazine for unbiased reviews of woodworking tools and accessories. You'll find them here, all in one place. While you're there, add reviews about the tools in your shop. Just click to compare specs, prices, and more.

