Forest Products Center

UT Extension
W158

WOOD PRODUCTS INFORMATION

A Test of Water-Repellent Coatings for Wood

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Water-repellent coatings slow the uptake of liquid water and are used to improve the appearance and longevity of exterior wood surfaces. By reducing the periodic wetting of wood, water-repellent coatings can reduce the swell-and-shrink cycles that contribute to the checking and weathering of exposed wood such as decking boards.

Many different water-repellents, varying widely in price, are available from a number of manufacturers. A test conducted at the University of Tennessee Forest Products Center compared some of these products.

The Test

When dry wood gets wet, it swells. If a water-repellent coating is effective, it will delay the wetting of the wood and thus slow down the rate of swelling. In this test, water-repellents for wood were tested for anti-swell efficiency according to ASTM D4446-84 Standard Test Method for Anti-Swelling Effectiveness of Water-Repellent Formulations and Differential Swelling of Untreated Wood When Exposed to Liquid Water Environments. This "swellometer "test involved measuring the swelling of wood samples after 30 minutes of submersion in water. The coated samples were then compared to the bare-wood controls. Each water-repellent product was tested on ten samples of southern pine wood.

Thirteen brands of water repellent were purchased from local retailers. Both water-based (water clean up) and solvent-based (also called oil-based — clean up with mineral spirits) formulations were included. Where possible clear products were chosen; although in some cases, slightly pigmented products (containing some color) were all that were available.

The swellometer. For the testing, this device was submerged in water to the top of the wood. The wood sample was free to move on its edges and at the top. The dial gauge at the top measured the amount of swelling in the coated wood pieces compared to the un-coated wood cut from the same boards.

Products Tested	Base	Retail Price (per gallon)
Ace SealTech	Solvent	$13.49
Behr Waterproofing Wood Protector	Water	$12.98
Behr Premium Transparent Weatherproofing	Water	$18.98
Behr Scandinavian Tung Oil Finish	Solvent	$17.98
Cabot Australian Timber Oil	Solvent	$29.97
Cabot Clear Solution	Solvent	$26.97
Flood CWF-UV	Water	$15.99
Olympic Maximum	Solvent	$24.97
Olympic WaterGuard	Solvent	$11.67
Penofin Pentrating Oil Finish	Solvent	$29.99
Permachink Lifeline Endure	Water	$37.95
Thompson's Water Seal	Solvent	$12.88
Thompson's Water Seal Advanced	Water	$19.97

The Results

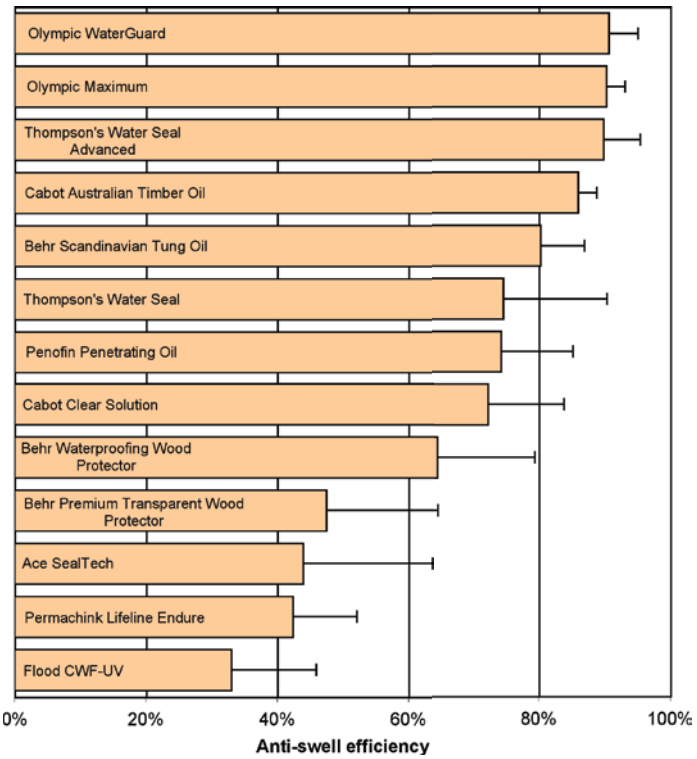
Each of the products tested provided significant protection against swelling compared to un-coated, bare wood. This reduction in swelling indicates that the water-repellents were doing their job: slowing the wetting of wood. As expected, none of the products completely prevented the wetting and swelling of the wood — it is generally accepted that there is no wood coating that is completely waterproof.

The products varied in their effectiveness. In the graph below, the bars show the anti-swell efficiency (ASE) of each product, calculated as the difference in swelling between the repellent-coated and the un-coated wood samples:

$$ASE(\%) = \frac{(\text{swelling of uncoated sample} - \text{swelling of coated sample})}{\text{swelling of uncoated sample}} \times 100\%$$

The longer bars indicate less swelling and more water repellency – a "perfect" water-repellent would have 100% anti-swell efficiency. The error lines on the end of each of the bars show one standard deviation, which is a measure of the variability in the data.

The solvent-based products in general provided better water repellency in this test. However, there were water-based formulations (e.g. Thompson's Water Seal Advanced) that performed relatively well.



There was no relationship between the price of the water-repellent and its performance in this test. For example, the Olympic WaterGuard was the least expensive product, but it provided the greatest average swelling protection.

Further Testing Needed

This test measured only the short-term swelling prevention of the water-repellents on freshly coated samples. This short-term test doesn't give information on how well the water-repellents will perform over time in exposed situations. Also, as per ASTM specifications, only one wood species (southern pine) was tested and results may differ with other species. Preservative-treated southern yellow pine is the most commonly used decking material, but it tends to shrink and swell a lot compared with other species such as cedar. Other species also may interact with coatings in different ways, due to differences in the wood anatomy and chemistry.

Ongoing research at the Forest Products Center is testing the performance of these products after exposure to the elements and after simulated weathering cycles.

Conclusion

Water-repellents slow the wetting of wood and reduce swelling. Many water-repellents are available and the different products vary in their effectiveness at preventing swelling. Both water-based and solvent-based products can perform well; price, however, is not a reliable guide to performance in short-term swelling tests.

Please Note

Water-repellents are intended to provide only short-term protection against liquid water. Water-repellents are not wood preservatives, and they cannot protect wood that is exposed to regular wetting or wood that is in contact with the ground. Preservative treated wood or naturally durable wood (eg. cedar) must be used for exposed decking, posts and other applications where the wood is exposed to the elements.

Water-repellents also have a short lifespan — from about six months to a few years. One way to assess whether your water-repellent is still effective is to sprinkle the surface of the wood with water — if the water doesn't bead up, it may be time for another application.

For More Information

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