The Use of Postsaver® Barrier Wraps to Increase Service Life of Wood in Ground Contact

by

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Abstract

This paper reviews the testing to date on Postsaver® barrier wrap wood preservative systems and also discusses data related to other barrier wrap protective systems. Included in this review are tests performed by the Building Research Establishment, Oregon State University, and Mississippi State University on barrier wrap systems. The ongoing tests have proven that the use of barrier wraps can significantly reduce the occurrence of decay and insect attack on treated and untreated wood structures when the ground contact portion of the wooden member is protected from soil contact by the barrier. The depletion of wood preservative in the ground line zone will also be addressed as part of the existing tests. Future research work is planned on this system at outside universities and research centers worldwide and will be discussed briefly. The concept of using above ground retentions of wood preservatives for wooden members in ground contact if the member is properly protected with a barrier wrap will also be discussed.

Keywords: Barrier Wraps, Service Life, Decay, Efficacy, Leaching, Depletion, Ground Contact

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Introduction

The concept of using a protective barrier to prevent attack on wood is not particularly new. In effect, many chemical preservative systems accomplish this by forming a barrier on the outer portions of the wood to prevent attack on the vulnerable inner portions of the wood. Similarly, millions of utility poles have had their service lives extended through the use of penetrating preservatives that are covered with a barrier wrap. Sometimes the two products are combined into a single "bandage" for simpler application.

Various physical barrier systems, typically plastic wraps, have been proposed for other uses through the years. None of the wrap systems have achieved commercial success though for a variety of reasons.

A recent development, Postsaver®, eliminates the problems of past systems through its combination of two essential attributes. First, the barrier system itself is a very thick, UV stabilized polyethylene with proven long term durability. Second, the plastic sheeting is adhered to the wooden substrate with bitumen to form a tight, weather resistant system that affords long term protection to the wooden substrate.

Four recent technical reports from three well-respected wood research organizations have demonstrated the performance of the barrier preservative systems. This report discusses and summarizes several of the research projects to date.

Results and Discussion

Study 1. Soil Bed Test at Oregon State University

In 1997, Oregon State University (OSU) researchers, T.C. Scheffer and J.J. Morrell, reported on a 2 year soil bed test where polyethylene boots were applied to both untreated and low retention treated stakes[1]. Ponderosa pine was chosen for the stakes since its sapwood has low decay resistance. Flat stakes were used and saw kerfs on the entire length of both flat faces were made on some stakes to simulate seasoning checks. These kerfs increased the severity of the test.

Half of the stakes in the test were fitted with a 2-mil polyethylene boot before insertion of the stakes into the test soil. The remaining stakes had no boot. In addition to the completely untreated stakes, stakes with low retentions of either a minimal-leaching ground contact preservative, copper naphthenate, or a boron containing above ground preservative, disodium octaborate tetrahydrate, were included.

The stakes were then inserted for 2 years in soil beds prepared from forest soil. This is the same methodology described in AWPA E14, Standard Method of Evaluating Wood Preservative in a Soil Bed. Water was periodically applied to the soil and "no attempt was made to keep water from entering the boots at the upper end." At the end of the 2 year exposure, the stakes were removed and weighed to determine any losses.

The boots effectively prevented any attack, even on the untreated stakes. The booted stakes whether they were kerfed or nonkerfed had losses ≤ 2% which the authors attributed to loss of extractives. The booted untreated stakes performed as well as the stakes with either of the preservative treatments.

In comparison, the unbooted stakes showed evidence of attack in every group. Most of the stakes had weight losses of 10-40%. The best performing group in the unbooted series, the nonkerfed copper naphthenate group, had 3 of 10 stakes with an average weight loss of 30% while the remaining seven averaged 2%. This could have been due to a localized instance of copper tolerant fungi or uneven preservative distribution. Regardless, it shows the effectiveness of the barrier in that none of the booted stakes showed any attack.

The authors conclude

> Booted stakes had little evidence of decay, whereas those without boots experience large weight loss and extreme shrinkage and deformation.

Study 2. Termite Test at Mississippi State University

In 2000, termite resistance tests were conducted at Mississippi State University (MSU) on barrier coated wood in comparison to non-coated wood[2]. The test was done according to AWPA E1, Standard Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites. The barrier coating used in this test was the Postsaver system.

For the "no choice" portion of the test, common subterranean termites (*Reticulitermes spp.*) were presented with a test specimen that was either coated or uncoated. There was no other food source available in the test container and this is considered the more severe test for termite resistance.

The results of the no choice were very convincing. There was no attack on any of the coated wood and all of the termites had starved to death at the end of the four week test. No detectable weight loss occurred for the coated samples in comparison to the 12-27% weight losses for the uncoated wood. This heavy attack was coupled with only slight termite mortality for the uncoated controls. In this severe test, the barrier coating clearly showed its termite resistance capabilities.

For the “choice” part of this test, both uncoated and coated southern pine wafers are in the containers and the termites can choose a food source. Again, there was no attack on any of the coated wafers while the uncoated ones had mostly heavy attack with some moderate attack. This test shows that the barrier system is repellant to termites and they will seek another food source if one is available.

Study 3. Soil Bed Test by British Research Establishment

In 1998, researchers at the British Research Establishment (BRE) reported the results of a soil bed test done on a barrier system[3]. (The BRE Centre for Timber Technology and Construction is the British counterpart of the USDA Forest Products Laboratory.) The testing methodology was similar to that discussed above but it followed appropriate European standards.

An important point in this particular test series in that the stakes were only wrapped with the barrier and not completely booted. Thus there was the possibility of attack on the buried, but unprotected stake end. The wrapping was the two-part Postsaver bitumen-polyethylene system and this test showed the importance of using a “boot” as opposed to a “wrap”.

The stakes in this test were about 20 inches long and those that were wrapped had about 4 inches of exposed wood at the bottom of the stake. The wrap extended 12 inches and then there was 4 inches of exposed wood at the top. The stakes were planted so that about 2 inches of the wrap was above the soil line and 10 inches was below. The samples are evaluated at 16, 32 and 48 weeks for attack and moisture content by cutting the stake into 2 inch zones and evaluating each zone.

The results are again conclusive in that the portions of the stake protected by the barrier system had essentially no attack even though there was considerable attack on the unprotected, buried ends of those stakes. Furthermore, the moisture contents of the below ground wrapped portions were below fiber saturation (<28%) while the exposed portion were 70-115%. Keeping wood dry is the first step in preventing its attack.

The unwrapped stakes were very wet with 95-170% moisture contents. The unwrapped stakes were also severely decayed at the end of the test with 40% weight loss in the ground line zone.

An important point is that there was an “interfacial zone” at the bottom edge of the wrap. Below that 2 inch zone, the unwrapped portion was wet and decayed and above that zone, the wrapped stake was dry and not decayed. In the interfacial zone, the attack and moisture contents were intermediate at 50% moisture content and 5% weight loss at test end. This further demonstrates the efficacy of the wrap in that even if it is breached, the attack is prevented from

extending any significant distance. To further elucidate the effect of “breaches” in the wrap, the BRE then conducted field stake tests where a saw cut was made in the plastic wrap.

Study 4. Field Stake Test by British Research Establishment

For this test[4], purposeful saw cuts were made in Postsaver® boots that otherwise encased the ends of the stakes. The cuts were halfway between the ground line and the end of the stake and were just through the plastic wrap. For comparison, stakes with undamaged boots and with a wrap as in the soil bed test were included. Naturally, untreated controls were included as well.

The European test protocol, EN252:1989, Field Test Method for Determining the Relative Effectiveness of a Wood Preservative in Ground Contact, was used. This test procedure is essentially the same as AWPA E7, Standard Method of Evaluating Wood Preservatives by Field Tests with Stakes. The only significant difference between the two procedures is that the rating scale for EN252 downgrades a stake more severely when the two scales are compared on the basis of loss of cross sectional area[5].

For this test, a series of low retention CCA stakes was also included. These stakes were dip treated to an average 0.09 pcf which is about one-fourth of the normal ground contact level.

Per the test method, the stakes were evaluated by tapping them with a wooden mallet and then inspecting and rating those stakes that did not break upon impact. Obviously, only those portions not covered with the wrap or boot could be examined since the test is continuing.

After five years of exposure, all of the untreated control stakes are decayed as expected. The unwrapped CCA stakes are showing slight attack as are the exposed, buried ends of the untreated but wrapped stakes. The wrapped CCA stakes did not show any signs of attack.

Essentially all of the booted stakes including those with the purposeful saw cut are sound after five years of exposure. One untreated stake with the saw cut failed but in this case, the saw cut was relatively deep and breached the protective bitumen inner layer.

The test is continuing but, at this point, it appears that boots are effectively protecting untreated wood as long as the secondary protective layer of bitumen is not breached. It would seem unlikely that such an occurrence would happen in the normal installation and life of the booted product.

Summary and Conclusions

Barrier wraps can be used to successfully lower the moisture content of wooden members near the ground line and slow the infection by decay and insect attack. All the studies published to date on the PostSaver® barrier wrap system show it to be superior to many other wrap systems since it actually contains dual protection: the bitumen inner layer protects wood in contact with this "tar-like" substance and the outermost polyethylene film layer further hinders attack and prevents water absorption. Further investigation into barrier wrap systems by Baecker and others[6-11] has shown that a wooden member that has been protected by a barrier wrap can use a much lower retention of active ingredient in the preservative system leaching is significantly reduced.

The American Wood-Preservers' Association (AWPA) is in the process of evaluating barrier wrap systems within a newly formed joint Task Force within AWPA Subcommittees T-2 (Treatment of lumber and Timbers) and T-4 (Treatment of Poles and Posts). However, this work may now include the possibility of allowing an above-ground wood preservative retention for use in exterior, ground-contact situations, if the system employs a barrier wrap. Consequently, the AWPA Executive Committee has deemed this matter to be a P-Committee prerogative should they wish to lower or modify previous retention recommendations.

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