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Copper Foil-Polyethylene Laminate Termite Barrier

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ABSTRACT

Polyethylene barrier wraps have been used to slow the depletion and out-migration of oil-borne wood preservatives from utility poles into the soil substrate where they are embedded. Laboratory research at the University of Hawaii has demonstrated copper foil laminate to polyethylene is an effective barrier to termites. Untreated posts wrapped in copper foil/polyethylene laminate barrier were placed in a field study at the New Orleans Lower Coast Algiers test site in August 2013. Some of the copper foil/polyethylene laminate was manufactured into a butyl-mastic repair tape. Feeder stakes running the entire length of the posts were placed directly against the tape seams to facilitate termite pressure on the butyl-mastic adhesive. After two years, extensive activity from native and Formosan subterranean termites was present but there was no observation of any termite grazing or damage to either the repair tape or the barrier wraps.

BACKGROUND

The copper foil laminate (Cu-Lam) barrier was tested against Formosan subterranean termites in laboratory assays by Dr. Ken Grace, professor of entomology at the University of Hawaii, using a penetration test in tubes. In half of the test samples he abraded the polyethylene surface so the termites could get a hold of the material with their mandibles. The termites were not able to penetrate the 18 micron copper foil in either the abraded or unabraded polyethylene laminate test samples.

A pilot study was initiated in New Orleans in the Lower Coast Algiers region where the Audubon Species Survival Center for Research of Endangered Species is located. The center sits on 1,200 acres of U.S. Coast Guard and city of New Orleans land along the Mississippi River. It includes undeveloped acreage around Wilderness Park, a protected archaeological dig site and it is also home base for programs such as Audubon Center for Research of Endangered Species. The mixed forest area is infested with both native subterranean termites (*Reticulitermes* sp.) and Formosan subterranean termites (*Coptotermes formosanus* Shiraki) and provides a secluded research area not accessible to the public where field trials can be safely monitored over long periods of time completely undisturbed.

MATERIALS AND METHODS

To determine the effectiveness of the butyl mastic copper foil/polyethylene (poly) laminate repair tape and to further test the Cu-Lam barrier itself against termite attack in field conditions, twenty untreated Eastern red cedar posts measuring 72 in. by 4 in. diameter were prepared as follows:

1. Ten posts were completely wrapped in the Cu-Lam barrier and sealed with butyl mastic copper foil/poly tape
2. Six posts were completely wrapped with Cu-Lam barrier but not sealed with butyl mastic copper foil/poly tape. The Cu-Lam barrier was attached to the posts with staples
3. Two posts were partially wrapped with Cu-Lam barrier
4. Two posts were left unwrapped
5. Twenty SPF (spruce/pine/fir) 2x4x72 in untreated studs were used as feeder material

Each Eastern red cedar post was embedded vertically in the soil to an approximate depth of 16-20 inches. Untreated SPF studs were buried directly against and on each side of the post to encourage termite pressure along the entire taped seam. Testing the termite resistance of the butyl mastic in the copper foil/poly tape was the primary objective of this field trial (Figure 1). Each embedment location set two Eastern red cedar posts alternating between two untreated SPF (Figure 1). The ten embedment locations were placed approximately three feet apart in two rows (Figure 2) to maximize termite activity. The treatment site was left undisturbed for a year before returning to the site to determine termite activity on the repair tape, barrier wrap, Eastern red cedar posts and the SPF feeder stakes.

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RESULTS

The test site was inspected one year after installation on August 27, 2014. The untreated feeder stakes were pulled out of the soil and examined for termite activity. Although Formosan termites were present in the surrounding trees, the pressure on the feeder stakes was not as high as anticipated. One feeder stake next to the butyl mastic repair tape seam on a Cu-Lam wrapped Eastern red cedar post showed evidence of live Formosan termites present and feeding on the stake (Figure 3). The Formosan termites did not graze on or penetrate the Cu-Lam barrier or the butyl copper foil/poly tape even though there was plenty of evidence of termite presence along the surface and edge of the repair tape (Figure 4). All the feeder stakes were re-embedded back in place next to the Eastern red cedar posts.

The test site was re-inspected on August 18, 2015 after two years in the field. Additional termite pressure was found on the Cu-Lam barrier posts but there was no indication of any grazing or penetration of the barrier. The embedded section of the wood on some of the feeder stakes was damaged by the termites to the point that one stake fell over (Figure 5). Additionally, we observed feeder stakes that had been discarded horizontally at random along the perimeter of the test site. These horizontal feeder stakes were surplus and not used in the field trial and were not examined in 2014. These horizontal SPF 2x4s were completely destroyed by the Formosan termites (Figure 6) by August 2015.

An inspection was also conducted on November 11, 2015. Unfortunately, the test site was partially flooded from heavy rainfall and the termites were not active on the feeder stakes. At this time one unsealed Eastern red cedar post that was wrapped with the Cu-Lam barrier but not sealed with the butyl copper foil/poly tape was found with carpenter ants under the barrier. The ants had chewed an opening through the barrier starting at a staple perforation and had caused some damage to the post (Figure 7).

SUMMARY

With sustained termite pressure directly on the seams, no termite attack was observed on the butyl mastic repair tape. Formosan termite pressure on the test site during the first year was less than what was expected even though the trees surrounding the area were active. By the second year the Formosan termites attacked the feeder stakes causing extensive damage. The SPF feeder stakes and adjacent posts wrapped with the Cu-Lam barrier were not attractive to the termites when compared to the horizontal SPF 2x4s. None of the Eastern red cedar posts wrapped with barrier were penetrated by the termites, although frass galleries showed plenty of evidence that termites had been present on the barrier and repair tape where it was touching the feeder stakes. The horizontal SPF 2x4s that were placed on the soil randomly around the test site were extensively attacked by both *Coptotermes formosanus* and *Reticulitermes* sp. subterranean termites and completely consumed in most cases.

To further explore the effects of the Cu-Lam barrier on the termites, further testing will continue at the Lower Coast Algiers site. Additional sites may be installed in New Orleans to determine if the same effects can be reproduced with other Formosan subterranean colonies. Further trials are needed to clarify the observations made during this field study, additional trials are under way to see if the mere presence of the copper foil barrier is somewhat repellent to termites.



Figure 1. Eastern red cedar post with two untreated SPF feeder stakes on each side.



Figure 2. Test site in Lower Coast Algiers, New Orleans, Louisiana.



Figure 3. Evidence of Formosan termite feeding on the feeder stake.



Figure 4. Signs of Formosan termite feeding pressure on the butyl copper foil/poly tape.

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Figure 5. This feeder stake was consumed by Formosan termites to the point where it fell over.



Figure 6. Randomly placed feeder stakes around the test site were completely consumed by Formosan termites.

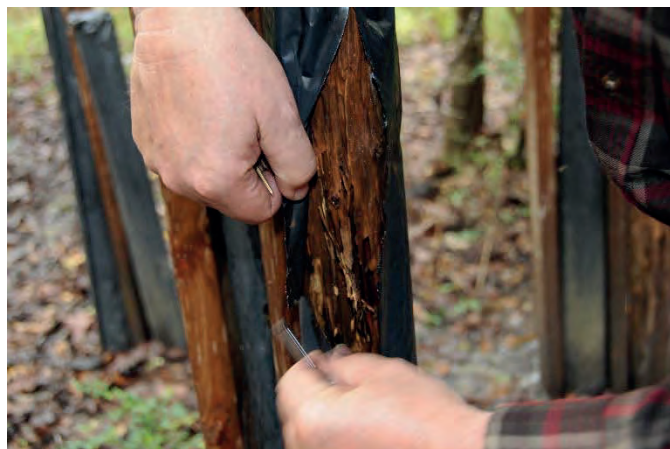


Figure 7. Carpenter ants found under the barrier in an unsealed Eastern red cedar post that was wrapped with the Cu-Lam barrier but not sealed with the butyl copper foil/poly tape.