Test Results | Termite Resistance
THERMORY®Ash | THERMORY®Pine | THERMORY®Spruce

TERMITE RESISTANCE

TESTED

- Resistance and potential possibility of termite attack and resistance of THERMORY® Ash, THERMORY®Pine, and THERMORY® Spruce comparison to Southern Pine which is knowns as a termite favorite.

RESULTS

- This test indicated that the termites feed more heavily on the Southern Pine choice controls than the modified wood, however the modified Pine was attacked more than the modified Ash.

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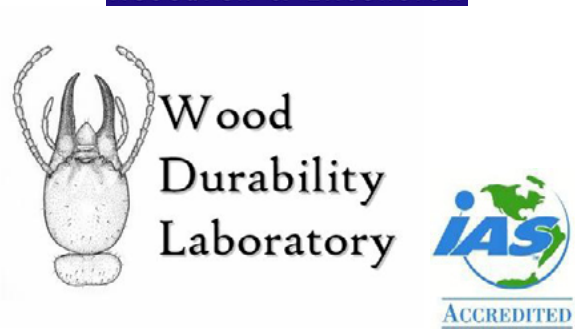
Formosan Subterranean Termite Resistance to Thermally Modified Materials and 5 Southern Pine Control Samples



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We kindly request that all public references to the contents of this report be attributed to "LSU AgCenter's Wood Durability Lab"

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BACKGROUND

The Wood Durability Laboratory (WDL) at the LSU AgCenter became an ISO 17025 accredited laboratory through the International Accreditation Services (IAS) accreditation system on March 1, 2008, July 24, 2008, November 20, 2009, and May 31, 2012. Additional test standards were added by IAS to the WDL approved scope of services on July 24, 2008 (Table 1). The lab has been essentially operating under ISO 17025 Guidelines for over five years. This report is an AC-85 compliant report as determined by IAS guidelines the report has not been reviewed by a licensed professional engineer or a third party skilled in the art.

Samples and information sheets on traceability of samples were provided by the sponsor. The results from this test only relate to the items tested.

Table 1. Current WDL test methods accredited by IAS.

Wood testing	ASTM Standards D 143[2], D 1037[2]; Test methods referenced in Section 4.0 of ICC-ES Acceptance Criteria AC257[3]
Wood preservatives	ASTM Standards D 1413[1], D 1758[1],D2481[3], D 3273, D 3345[1], D 4445[3] and D5516[4]; AWPA Standards A9[4] E1[1], E5[3], E7[1], E9[3], E10[1], E11[1], E12[1], E16[3], E18[3], E21[4], E22[2], E23[2], E24[1], E26[4] and EXX-XX*[4]; WDMA Standards TM-1[1] and TM-2[1] *Antisapstain Field Test Method

[1]Approved March 1, 2008, [2]Approved July 24, 2008, [3]Approved November 20, 2009, & [4]Approved May 31, 2012.

OBJECTIVES

The objective of this study was to evaluate thermally modified materials provided by the sponsor. The test consisted of 3 different materials that are used for outdoor decking and cladding: thermo-ash, thermo-pine and thermo-spruce for resistance to Formosan subterranean termites (*Coptotermes formosanus*). The choice test method was used for this test with each jar containing one thermally modified sample and one untreated southern pine (SP) control (choice) sample. The test included 15 thermally modified samples and 15 untreated SP choice samples, and 5 SP controls.

Table 2. Sample treatment and identification.

Sample ID	Treatment	MC Sample ID
5-Jan	Thermo Pine	1-5mc
10-Jun	Thermo Spruce	6-10mc
15-Nov	Thermo Ash	11-15mc
1c-5c	pine – SP choice	1c mc-5c mc
6c-10c	Spruce - SP choice	
11c-15c	ash – SP choice	
16c-20c	SP controls	

MATERIALS AND METHODS

Procedure

The test was performed in accordance with American Wood Protection Association (AWPA) E1-09 Standard Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites (AWPA 2012). The choice method was used. This test was started on 8/27/2012 and concluded on 9/24/2012. All samples were milled into 1 in. x 1 in. x ¼ in. test specimens. All samples were milled in the correct grain orientation and contained 4 to 6 rings per inch. Sample treating was conducted by Thermory.

Each testing jar contained 150 g of autoclaved sand and 30 ml of distilled water. Two samples were placed in each jar on top of the sand, one thermally modified sample and one SP choice sample. Termites were obtained from the Brechtel State Park (Algiers, La) on 8/13/2012 and added to the E1-06 test on 8/27/2012. Samples of termites were taken, weighed and an average weight per termite determined. An average of 0.00552g per termite was determined; therefore, each jar contained 2.21 grams of termites. Four hundred termites, measured by weight, were introduced into each jar on the side opposite the samples.

After 28 days of exposure, the samples were removed and cleaned with distilled water to remove termites and sand, rated and oven dried. Each sample was rated based on the following AWPA rating system:

10	Sound, surface nibbles permitted
9	Light attack
7	Moderate attack, penetration
4	Heavy attack
0	Failure

The data obtained were analyzed for resistance with means and standard deviations determined (SPSS 2012). The Least Significant Difference (LSD) mean separation test procedure was used (Steel and Torrie 1980). Different capital letters within columns indicate that significant differences were found at the significance level $\alpha = 0.05$. Significant differences were not found among treatments when means shared the same letters within columns. All data and records collected during the tests are maintained at the WDL and are available upon request.

RESULTS

Table 3 provides a summary of the means (Ave.) for the primary data of interest (i.e., percent mortality, percent weight loss, and treatment ratings). Table 4 provides information on significant differences determined between treatments for the experimental variables using the LSD test procedure. Table 5 shows statistical data for termite mortality, sample weight loss, and sample rating, respectively. Samples

containing the same letters are not significantly different from one another but are significantly different from the others.

Percent Mortality. All live termites are counted after the 28 day exposure period. Percent mortality was obtained with this calculation: (initial termites – live termites) / initial termites)*100. As shown in Table 4, there was no significant difference among all jars.

Percent Weight Loss. Percent weight loss is based on the original oven dry weight using this formula: (initial calculated ODWt – final ODWt)/initial calculated ODWt). The test sample oven dry weight is determined by measuring the moisture content of the matched sample and using it to calculate the sample oven dry weight. The final oven dry weight is determined by oven drying the sample after the test. The thermally modified Spruce and Ash had the lowest sample weight loss and were not significantly different from one another. The thermally modified Pine was significantly different from all groups. All of the control samples were not significantly different from one another.

Rating. The rating of each sample was done visually by estimating the extent of damage. The rating scale used was 0 to 10 with 0 being complete failure and 10 being sound with nibbles allowed. The thermally modified Spruce and Ash had the highest sample ratings and were not significantly different from one another. The thermally modified Pine was significantly different from all groups. All of the control samples were not significantly different from one another.

CONCLUSIONS

This choice test indicated that the termites feed more heavily on the SP choice controls. The thermally modified materials did have less attack than the SP choice controls. However the thermally modified Pine samples were heavily attacked. The untreated SP control mortality, sample weight loss, and sample ratings were consistent with previous test results. The results from the untreated SP control samples indicate strong termite vigor and performance, and hence the test data are valid.

REFERENCES CITED

American Wood Protection Association (AWPA). 2009. Standard method for laboratory evaluation to determine resistance to subterranean termites (E1-09). 2012 book of standards. Birmingham, AL.

SPSS For Windows. 2012. Chicago, IL.

Steel, R.G.D. and J.H. Torrie. 1980. Principle and procedures of statistics – A biometrical approach. 2nd edition. McGraw Hill. New York. 633 p.

Table 3. Summary data for termite mortality, sample weight loss, and sample rating.

ID	ANOVA	Mortality (%)	Mortality Average (%)	Weight Loss (%)	Wt. Loss Average (%)	Ratings (0-10)	Ratings Average
1	1	11.25		9.86		7	
2	1	10.50		35.13		0	
3	1	11.75	11.55	23.76	21.65	4	4.4
4	1	13.25		27.60		4	
5	1	11.00		11.91		7	
6	2	12.50		7.05		8	
7	2	10.25		5.88		8	
8	2	13.75	12.60	5.06	6.05	8	8.0
9	2	11.50		6.22		8	
10	2	15.00		6.03		8	
11	3	15.25		11.17		8	
12	3	10.00		9.81		7	
13	3	13.25	12.80	10.39	10.17	8	7.8
14	3	13.00		8.22		8	
15	3	12.50		11.28		8	
1c	4	11.25		30.31		0	
2c	4	10.50		30.03		0	
3c	4	11.75	11.55	34.10	32.08	0	0.0
4c	4	13.25		31.83		0	
5c	4	11.00		34.13		0	
6c	5	12.50		31.02		0	
7c	5	10.25		28.26		0	
8c	5	13.75	12.60	31.47	31.99	0	0.0
9c	5	11.50		35.53		0	
10c	5	15.00		33.68		0	
11c	6	15.25		30.59		0	
12c	6	10.00		29.41		0	
13c	6	13.25	12.80	27.30	28.61	0	0.0
14c	6	13.00		27.36		0	
15c	6	12.50		28.38		0	
16c	7	12.00		32.77		0	
17c	7	10.25		32.46		0	
18c	7	10.75	11.30	34.62	33.57	0	0.0
19c	7	10.50		35.15		0	
20c	7	13.00		32.85		0	

Table 4. Summary data for termite mortality, sample weight loss, and sample rating with corresponding LSD grouping.

Choice Test						
ANOVA ID	**Mortality (%)**	**LSD**	**Weight Loss (%)**	**LSD**	**Ratings (0-10)**	**LSD**
1	11.55	**A**	21.65	**B**	4.4	**B**
2	12.60	**A**	6.05	**A**	8.0	**A**
3	12.80	**A**	10.17	**A**	7.8	**A**
4	11.30	**A**	32.08	**C**	0.0	**C**
5	12.60	**A**	31.99	**C**	0.0	**C**
6	12.80	**A**	28.61	**C**	0.0	**C**
7	11.30	**A**	33.57	**C**	0.0	**C**

Table 5. Termite mortality, weight loss, and sample rating data and LSD grouping.

Treatment	**Sample ID**	**ANOVA ID**	**Mortality (%)**	**LSD Group**
pine – SP choice	1c-5c	4	11.30	**A**
SP controls	16c-20c	7	11.30	**A**
Thermo Pine	1-5	1	11.55	**A**
Thermo Spruce	6-10	2	12.60	**A**
spruce – SP choice	6c-10c	5	12.60	**A**
Thermo Ash	11-15	3	12.80	**A**
ash – SP choice	11c-15c	6	12.80	**A**

Treatment	**Sample ID**	**ANOVA ID**	**Weight Loss (%)**	**LSD Group**
Thermo Spruce	6-10	2	6.05	**A**
Thermo Ash	11-15	3	10.17	**A**
Thermo Pine	1-5	1	21.65	**B**
ash – SP choice	11c-15c	6	28.61	**C**
spruce – SP choice	6c-10c	5	31.99	**C**
pine – SP choice	1c-5c	4	32.08	**C**
SP controls	16c-20c	7	33.57	**C**

Treatment	**Sample ID**	**ANOVA ID**	**Rating**	**LSD Group**
Thermo Ash	11-15	3	7.8	**A**
Thermo Spruce	6-10	2	8.0	**A**
Thermo Pine	1-5	1	4.4	**B**
pine – SP choice	1c-5c	4	0.0	**C**
spruce – SP choice	6c-10c	5	0.0	**C**
ash – SP choice	11c-15c	6	0.0	**C**
SP controls	16c-20c	7	0.0	**C**

END OF REPORT