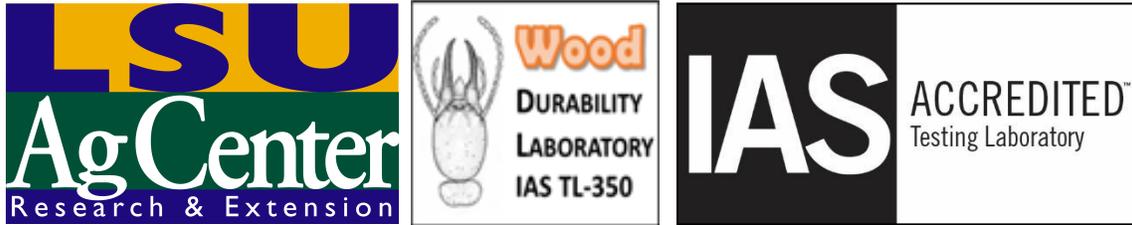


**Performance of Thermally Modified and Unmodified Softwoods from Montana
Timber Products by Standard Laboratory Testing**



Report #: WDL-2025-03b

Final Report To:

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June 30, 2025

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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. The lab has been operating under ISO 17025 Guidelines for over seventeen years. This report follows ICC-ES AC85. This report has not been reviewed by a licensed professional engineer nor a third party skilled in the art. Samples and information sheets on traceability of samples were provided by the sponsor and verified at the time of sample creation. The results from this test only relate to the items evaluated.

Table 1. Current scope and WDL test methods accredited by IAS.

IAS Accreditation Number:	TL-350
Accredited Entity:	Wood Durability Laboratory
Address:	227 Renewable Natural Resources Louisiana State University Baton Rouge, Louisiana 70803
Contact Name:	Dr. Qinglin Wu, Director
Telephone:	(225) 578-8369
Effective Date of Scope of Accreditation:	July 25 th , 2023
Accreditation Standard:	ISO/IEC Standard 17025:2017

Fields of Testing	Accredited Test Methods
Wood testing	ASTM Standards D143 ² , D1037 ² (Compression Parallel to surface, section 12 excluded), D2395 ⁸ , D3043 ⁵ (Methods A & D only), D3201 ¹⁰ , D3500 ¹⁰ , D4442 ⁸ , and D5456 ⁵ (Test methods referenced in Annex A3 & A4); AC257 ³ test methods referenced in Section 4.0, excluding 4.3.1.1, 4.3.1.2, 4.3.1.4, & 4.3.2.2)
Wood preservatives	ASTM Standards D2481 ³ , D3273 ⁵ , D3345 ¹ , D4442 ⁸ , D4445 ³ , D5516 ⁴ , and D5664 ¹⁰ AWPA Standards E1 ¹ , E5 ³ , E7 ¹ , E9 ³ , E10 ¹ , E11 ¹ , E12 ¹ , E16 ³ , E18 ³ , E20 ⁶ , E21 ⁴ , E22 ² , E23 ² , E24 ¹ , E26 ⁴ and E29 ⁵ WDMA Standards TM-1 ¹ and TM-2 ¹ WDL-SOP-25 ⁶ – Field Evaluation of Termiticide against Subterranean Termites AC380 ⁷ test methods referenced in Sections 3, 4.1, 4.2 and 4.3, excluding 4.4.1 through 4.4.9)

Approved: ¹March 1, 2008, ²July 24, 2008, ³November 20, 2009, ⁴May 31, 2012, ⁵January 24, 2014, ⁶March 31, 2016, ⁷July 26, 2016, ⁸June 6, 2018, ⁹April 28, 2020, and ¹⁰July 25, 2023.

OBJECTIVES

The objective of this study was to evaluate performance of thermally modified and unmodified control softwoods for Montana Timber Products.

MATERIALS AND METHODS

1. Decay Procedure

Testing procedures used were based on the AWP A E10 “Standard Method of Wood Preservatives by Laboratory Soil-Block Cultures” (AWPA 2025). Decay fungi were obtained from the USDA FPL, Madison, Wisconsin, consisting of *Gloeophyllum trabeum*, *Postia placenta*, *Trametes versicolor*, and *Irpex lacteus*. The decay fungi were grown on agar media for two weeks prior to the samples being placed into the testing bottles (on the top of each feeder strip). After a two-week growing period in the testing bottles (allowing the fungi to grow on the feeder strip); test samples were placed on top of the feeder strips. Substrates used were southern pine for brown rot decay and sweetgum for white rot decay. Five samples were evaluated per group.

Table 2. Treated samples plus controls.

E10 Decay Test			
<i>Gloeophyllum trabeum</i> (GT)		<i>Postia placenta</i> (PP)	
ID	Test Group	ID	Group
1-5	UT Pine	6-10	UT Pine
1t-5t	MCA	6t-10t	MCA
21-25	Thermally mod Pine	26-30	Thermally mod Pine
41-45	Thermally mod W. Hemlock	46-50	Thermally mod W. Hemlock
61-65	Untreated Douglas fir	66-70	Untreated Douglas fir
H1-H5	Untreated W. Hemlock	H6-H10	Untreated W. Hemlock

<i>Trametes versicolor</i> (TV)	
ID	Group
11-15	UT Sweetgum
11t-15t	MCA
31-35	Thermally mod Pine
51-55	Thermally mod W. Hemlock
71-75	Untreated Douglas fir
H11-H15	Untreated W. Hemlock

<i>Irpex lacteus</i> (IL)	
ID	Group
16-20	UT Sweetgum
16t-20t	MCA
36-40	Thermally mod Pine
56-60	Thermally mod W. Hemlock
76-80	Untreated Douglas fir
H16-H20	Untreated W. Hemlock

Table 3. Experimental product plus control samples.

Treatment	Sample ID #	MC
Untreated Pine	1-5	1mc-5mc
Thermally mod Pine (dark)	6-10	6mc-10mc
Thermally mod W. Hemlock (light)	11-15	11mc-15mc
Untreated Douglas fir	16-20	16mc-20mc
Untreated Western Hemlock	21-25	21mc-25mc

2. Termite Procedure

The test was performed in accordance with American Wood Protection Association (AWPA) E1-23 Standard Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites (AWPA 2024). The no-choice test method was used. The test started on 3/20/25 and was completed on 4/17/25. This test supports product development and positioning for exterior siding and cladding products exposed to harsh climates. The experiment consisted of 5 thermally modified pine, 5 thermally modified western hemlock, 5 untreated Douglas fir, 5 untreated southern pine, and 5 untreated western hemlock. Lumber was sent to the WDL from Montana Timber Products and samples were machined into 1 x 1 x ¼ in. test specimens. The pine controls were provided by the WDL and were milled in the correct grain orientation containing 4-6 rings per inch.

Each test jar contained 150 grams of autoclaved sand and 30 milliliters of distilled water. A sample was placed in each jar on top of the sand and four hundred termites were introduced to each jar on the side opposite the sample. Termites were obtained from New Orleans, LA on 3/19/25 and added to the E1-23 test on 3/17/25. Samples of termites were taken, weighed and the average weight per termite was determined to be 0.00502 grams per termite. Therefore, each jar contained 2.007 grams of termites determined by weight.

After 28 days of exposure, the samples were removed and cleaned with distilled water. The following AWPA E1-23 Rating Scale was used to visually rate each sample.

- 10 Sound.
- 9.5 Trace, surface nibbles permitted.
- 9 Slight attack, up to 3% of cross-sectional area affected.
- 8 Moderate attack, 3-10% of cross-sectional area affected.
- 7 Moderate/severe attack, penetration, 10-30% of cross-sectional area affected.
- 6 Severe attack, 30-50% of cross-sectional area affected.
- 4 Very severe attack, 50-75% of cross-sectional area affected.
- 0 Failure.

3. Bending Test Procedure

The lumber for this testing was sent to the WDL for testing. Test specimens were prepared from high-grade lumber. Sample preparation, treatment, and redrying procedures were conducted by Montana Timber Products personnel. Treatments and controls are: Thermally Modified Pine, Thermally Modified Western Hemlock, Untreated Douglas Fir, Untreated Pine, and Untreated Western Hemlock. All test samples were conditioned to reach constant weight (equilibrium) in a controlled room at 22+5C (72+9F) and 65+1% relative humidity.



Figure 1. Flexure test set-up.

Test specimen preparation was performed in accordance with the *American Society for Testing and Materials (ASTM) D5664*, Standard Test Method for Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on Strength Properties of Fire-Retardant Treated Lumber. Testing was done in accordance with procedure 3 for initial strength effects only, in section 6.5 of ASTM D5664-17. Bending tests were conducted in accordance with ASTM D143-22 per Sect. 6.3.4. Modulus of rupture (MOR, psi), modulus of elasticity (MOE, psi), and work to maximum load (WML, kJ/mm³) properties were evaluated on the specimens. A small sample was then machined from the unbroken portion as close to the failure place as possible. The sample was used to measure sample density and actual moisture content based on oven drying method (104 C for 24 hours).

4. Hardness Test Procedure

The hardness test was done based on ASTM D143 with 2x2x6 inch samples. A steel ball 0.444 in. (11.3 mm) in diameter was pressed one half its diameter into the wood and load was recorded. Two penetrations were made on a tangential surface, and two on a radial surface for each sample. The load was applied continuously throughout the test at a rate of motion of the movable crosshead of 0.25 in. (6 mm/min).

5. Hygroscopic Property Procedure

The test was performed in accordance with ASTM D3201 Standard Test Method for Hygroscopic Properties of Fire-Retardant Wood and Wood-Based Products. The 2x4 boards were milled into test samples, stickered, and allowed to air dry in the laboratory at ambient temperature for 14 days. Each sample was weighed prior to high humidity exposure. Then the samples were exposed to 92 % RH and 81 degrees F for 168 hours. Immediately after exposure, the samples were weighed to obtain weight after exposure. Samples were then dried in a force-draft oven at 104C until constant weight was achieved. Final Oven-dry weight was taken to obtain oven-dry sample weight. Moisture content of each specimen was measured and again after high-humidity exposure.

6. Radial and Tangential Shrinkage Test Procedure

The radial and tangential shrinkage test was done based on modified ASTM D143. Since all standard specifies green wood and all wood received is already dried, the dimension measurements were done after samples were conditioned to a high humidity level and dried.

RESULTS

1. Decay Results

The data obtained were analyzed for fungal resistance with means and standard deviations (SPSS 27). The Least Significant Difference (LSD) mean separation test procedure was used (Steel and Torrie 1980). Different capital letters following each data value 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 and are available upon request per ISO 17025 Lab Guidelines.

Table 3 summarizes the brown rot fungi data and Table 4 summarizes the white rot fungi data for weight loss. Figure 1 shows plots of the individual groups against the brown rot decay fungi. Figure 2 shows plots of the individual groups against the white rot decay fungi.

1. *Gloeophyllum trabeum* – The pine controls had the largest weight loss of 54.45%. Thermally modified western hemlock had 2.18% and thermally modified pine had 6.01% sample weight loss. The MCA wood control had 2.12% weight loss. Significant differences at the $\alpha=0.05$ significance level can be found in Table 3.
2. *Postia placenta* – The pine controls had the largest weight loss of 55.27%. Thermally modified western hemlock had 0.74% and thermally modified pine had 5.33% sample weight loss. The MCA wood control had 3.77% weight loss. Significant differences at the $\alpha=0.05$ significance level can be found in Table 4.
3. *Trametes versicolor* – The sweetgum controls had the largest weight loss at 36.25%. Thermally modified western hemlock had 0.20% and thermally modified pine had 3.44% sample weight loss. The MCA wood control had 8.43% weight loss. Significant differences at the $\alpha=0.05$ significance level can be found in Table 5.
4. *Irpex lacteus* - The sweetgum controls had the largest weight loss at 42.077%. Thermally modified western hemlock had 3.39% and thermally modified pine had 3.35% sample weight loss. The MCA wood control had 2.21% weight loss. Significant differences at the $\alpha=0.05$ significance level can be found in Table 6.

Table 4. Summary data for weight loss % for brown rots *Gloeophyllum trabeum* and *Postia placenta*.

WDL-2025-03b			
Brown Rot Weight Loss Stats			
Group ID	BR Decay	Weight Loss %	LSD Group
MCA Wood	<i>Gloeophyllum trabeum</i>	2.12%	A
Thermally Modified W. Hemlock		2.18%	A
Thermally Modified Pine		6.01%	A
Untreated W. Hemlock		25.66%	B
Untreated Douglas fir		37.82%	C
UT Pine		54.45%	D

Group ID	BR Decay	Weight Loss %	LSD Group
Thermally Modified W. Hemlock	<i>Postia placenta</i>	0.74%	A
MCA wood		3.77%	A
Thermally Modified Pine		5.33%	A
Untreated W. Hemlock		25.64%	B
Untreated Douglas fir		31.83%	C
UT Pine		55.27%	D

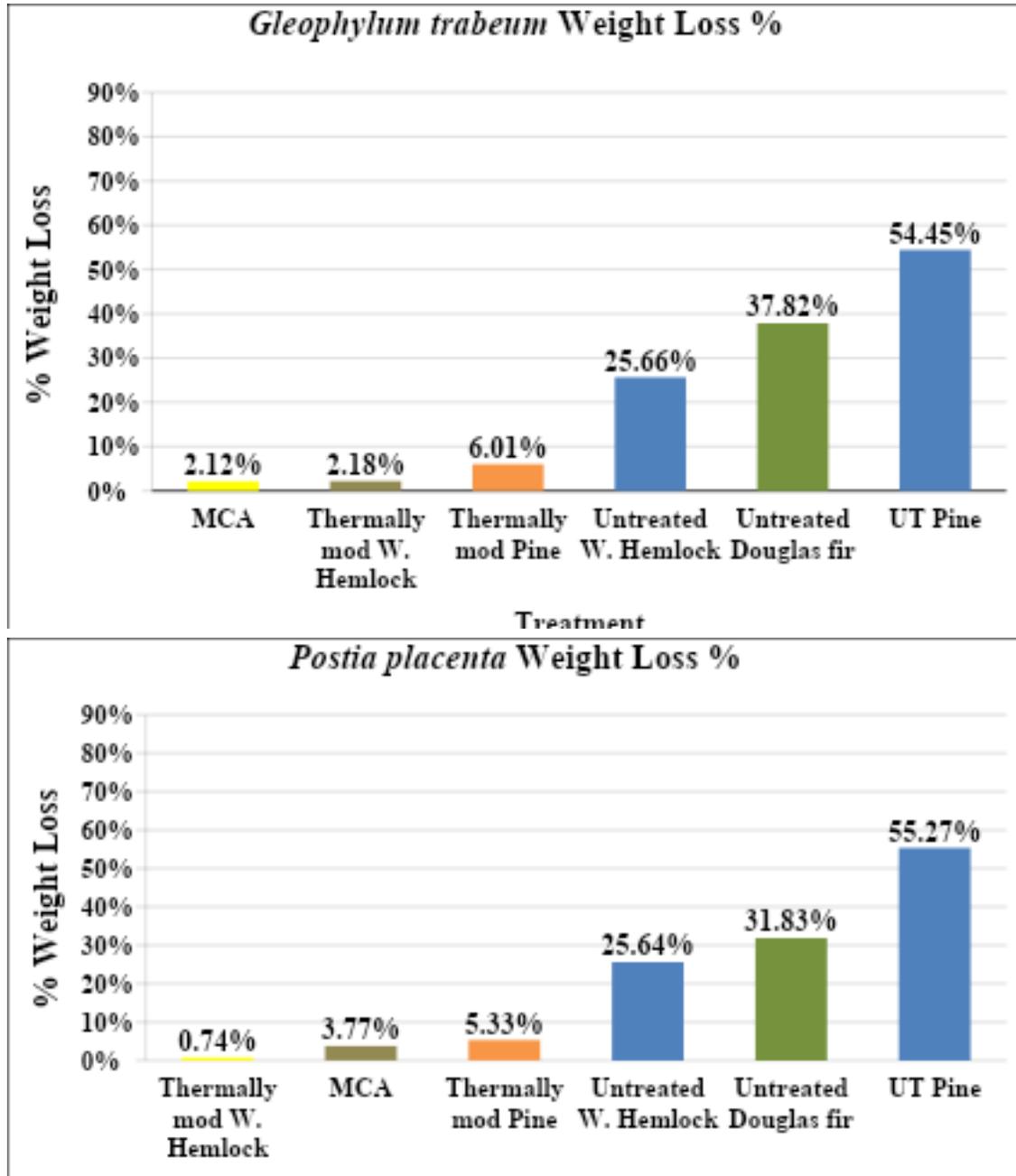
*Weight loss values sharing a capitool LSD letter are not significantly different at $\alpha=0.05$.

Table 5. Summary data for weight loss % for white rots *Trametes versicolor* and *Irpex lacteus*.

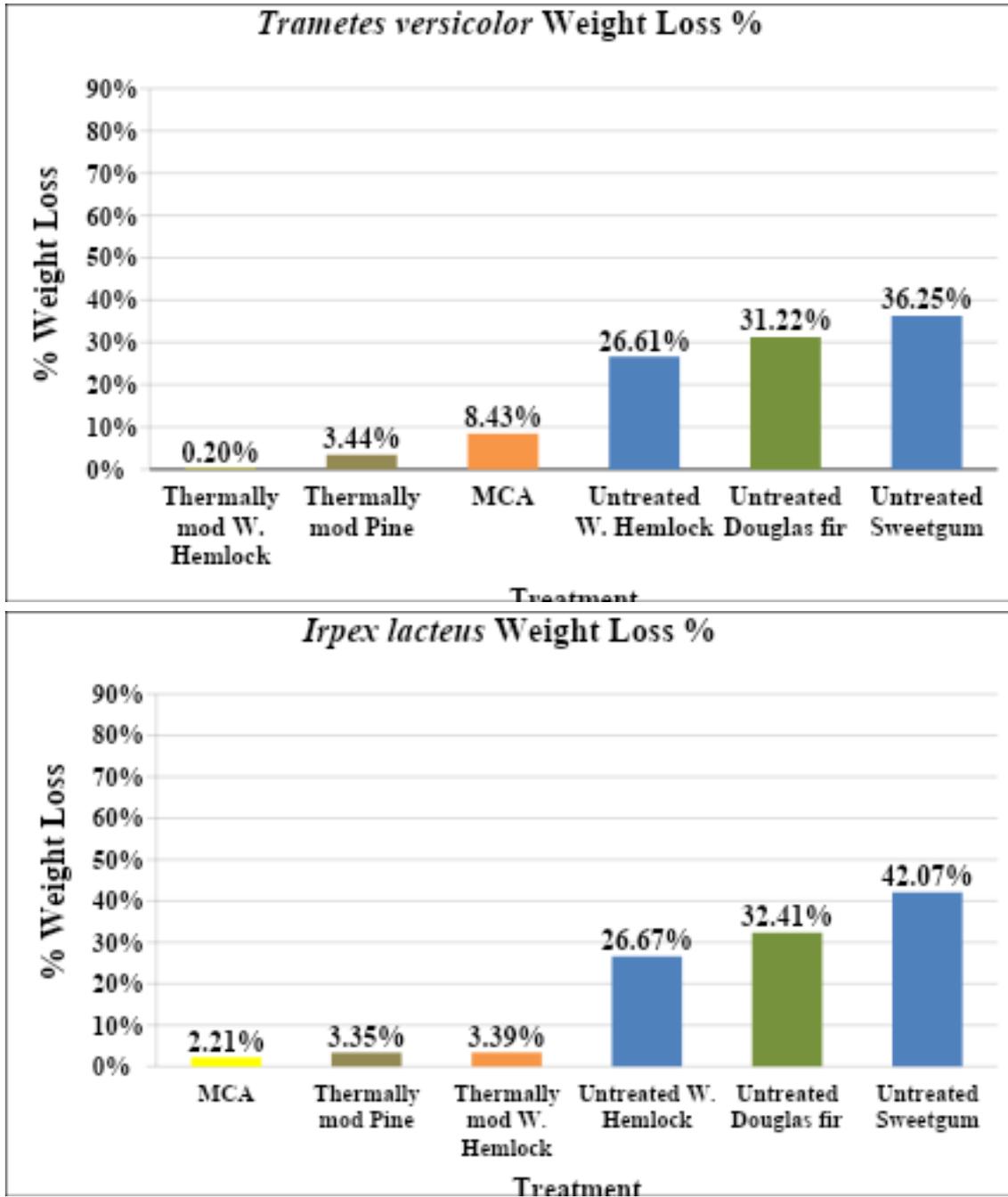
WDL-2025-03b			
Brown Rot Weight Loss Stats			
Group ID	BR Decay	Weight Loss %	LSD Group
Thermally Modified W. Hemlock	<i>Trametes versicolor</i>	0.20%	A
Thermally Modified Pine		3.44%	A
MCA Wood		8.43%	B
Untreated W. Hemlock		26.61%	C
Untreated Douglas fir		31.22%	D
Untreated Sweetgum		36.25%	E

Group ID	BR Decay	Weight Loss %	LSD Group
MCA Wood	<i>Irpex lacteus</i>	2.21%	A
Thermally Modified Pine		3.35%	A
Thermally Modified W. Hemlock		3.39%	A
Untreated W. Hemlock		26.67%	B
Untreated Douglas fir		32.41%	C
Untreated Sweetgum		42.07%	D

*Weight loss values sharing a capital LSD letter are not significantly different at $\alpha=0.05$.



Figures 1. Graphs of means for percentage weight loss evaluated against *Gleophyllum trabeum* and *Postia placenta* brown rot fungi after 12 weeks exposure.



Figures 2. Graph of means for percent weight loss evaluated against *Trametes versicolor* and *Irpex lacteus* white rot fungi after 12 weeks exposure.

2. Termite Results

The data obtained were analyzed for termite resistance with means and standard deviations (SPSS 2024). The Least Significant Difference (LSD) mean separation test procedure was used (Steel and Torrie 1980). Different capital letters following each data value 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 and are available upon request per ISO 17025 Lab Guidelines.

Table 3 provides statistical data for termite mortality, sample weight loss, and sample rating using the Least Significant Difference (LSD) mean separation test procedure.

Percent Termite Mortality. All live termites were counted after the 28-day exposure period. The untreated group had the lowest mortality value of 7.1%, followed by the remainder of the groups between 8-10%. Groups were not significantly different at the $\alpha=0.05$ significance level.

Percent Sample Weight Loss. Percent weight loss was based on the original oven dry weight using this formula: $(\text{calculated ODWt} - \text{final ODWt}) / \text{calculated ODWt} * 100$. 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 was determined by oven drying the sample after the test. Weight loss for the untreated controls was 83.94%. The Thermally modified Western Hemlock had the next highest sample weight loss at 76.28%. The Untreated Douglas fir had 38.59% samples weight loss. The Thermally modified pine had 21.24% sample weight loss. Finally, the untreated western hemlock had 19.38% sample weight loss. Groups were significantly different at the $\alpha=0.05$ significance level, see table 6.

Sample Rating. Trained and experienced scientists estimated the extent of damage by visually sample rating each sample. The rating scale used was 0 to 10. The mean rating value of the untreated pine, thermally modified western hemlock, and the untreated Douglas fir were 0, indicating failures. Thermally modified pine had ratings of 5, indicating severe termite attack followed by the untreated western hemlock with ratings of 4 indicating very severe attack. Groups were significantly different at the $\alpha=0.05$ significance level, see table 6.

Table 6. Termite mortality, weight loss, and sample rating and statistics*.

WDL-2025-03a						
Treatment	Mortality	AVE	Weight Loss	AVE	Ratings	AVE
Untreated Pine	8.25%		82.29%		0	
	8.25%		88.26%		0	
	7.25%	7.10%	85.96%	83.94%	0	0
	5.75%		76.26%		0	
	6.00%		86.91%		0	
Thermally Modified Pine	11.25%		26.36%		4	
	10.50%		22.80%		5	
	9.00%	9.80%	18.48%	21.24%	6	5
	9.00%		16.94%		6	
	9.25%		21.63%		5	
Thermally Modified Western Hemlock	8.50%		74.97%		0	
	9.00%		81.80%		0	
	8.00%	8.35%	77.54%	76.28%	0	0
	7.50%		77.67%		0	
	8.75%		69.41%		0	
Untreated Douglas fir	7.50%		35.06%		0	
	7.75%		37.98%		0	
	7.50%	7.85%	42.29%	38.59%	0	0
	7.25%		38.77%		0	
	9.25%		38.83%		0	
Untreated Western Hemlock	9.50%		20.04%		4	
	10.75%		22.47%		4	
	10.00%	9.85%	17.58%	19.38%	5	4
	9.50%		19.29%		4	
	9.50%		17.53%		5	

Table 4. Means and statistical rankings of test specimens.

Treatment	Mortality	LSD	Weight Loss	LSD	Rating	LS D
Untreated Pine	7.10%	A	83.94%	C	0	B
Thermally Modified Pine	9.80%	A	21.24%	A	5	A
Thermally Modified Western Hemlock	8.35%	A	76.28%	C	0	B
Untreated Douglas fir	7.85%	A	38.59%	B	0	B
Untreated Western Hemlock	9.85%	A	19.38%	A	4	A

*Groups containing the same capital letter are not significantly different at $\alpha=0.05$.

Table 7. Individual species comparisons of test specimens.

Treatment	Mortality	LSD	Weight Loss	LSD	Rating	LSD
Untreated Pine	7.10%	A	83.94%	B	0	B
Thermally Modified Pine	9.80%	A	21.24%	A	5	A

Treatment	Mortality	LSD	Weight Loss	LSD	Rating	LSD
Untreated Western Hemlock	9.85%	A	19.38%	A	4	A
Thermally Modified Western Hemlock	8.35%	A	76.28%	B	0	B

*Groups containing the same capital letter are not significantly different at $\alpha=0.05$.

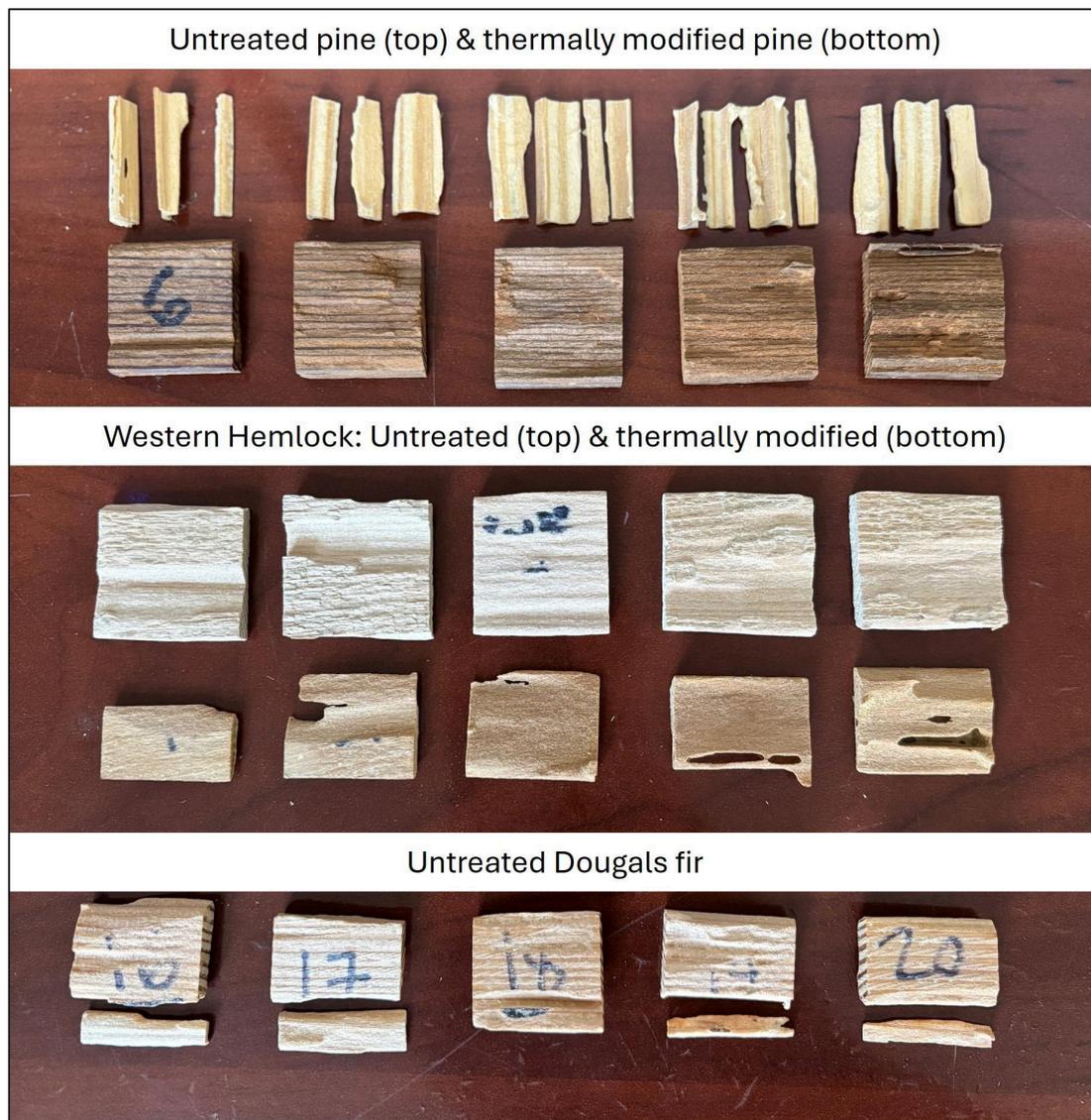


Figure 3. Samples after 28 days exposure to Formosan subterranean termites. Top: untreated pine, 2nd row thermally modified pine, 3rd row thermal modified western hemlock, & last row untreated Douglas fir.

3. Bending Test Results

Table 8. Bending properties of test specimens.

MEAN	Density	% MC	MOE, PSI	MOR, PSI	WML, BTU
Untreated Pine	0.62	10.13	1414383.00	10763.75	0.0838
Thermally mod Pine	0.53	6.67	1581180.47	9244.40	0.0500
Untreated Western Hemlock	0.49	9.03	1199918.75	8957.83	0.0583
Thermally mod W. Hemlock	0.51	8.20	1832988.78	11063.06	0.0550
STDEV	Density	% MC	MOE, PSI	MOR, PSI	WML, BTU
Untreated Pine	0.08	0.54	277454.00	1333.04	0.0052
Thermally mod Pine	0.05	0.68	120349.28	614.60	0.0141
Untreated Western Hemlock	0.01	0.98	235688.41	550.27	0.0170
Thermally mod W. Hemlock	0.04	0.47	206638.64	1907.18	0.0280

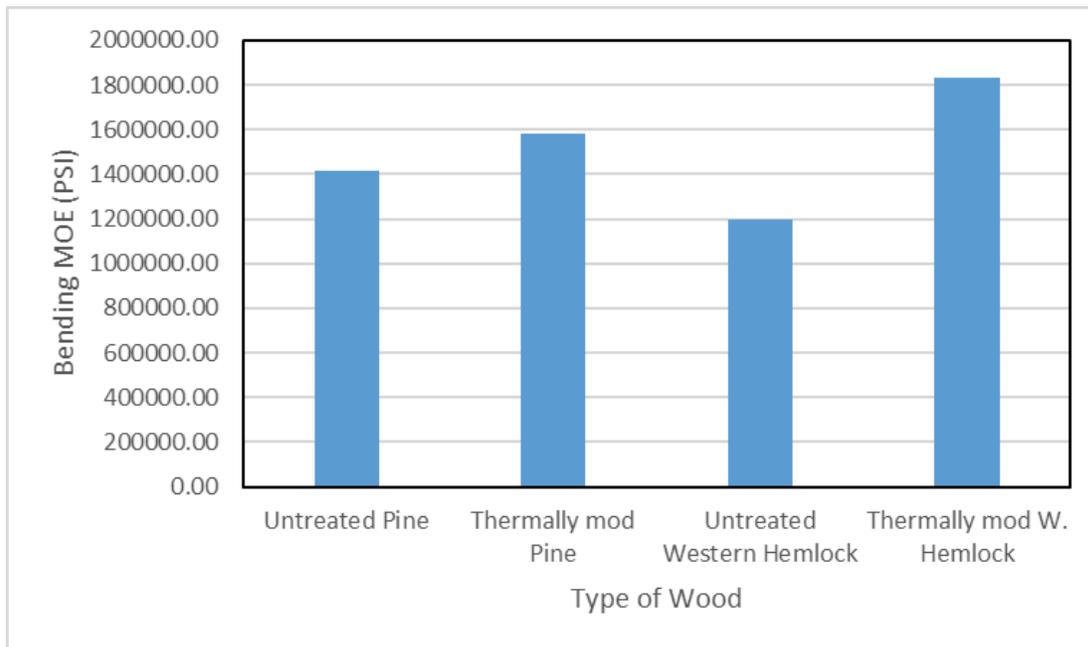


Figure 4. Bending MOE of test specimens.

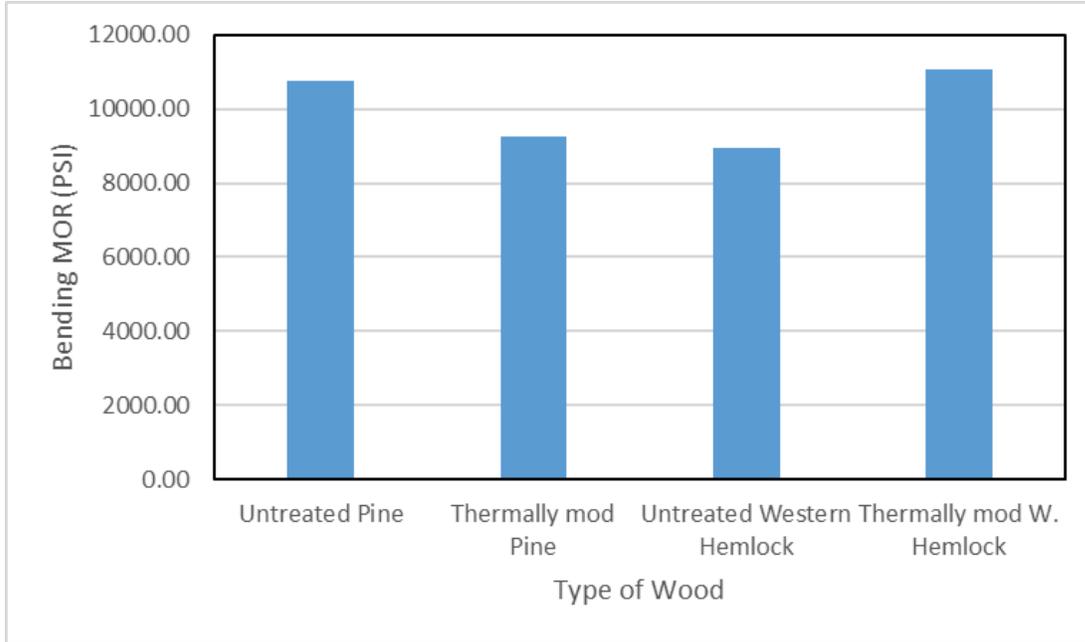


Figure 5. Bending MOR of test specimens.

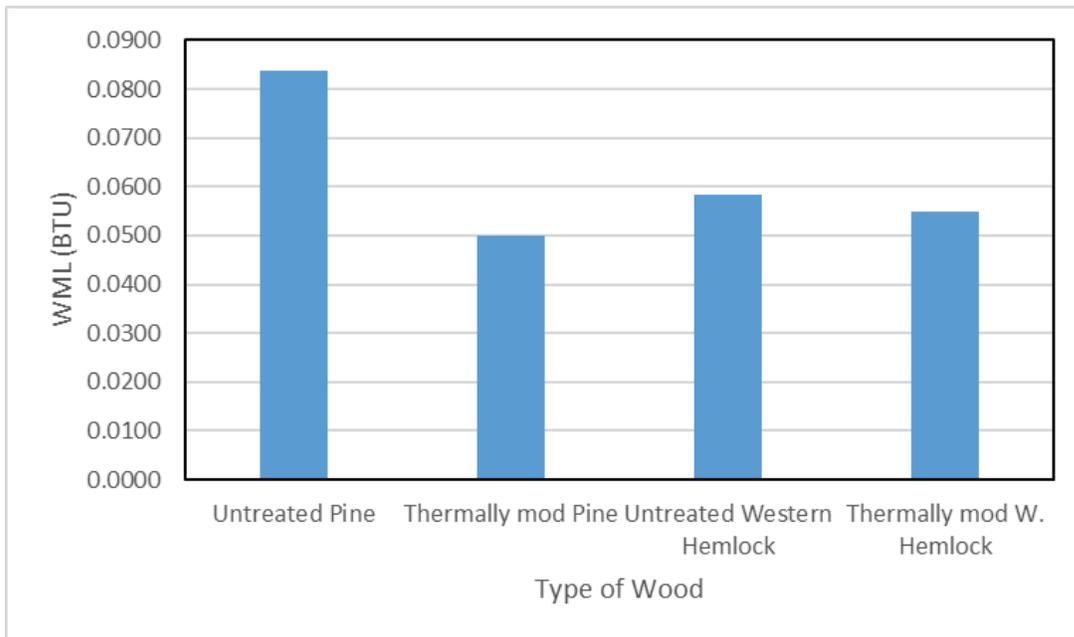


Figure 6. Bending Work to the Maximum Load (WML) of test specimens.

Data shows that thermal modification did not significantly alter the properties of bending modulus, strength, and work to the maximum load.

4. Hardness Data

Table 9. Hardness properties of test specimens.

MEAN	Hardness (Lbs)		MC,%
	Tangential	Radial	
Untreated Pine	701.20	755.87	12.80
Thermally Modified Pine	733.63	744.78	6.35
Untreated WHL	553.51	561.46	11.50
Thermally Modified Western Hemlock	991.32	890.62	8.21
UTDF	575.00	620.68	9.09
STDEV	Tangential	Radial	MC,%
Untreated Pine	83.83	154.42	0.49
Thermally Modified Pine	215.07	206.34	0.77
Untreated WHL	69.12	59.64	0.31
Thermally Modified Western Hemlock	222.00	151.27	0.46
UTDF	101.49	210.17	0.54

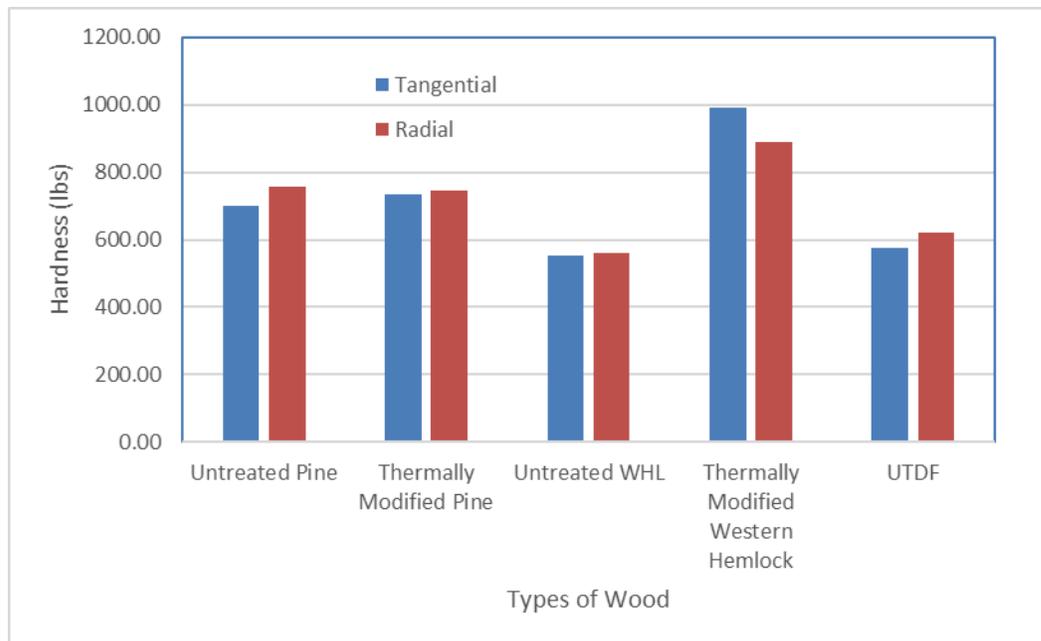


Figure 7. Hardness data of test specimens.

Hardness data shows thermally modified wood had similar or better hardness.

5. Hygroscopicity and Shrinkage Data

Table 10. Hygroscopicity and Shrinkage of test specimens.

MEAN	EMC	Tshrinkage	Rshrinkage	Lshrinkage	SG
	%	%	%	%	%
Thermally mod Pine (dark)	14.69	3.82	3.66	0.45	0.52
Untreated Pine	17.82	5.30	4.30	0.17	0.49
Thermally mod W. Hemlock (light)	15.30	4.34	3.38	0.11	0.52
UT Western Hemlock	15.90	3.90	5.04	0.23	0.52
STDEV	EMC	Tshrinkage	Rshrinkage	Lshrinkage	SG
	%	%	%	%	%
Thermally mod Pine (dark)	0.58	0.69	0.58	0.42	0.04
Untreated Pine	0.93	0.66	0.83	0.38	0.03
Thermally mod W. Hemlock (light)	0.19	1.00	15.79	0.10	0.01
UT Western Hemlock	1.55	0.93	1.96	0.15	0.04

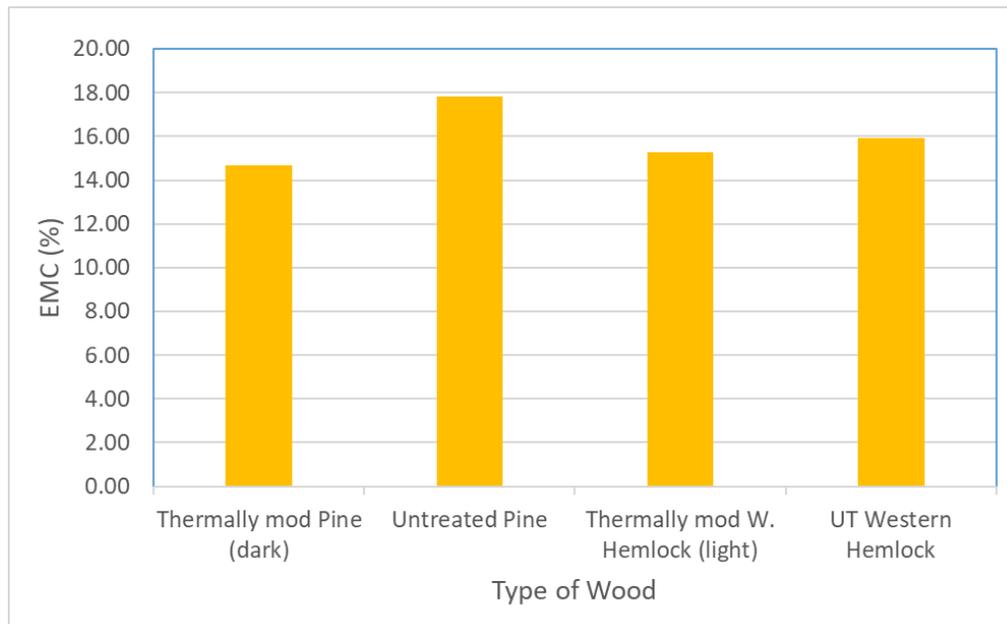


Figure 8. EMC data of wood samples equilibrium at 85% relative humidity and 25C.

EMC values are generally smaller for thermally modified wood.

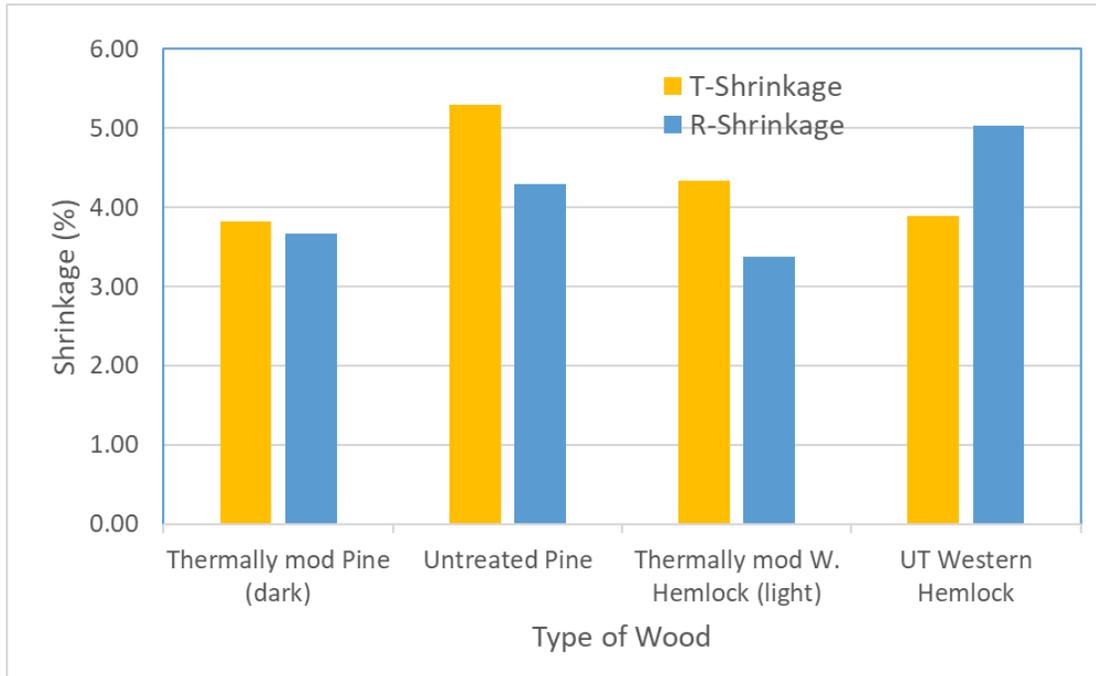


Figure 9. Radial and tangential shrinkage data of wood samples with MC change from about 15% to Oven dry.

Both radial and tangential shrinkage values are smaller for thermally modified wood.

CONCLUSIONS

Thermally modified products performed well against decay fungi and others. The MCA wood samples performed as expected and had similar weight losses as in previous tests. The untreated control wood showed high sample weight loss for all species, indicating that the fungi used were of high vigor and the data are valid.

Thermally modified pine and the untreated western hemlock had slight resistance to termite attack, while the thermally modified western hemlock, untreated Dougals fir, and untreated pine controls had no resistance to termite attack. The results from the untreated control samples (mortality, sample weight loss, and sample ratings) indicate strong termite vigor and performance, and hence the test data are valid.

Thermal modification did not significantly alter the properties of bending modulus, strength, and work to the maximum load, and hardness. EMC and shrinkage of thermally modified wood are generally smaller than these from untreated wood.

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American Society for Testing and Materials (ASTM). D5516-18. Standard Test Method for Evaluating the Flexural Properties of Fire-Retardant Treated Softwood Plywood Exposed to Elevated Temperatures.



CERTIFICATE OF ACCREDITATION

This is to attest that

WOOD DURABILITY LABORATORY

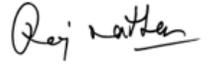
227 RENEWABLE NATURAL RESOURCES
BATON ROUGE, LOUISIANA 70803, U.S.A.

Testing Laboratory TL-350

has met the requirements of AC89, *IAS Accreditation Criteria for Testing Laboratories*, and has demonstrated compliance with ISO/IEC Standard 17025:2017, *General requirements for the competence of testing and calibration laboratories*. This organization is accredited to provide the services specified in the scope of accreditation.

Effective Date July 25, 2023





President

Visit www.iasonline.org for current accreditation information.

SCOPE OF ACCREDITATION

International Accreditation Service, Inc.
3060 Saturn Street, Suite 100, Brea, California 92821, U.S.A. | www.iasonline.org

WOOD DURABILITY LABORATORY

Contact Name Dr. Qinglin Wu

Contact Phone +225 578-8369

Accredited to ISO/IEC 17025:2017

Effective Date July 25, 2023

Physical	
ASTM D143	Standard test methods for small clear specimens of timber
ASTM D1037	Standard test methods for evaluating properties of wood-base fiber and particle panel materials (compression parallel to surface, section 12, excluded)
ASTM D2395	Standard Test Methods for Density and Specific Gravity (Relative Density) of Wood and Wood-Based Materials
ASTM D2481	Standard test method for accelerated evaluation of wood preservatives for marine services by means of small size specimens
ASTM D3043	Standard test methods for structural panels in flexure (methods A and D only)
ASTM D3201	Standard test method for hygroscopic properties of fire-retardant wood and wood-based products
ASTM D3273	Standard test method for resistance to growth of mold on the surface of interior coatings in an environmental chamber
ASTM D3345	Standard test method for laboratory evaluation of wood and other cellulosic materials for resistance to termites
ASTM D3500	Test methods for structural panels in tension (test method A only)
ASTM D4442	Standard test methods for direct moisture content measurement of wood and wood-based materials
ASTM D4445	Standard test method for fungicides for controlling sapstain and mold on unseasoned lumber (laboratory method)
ASTM D5458	Standard specification for evaluation of structural composite lumber products (test methods referenced in annex A3 and A4 only)
ASTM D5518	Standard test method for evaluating the flexural properties of fire-retardant treated softwood plywood exposed to elevated temperatures
ASTM D5864	Standard test method for evaluating the effects of fire-retardant treatments and elevated temperatures on strength properties of fire-retardant treated lumber (Procedures 1 and 2 only)
AWPA E1	Laboratory methods for evaluating the termite resistance of wood-based materials: choice and no-choice tests

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AWPA E5	Standard test method for evaluation of wood preservatives to be used in marine applications (UC5A, UC5B, UC5C); panel and block tests
AWPA E7	Standard field test for evaluation of wood preservatives to be used in ground contact (UC4A, UC4B, UC4C); stake test
AWPA E9	Standard field test for the evaluation of wood preservatives to be used above ground (UC3A and UC3B); L-joint test
AWPA E10	Laboratory method for evaluating the decay resistance of wood-based materials against pure basidiomycete cultures: soil/block test
AWPA E11	Standard method for accelerated evaluation of preservative leaching
AWPA E12	Standard method of determining corrosion of metal in contact with treated wood
AWPA E16	Standard field test for evaluation of wood preservatives to be used above ground (UC3B); horizontal lap-joint test
AWPA E18	Standard field test for evaluation of wood preservatives to be used above ground (UC3B); ground proximity decay test
AWPA E20	Standard method of determining the depletion of wood preservatives in soil contact
AWPA E21	Standard field test method for the evaluation of wood preservatives to be used for interior applications (UC1 and UC2); full-size commodity termite test
AWPA E22	Laboratory method for rapidly evaluating the decay resistance of wood-based materials against pure basidiomycete cultures using compression strength: soil/water test
AWPA E23	Laboratory method for rapidly evaluating the decay resistance of wood-based materials in ground contact using static bending: soil jar test
AWPA E24	Laboratory method for evaluating the mold resistance of wood-based materials: mold chamber test
AWPA E26	Standard field test for evaluation of wood preservatives intended for interior applications (UC1 and UC2); ground proximity termite test
AWPA E29	Antistain field test method for green lumber
ICC ES AC257	Corrosion-resistant fasteners and evaluation of corrosion effects of wood treatment chemicals (test methods referenced in section 4.0, excluding sections 4.3.1.1, 4.3.1.2, 4.3.1.4 and 4.3.2.2)
ICC ES AC380	Termite physical barrier systems (test methods referenced in sections 3, 4.1, 4.2 and 4.3, excluding 4.4.1 through 4.4.9)
WDL-SOP-25	Field evaluation of termiticide against subterranean termites
WDMA T.M. 1	Soil block test method
WDMA T.M. 2	Swellometer test method

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AWPA: American Wood Preservers' Association

WDMA: Window and Door Manufacturer Association

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Report: WDL-2022-13b

END OF REPORT