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TSL Professional Services
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Report For:	**JIMDI Inc.** 5375 Edgeway Drive, ALLENDALE, MI, USA 49401 Phone: 616 875 7725 Fax: 616 875 6009 E-Mail: njspooner@charter.net	**Laboratory #:** **Report Date:** **Received Date:** **Customer P.O. #:**	**402876-05** REVISED December 21, 2005 November 3, 2005 COD
Attention:	Nancy Spooner & Richard Schroetenboer		
Specimen:	Polypropylene Decking & Dock System Material		

TEST REPORT

RE: TESTING OF POLYPROPYLENE DECKING & DOCK SYSTEM MATERIAL

1.0 INTRODUCTION

On October 20, 2005 JIMDI Inc. submitted TREDZ – Polypropylene Decking & Dock System material to Cambridge Materials Testing Limited (CMTL) for physical property testing.

The submitted material was tested using the following test methods:

- Coefficient of Linear Expansion as per ASTM D696-03
- Creep - Recovery Test as per ASTM D7031-04 Section 5.10.1 and ASTM D6109-05 (Method A)
- Izod Impact Test as per ASTM D256-05
- Flexural Property Testing as per ASTM D6109-05 (Method A)
- Clip Pull-Though Resistance Test as per ASTM D1761-88 (2000)-Modified
- Lateral Clip Resistance Test as per ASTM D1761-88 (2000)-Modified

The following results were obtained:

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Per _____ *QUALITY ASSURANCE*

Per _____ *TECHNICIAN*

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2.0 COEFFICIENT OF LINEAR THERMAL EXPANSION

Specimens were tested to determine Coefficient of Linear Expansion (Thermal) in accordance with ASTM D696-03. They were prepared from the polypropylene Decking and Dock System Material by milling to finished dimensions of approximately 2 x 0.5 x 0.125 inches. Two specimens were prepared with the specimen length parallel to the length of the deck board and two specimens were prepared with the specimen length perpendicular to the length of the deck board. The specimens were conditioned for a minimum of 40 hours at 23 ± 2°C and 50 ± 5% relative humidity prior to testing.

RESULTS

Direction	Trial	Temperature Range (°F)	Coefficient of Linear Thermal Expansion
Parallel to Decking Material Length	A	-24.3 to 87.8 to –24.7	1.42×10^{-5} 1°F
	B	-23.6 to 88.2 to –24.2	1.61×10^{-5} 1°F
Perpendicular to Decking Material Length	A	-22.9 to 87.8 to –23.8	2.70×10^{-5} 1°F
	B	-23.8 to 88.7 to –24.5	2.70×10^{-5} 1°F

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3.0 CREEP- RECOVERY

Ten specimens were tested to determine Creep Recovery in accordance with ASTM D7031-04, Section 5.10.1 and ASTM D6109-05 using a 16 inch support span and load of 200 psf. The loading noses and supports were aligned so that the axes of the cylindrical surfaces were parallel and the load span was one-third of the support span.

The load was applied for 24 hours and the specimens were allowed to recover with no superimposed load for an additional 24 hours. A calibrated dial gauge was secured under the deck boards and the deflection at the mid-span was recorded four times: (1) prior to the application of load, (2) at 24 hour with load on, (3) within one minute after the load is removed, and (4) after the 24 hour recovery period. The percent recovery was calculated as follows:

Total Deflection = (2) Deflection at 24h with load on – (1) Deflection prior to application the of load

Recovered Deflection = Total Deflection – (4) Deflection at the end of the 24h recovery period

$$\text{Percent Recovery} = \frac{\text{Recovered Deflection}}{\text{Total Deflection}} \times 100$$

RESULTS

Direction	Deflection (inches)				
	Board 1	**Board 2**	**Board 3**	**Board 4**	**Board 5**
Total Deflection	0.1930	0.1935	0.1935	0.1952	0.2009
Recovered Deflection	0.1622	0.1613	0.1653	0.1668	0.1691
Percent Recovery	84%	83%	85%	85%	84%

Direction	Deflection (inches)				
	Board 6	**Board 7**	**Board 8**	**Board 9**	**Board 10**
Total Deflection	0.1909	0.1798	0.2136	0.1986	0.1910
Recovered Deflection	0.1604	0.1563	0.1708	0.1677	0.1597
Percent Recovery	84%	87%	80%	84%	84%

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4.0 IMPACT RESISTANCE – NOTCHED IZOD

Five specimens were machined and notched by Cambridge Materials Testing to ASTM D256-05 specifications. The specimens were prepared with the specimen length parallel to the length of the deck board. They were tested for Izod Impact testing in accordance with ASTM D256-05, Method A using a 2 ft·lbf pendulum. The specimens were conditioned a minimum of 40 hours at 23 ± 2°C and 50 ± 5% R.H. prior to testing.

RESULTS

Depth Under Notch (mm)	Width Along Notch (mm)	Impact Resistance (J/m)	Type of Failure
10.12	3.30	47.8	Complete Break
10.12	3.35	40.1	Complete Break
10.11	3.42	36.3	Complete Break
10.11	3.38	48.2	Complete Break
10.14	3.37	56.2	Complete Break
		Average = 45.7 J/m	

5.0 FLEXURAL PROPERTY TESTING

The baseline flexural properties were determined in accordance with ASTM D6109-05, Method A procedures using third point loading. The testing parameters used for all ASTM D6109-05 tests are outlined below.

Testing Position	Flatwise	Radius of Support Noses	2”
Nominal Sample Size	29” x 5.5” x 1.50”	Radius of Loading Noses	1”
Support Span	24”	Distance from Neutral Axis	1.087"
Support Span to Depth Ratio	16:1	Testing Machine	United SFM20
Testing Speed	0.490 “/minute	Operating Software	Satec Partner

For each flexural test conducted, the operating software recorded the deflection of the deck board at the mid-span between the supports and the corresponding load.

Five (5) boards were tested at 73+/-3°F. The key properties recorded and calculated for each board sample tested were:

Load at Rupture measured in pounds-force (lbf) – this property is extrapolated from the load-deflection curve at the point where the board samples reached the maximum load.

Load at L/180 measured in pounds-force (lbf) – this property is recorded from the load-deflection curve at the deflection corresponding to the support span (L) divided by 180.

Modulus of Rupture (MOR) measured in pounds force per square inch (psi) – this property is calculated using the following equation:

$$MOR = \frac{(\text{Load at Rupture} \times 24 \times \text{Distance from Neutral Axis})}{(6 \times \text{Moment of Inertia})}$$

Slope of Tangent measured in lbf/in – this property is recorded from the load-deflection curve between the steepest initial portion of the load-deflection curve.

Modulus of Elasticity (MOE) measured in pounds force per square inch (psi) – this property is calculated using the following equation:

$$MOE = \frac{(24^3 \times \text{Slope of Tangent to Load-Deflection Curve})}{(56.25 \times \text{Moment of Inertia})}$$

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5.0 FLEXURAL PROPERTY TESTING (Cont'd)

RESULTS

Board No.	Load at Rupture (lbf)	Load at L/180 (lbf)	Slope of Tangent (lbf/in)
1	182	113	598
2	178	124	525
3	182	76	352
4	180	82	535
5	178	81	293
	Average = 180 lbf	Average = 95 lbf	Average = 461 lbf/in

Note: Moment of Inertia must be known to calculate MOR and MOE. This variable can be obtained from UMA Engineering Ltd.

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6.0 DIRECT WITHDRAWAL LOAD TEST

Specimens were subjected to a direct withdrawal load test. Each clip was attached to the 1-1/2" wide face of a section of 2 x 6 pressure treated lumber using the JIMDI-supplied #8 X 1-1/4" screws. Two pieces of the JIMDI-supplied plastic decking were slid into each groove of the clip (refer to Figure 1). The maximum force required to either pull the clip from the two pieces of plastic decking or from the pressure treated lumber was measured. The force (F) was applied by pulling on the pressure treated lumber while the plastic decking was secured to the table of the testing machine. Testing was performed according to ASTM D1761-88(2000)^{E1} (modified) with a test speed of 2.5 mm/minute. All materials were conditioned for a minimum of 48 hours at 23°C and 50% RH prior to testing.

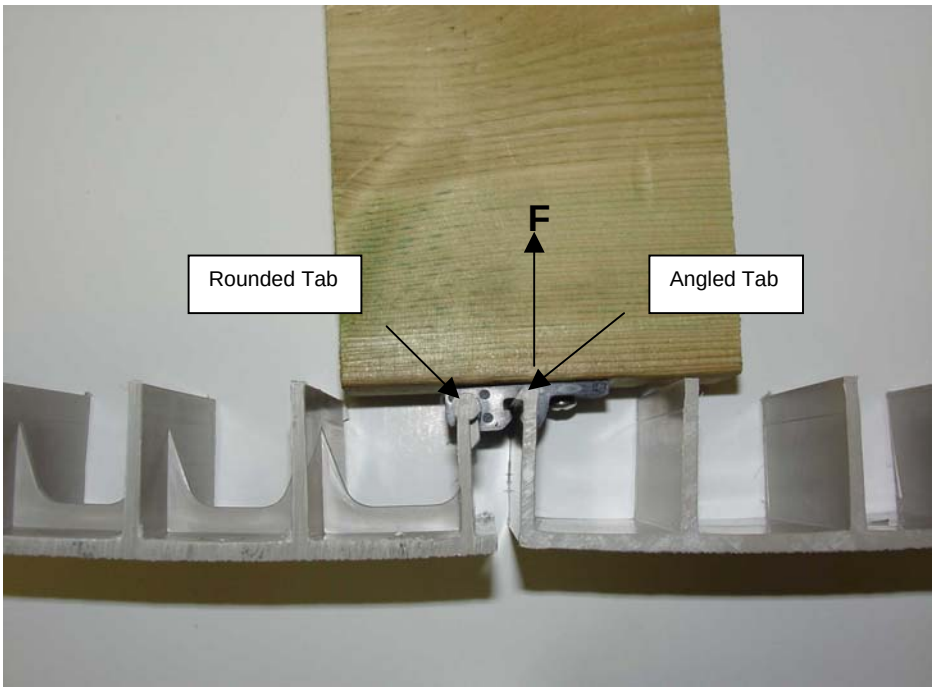

Figure 1

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6.0 DIRECT WITHDRAWAL LOAD TEST (Cont'd)

RESULTS

Trial #	Maximum Force (lbf)	Observations
1	109	The angled tab on the decking cracked as the clip pulled away.
2	110	The clip pulled away from the angled tab on the decking.
3	111	The angled tab on the decking cracked as the clip pulled away.
4	120	The angled tab on the decking cracked as the clip pulled away.
5	106	The angled tab on the decking cracked as the clip pulled away.

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7.0 LATERAL CLIP RESISTANCE

Specimens were subjected to lateral resistance load tests. Each clip was attached to the 1-1/2" wide face of a section of 2 x 6 pressure treated lumber using the JIMDI-supplied #8 X 1-1/4" screws. Testing was performed according to ASTM D1761-88(2000)^{E1} (modified) at a test speed of 2.5 mm/minute. All materials were conditioned for 48 hours at 23°C and 50% RH prior to testing.

Test #1 was conducted with the force (F) applied along the tab farthest from the screw hole with the direction of force being away from the screw hole, refer to Figure 1.

Test #2 was conducted with the force (F) applied along the tab closest to the screw hole with the direction of force being towards the screw hole, refer to Figure 1.

Test #3 was conducted with the force (F) applied along the length of one of the long sides of the clip with the direction of force being parallel to the long direction of the tabs, refer to Figure 1.

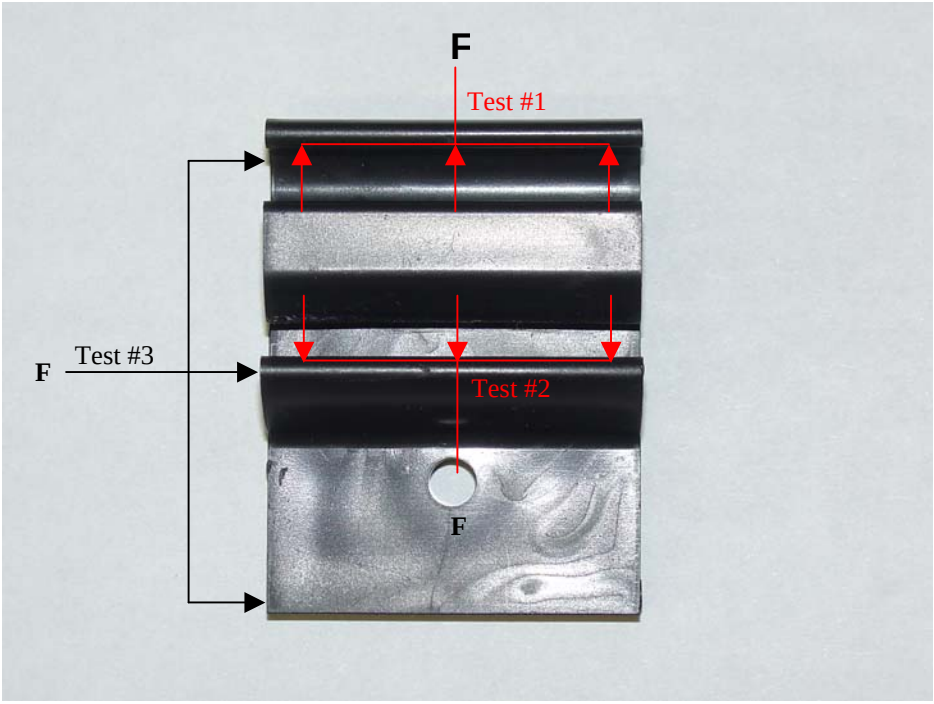

Figure 1

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RESULTS

Test #1

Trial #	Maximum Force (lbf)	Observations
1	149	Clip bent. Bottom edge of round slot had small cracks across it.
2	168	Clip bent. Bottom edge of round slot cracked all the way across.
3	170	Clip bent. Bottom edge of round slot cracked all the way across.
4	159	Clip bent.
5	175	Clip bent. Bottom edge of round slot had a small crack.

Test #2

Trial #	Maximum Force (lbf)	Observations
1	249	Clip pulled up away from the board. Crack appeared underneath (on wood side) on the clip.
2	226	Clip pulled up and away from the board.
3	244	Clip pulled up and away from the board.
4	264	Clip pulled up away from the board. Crack appeared underneath (on wood side) on the clip.
5	219	Clip pulled up away from the board. Crack appeared on the inside edge of the clip.

Test #3

Trial #	Maximum Force (lbf)	Observations
1	615	The screw hole enlarged as the clip and screw were pushed across the wood.
2	651	The screw hole enlarged as the clip and screw were pushed across the wood.
3	628	The screw hole enlarged as the clip and screw were pushed across the wood.
4	627	The screw hole enlarged as the clip and screw were pushed across the wood.
5	638	The screw hole enlarged as the clip and screw were pushed across the wood.