Test Results | THERMORY® Pine
Strength & Hardness

Strength
& Hardness

TESTED

- Moisture content and, weight and density were calculated and then the strength was evaluated on a bending device to determine the strength of each THERMORY®Pine sample.

RESULTS

- The impact resistance and strength was calculated to be slightly harder than Cedar and strength to be extremely suitable for a decking surface.

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TEST REPORT No 17-6/KML/26 November 25, 2016

Customer:	Brenstol OÜ
Product:	Natural and thermally modified pine wood (*Pinus sylvestris*)
Ground of testing:	Order for testing 03.10.2016
Testing objective:	Determine strength properties
Test methods:	Bending strength, modulus of elasticity in bending (MOE), surface resistance to indentation, impact resistance, density and moisture content.

Product description

Tested products were natural and thermally modified (215 °C) pine wood (*Pinus sylvestris*). From both materials 10 boards were tested.

Test description

Density was determined for oven-dry samples. Moisture content was determined by oven-dry method by drying the specimens at temperature 103 ± 2 °C until the constant weight was reached. Moisture content is expressed as a percentage of the oven-dry weight. Moisture content and density values are in Table 1.

Bending tests were carried out with Instron 5866 device, span 520 mm, testing speed 20 mm/min, cross section of the tested material was 26 x 100 mm. See results in Table 2.

Surface resistance to indentation (Brinell) was tested according to EVS-EN 1534:2010 Wood flooring - Determination of resistance to indentation - Test method. See results in Table 3.

Impact resistance was tested on BKM-5 device with 150 kgf/cm pendulum, span 90 mm, cross section of the tested material was 10 x 10 mm. See results in Table 3.

All series average values of measured properties are presented in Table 4 for comparison between natural and thermally treated pine wood.

All properties, except density, were measured at the initial moisture content.

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Test results

Table 1. Moisture content and density.

Sample No	Thermo				Natural			
	Moisture content, %	Sample average moisture content, %	Oven-dry density, kg/m^3	Sample average oven-dry density, kg/m^3	Moisture content, %	Sample average moisture content, %	Oven-dry density, kg/m^3	Sample average oven-dry density, kg/m^3
1.1	4.40	4.40	393.79	393.19	16.89	16.85	464.32	465.19
1.2	4.40		392.59		16.80		466.05	
2.1	4.43	4.44	392.24	388.69	15.70	15.67	417.62	417.31
2.2	4.45		385.13		15.64		416.99	
3.1	4.44	4.41	389.36	388.48	15.95	15.96	430.09	428.72
3.2	4.39		387.60		15.97		427.35	
4.1	3.94	3.95	399.54	399.78	16.83	16.84	434.43	434.01
4.2	3.96		400.02		16.84		433.59	
5.1	4.58	4.58	328.22	328.13	16.75	16.71	434.23	434.22
5.2	4.58		328.03		16.67		434.21	
6.1	4.49	4.53	341.43	340.00	15.92	15.87	365.87	364.28
6.2	4.57		338.56		15.82		362.69	
7.1	4.64	4.66	330.13	330.06	15.17	15.22	431.97	431.49
7.2	4.69		329.99		15.28		431.01	
8.1	3.89	3.93	380.00	380.57	15.78	15.76	428.69	430.29
8.2	3.97		381.14		15.74		431.89	
9.1	3.95	3.98	397.70	396.42	15.53	15.46	427.89	427.11
9.2	4.00		395.13		15.40		426.33	
10.1	3.80	3.77	399.73	397.08	15.25	15.21	429.19	430.13
10.2	3.73		394.43		15.17		431.07	
Series average		**4.27**		**374.24**		**15.96**		**426.27**

Table 2. Bending tests results.

Sample No	Thermo		Natural	
	Bending strength, MPa	MOE, GPa	Bending strength, MPa	MOE, GPa
1	14.03	3.04	30.80	4.52
2	15.23	3.14	30.29	3.69
3	21.16	3.34	21.55	2.63
4	16.55	3.60	29.74	4.14
5	17.00	3.26	31.20	4.43
6	16.77	4.03	26.39	2.98
7	13.35	3.27	31.28	3.65
8	17.44	3.46	20.51	3.13
9	14.53	3.53	13.62	2.31
10	28.07	3.72	24.31	3.44
Series average	**17.41**	**3.44**	**25.97**	**3.49**

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Table 2. Surface resistance to indentation and impact resistance tests.

Sample No	Thermo				Natural			
	Resistance to indentation, N/mm²	**Sample average resistance to indentation, N/mm²**	**Impact resistance, J/cm²**	**Sample average impact resistance, J/cm²**	**Resistance to indentation, N/mm²**	**Sample average resistance to indentation, N/mm²**	**Impact resistance, J/cm²**	**Sample average impact resistance, J/cm²**
1.1	13.23	13.35	8.40	8.63	17.31	17.45	11.70	11.70
1.2	13.46		8.85		17.60		11.70	
2.1	13.46	13.93	8.40	8.25	10.68	10.78	9.60	9.60
2.2	14.40		8.10		10.88		9.60	
3.1	10.47	10.88	8.85	8.70	13.69	12.91	9.30	9.53
3.2	11.29		8.55		12.13		9.75	
4.1	13.69	12.91	9.30	9.15	10.68	9.87	10.20	10.05
4.2	12.13		9.00		9.06		9.90	
5.1	9.26	10.91	8.70	8.63	13.92	14.16	11.55	11.18
5.2	12.56		8.55		14.40		10.80	
6.1	9.67	10.69	8.70	8.63	10.07	10.17	9.75	9.68
6.2	11.71		8.55		10.27		9.60	
7.1	8.85	8.85	8.85	9.00	11.50	16.89	9.60	9.53
7.2	8.85		9.15		22.28		9.45	
8.1	12.35	13.37	8.70	9.00	12.56	11.62	9.90	9.15
8.2	14.40		9.30		10.68		8.40	
9.1	11.92	11.60	9.15	8.93	8.85	9.76	10.05	9.90
9.2	11.29		8.70		10.68		9.75	
10.1	13.23	13.70	8.85	8.85	15.15	17.14	9.90	9.53
10.2	14.16		8.85		19.13		9.15	
Series average		**12.02**		**8.78**		**13.08**		**9.98**

Table 4. Comparison of measured properties.

Series	Moisture content, %	Oven-dry density, kg/m³	Resistance to indentation, N/mm²	Impact resistance, J/cm²	Bending strength, MPa	MOE, GPa
Thermo	4.27	374.24	12.02	8.78	17.41	3.44
Natural	15.96	426.27	13.08	9.98	25.97	3.49

Remark: Results of testing are valid only for tested products.

/signed digitally/

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