
**SUMMARY REPORT
EVALUATION OF COMPOSITE DECK BOARDS
FOR PERFORMANCE
IN GENERAL ACCORDANCE WITH ASTM D7032-17**

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Proposal No.:	21-006-285816, RV2
Report No.:	21-06-P0093 RV1 7 Pages
Date:	October 17, 2022

1.0 INTRODUCTION

At the request of *The Millboard Company Ltd.*, Element Materials Technology Inc., was retained to evaluate two composite deck board materials for performance ratings, in accordance with ASTM D7032-17 test specification with or without modifications.

Upon receipt, the deck boards were assigned the following Element Sample numbers:

Client Sample Identification	Element Sample No.
WEATHERED OAK 200mm x 32mm x 3600 mm (7.75" x 1.25" x 141.5")	21-06-P0093-A
ENHANCED GRAIN 176mm x 32mm x 3600 mm (6.75" x 1.25" x 141.5")	21-06-P0093-B

Client Sample Identification	Element Sample No.
WEATHERED OAK 200mm x 31mm x 765 mm (7.75" x 1.25" x 30")	22-06-P0087-A
ENHANCED GRAIN 176mm x 31mm x 765 mm (6.75" x 1.25" x 30")	22-06-P0087-B
BULLNOSE 150mm x 31mm x 765 mm (6" x 1.25" x 30")	22-06-P0087-C

2.0 PROCEDURE

Test Standard Description	Test Specification
Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite and Plastic Lumber Deck Boards, Stair Treads, Guards, and Handrails.	ASTM D7032-17

Test Method Description	Test Method
Baseline Flexural test – Original Condition	ASTM D7032-17, Section 4.4.1 and 4.4.2 / ASTM D6109
Baseline Flexural test – Elevated Temperature Effect Samples conditioned to 125°F ± 4°F (52°C ± 2°C)	ASTM D7032-17, Section 4.5.1 / ASTM D6109
Baseline Flexural test – Reduced Temperature Effect Samples conditioned to -20°F ± 4°F (-29°C ± 2°C)	ASTM D7032-17, Section 4.5.1 / ASTM D6109
Baseline Flexural test – Moisture Effect Samples Immersed in Water for 7 days	ASTM D7032-17, Section 4.5.2 / ASTM D6109
Baseline Flexural test – UV Resistance Effect Samples UV exposed for 2000 hours per ASTM G154	ASTM D7032-17, Section 4.6 / ASTM D790
Baseline Flexural test – Freeze-Thaw Effect Samples subjected to 5 freeze-thaw cycles	ASTM D7032-17, Section 4.7 / ASTM D6109

Test Method Description	Test Method
Biodeterioration Tests – Fungal Decay and Termite Resistance	Not required as product formulation is not reported to contain biodegradable materials
Creep Recovery	ASTM D7032-17, Section 5.4
Mechanical Fastener Holding	ASTM D7032-17, Section 5.5 / ASTM D1761
Surface Burning Characteristics	ASTM D7032-17, Section 4.9
Deck Board Used as Stair Tread	ASTM D7032-17, Section 5.3.2

3.0 RESULTS

A summary of test results is presented in Tables 1a – f, Tables 2, 3 and 4. Imperial units were the primary unit of measure.

Table 1a: – Summary of Flexural Properties – Original Condition ASTM D 7032 / ASTM D6109 Element Sample No.: 21-06-P0093 – A & -B						
Sample ID	Width, in	Depth, in	Load at Span/180, lbf	Ultimate Load, lbf	Moment Capacity, in-lbf	Flexural Rigidity (EI), in ² -lbf
WEATHERED OAK						
16 in. (406 mm) Span	7.86	1.26	118	688	1,834	96,848
12 in. (305 mm) Span	7.83	1.26	228	1,155	2,359	105,125
ENHANCED GRAIN						
16 in. (406 mm) Span	7.03	1.25	132	805	2,145	108,469
12 in. (305 mm) Span	6.98	1.26	220	1144	2,288	107,319

Table 1b: – Summary of Flexural Properties – Elevated Temperature Effect

ASTM D 7032 / ASTM D6109

Element Sample No.: 21-06-P0093 – A & B

Sample ID	Width, in	Depth, in	Load at Span/180, lbf	Ultimate Load, lbf	Moment Capacity, in-lbf	Change Versus Original Condition	Flexural Rigidity (EI), in ² -lbf	% Change Versus Original Condition
WEATHERED OAK 16 in. (406 mm) Span	7.84	1.26	105	590	1,573	- 14%	85,759	- 11%
ENHANCED GRAIN 16 in. (406 mm) Span	7.04	1.25	147	646	1,723	- 20% *	120,610	+ 11%

Note - * Considered as most critical effect for both Enhanced Grain and Weathered Oak based on the same material composition.

Table 1c: – Summary of Flexural Properties – Reduced Temperature Effect

ASTM D 7032 / ASTM D6109

Element Sample No.: 21-06-P0093 – A & -B

Sample ID	Width, in	Depth, in	Load at Span/180, lbf	Ultimate Load, lbf	Moment Capacity, in-lbf	% Change Versus Original Condition	Flexural Rigidity (EI), in ² -lbf	% Change Versus Original Condition
WEATHERED OAK 16 in. (406 mm) Span	7.82	1.26	181	747	1,993	+ 9%	148,828	+ 54%
ENHANCED GRAIN 16 in. (406 mm) Span	7.00	1.25	159	605	1,614	- 25% *	130,507	+ 20%

Note - * Outlier result as reduced temperature expected to increase strength.

Table 1d: – Summary of Flexural Properties – Moisture Effect

ASTM D 7032 / ASTM D6109

Element Sample No.: 21-06-P0093 – A & -B

Sample ID	Width, in	Depth, in	Load at Span/180, lbf	Ultimate Load, lbf	Moment Capacity, in-lbf	% Change Versus Original Condition	Flexural Rigidity (EI), in ² -lbf	% Change Versus Original Condition
WEATHERED OAK 16 in. (406 mm) Span	7.88	1.26	93	749	1,996	+ 8%	75,988	-22%
ENHANCED GRAIN 16 in. (406 mm) Span	6.98	1.25	116	668	2,150	0	94,389	- 13%

Table 1e: – Summary of Flexural Properties – Freeze-Thaw Effect

ASTM D 7032 / ASTM D6109

Element Sample No.: 21-06-P0093 – A & -B

Sample ID	Width, in	Depth, in	Load at Span/180, lbf	Ultimate Load, lbf	Moment Capacity, in-lbf	% Change Versus Original Condition	Flexural Rigidity (EI), in ² -lbf	% Change Versus Original Condition
WEATHERED OAK 16 in. (406 mm) Span	7.90	1.26	106	765	2,041	+ 11%	87,071	+10%
ENHANCED GRAIN 16 in. (406 mm) Span	6.99	1.25	116	668	1,781	- 17% *	94,951	- 12%

Note - * Considered as most critical effect for both Enhanced Grain and Weathered Oak based on the same material composition.

Table 1f: – Summary of Flexural Properties – UV Resistance Effect ASTM D 7032 / ASTM D790 Element Sample No.: 21-06-P0093 – A & -B (9 in. (22.86 mm) Span)								
Sample ID	Width, in	Depth, in	Ultimate Load lbf	Deflection at Ultimate Load in.	Modulus of Rupture psi	Change Versus Original Condition	Modulus of Elasticity psi	% Change Versus Original Condition
ENHANCED GRAIN *								
Original Condition	1.28	1.25	152	0.17	1,111	-	65,567	
UV Aged	1.18	1.25	130	0.17	931	- 16 %	55,337	- 16 %

Note - * Enhanced Grain UV resistance performance is representative of Weathered Oak based on the same material composition.

Table 2: – Creep Recovery Test Results ASTM D 7032, Section 4.9 Element Sample No.: 21-06-P0093 – A & -B (Original Condition) 16-inch Support Span				
Sample ID	Total Deflection, mm (24 Hours With 200 psf Load On)	Recovered Deflection, mm	PERCENT RECOVERY Requirement > 75%	UNRECOVERED DEFLECTION, mm Requirement < 1.6 mm
Enhanced Gran #1	2.63	2.40	91	0.23
Enhanced Gran #2	2.67	2.40	90	0.27
Weathered Oak #1	2.77	2.53	91	0.24
Weathered Oak #2	2.69	2.47	92	0.22

Table 3: – Summary of Mechanical Fastener Holding Test Results ASTM D 7032, Section 5.5 Element Sample No.: 21-06-P0093 – A & -B (Original Condition)		
Sample ID	Screw Head Pull Through, Ultimate Load, Single Screw, lbf	Screw Head Pull Through, Allowable Capacity with Safety Factor of Three, Single Screw, lbf
WEATHERED OAK	152	51
ENHANCED GRAIN	135	45

Table 4: – Summary of Surface Burning Characteristics Test Results ASTM D 7032, Section 4.9, Referencing ASTM E84 Element Sample No.: 21-06-P0093 – A & -B (Original Condition)		
Sample ID	Flame Spread Index (FSI)	ASTM D7032 requirement
WEATHERED OAK	155	<200
ENHANCED GRAIN	155	<200

Table 5: – Summary of Stair Tread Performance ASTM D 7032 Section 5.3.2 Element Sample No.: 22-06-P0087 – A, B & C					
Sample ID	Width	Depth	Deflection Under 399 lbf (300 lbf + 33% Effect Adjustments)	Deflection Requirements	Resistance Under 998 lbf (750 lbf + 33% Effect Adjustments)
	in	in	In.	In.	
WEATHERED OAK 8 in. (203 mm) Span	7.75	1.25	0.103	< 0.125	Supported
ENHANCED GRAIN 8 in. (203 mm) Span	6.75	1.25	0.105	< 0.125	Supported
BULLNOSE 8 in. (203 mm) Span	6.00	1.25	0.102	< 0.125	Supported

Determination of Allowable Deck Board Load/Span Performance Ratings Per ASTM D7032-17

Based on the Original Condition flexural testing results from Table 1a, the following unadjusted allowable loads are applicable:

- The limiting average flexural strength corresponds to the Load at Span/180 determined using third point loading
- Converting the third point loading to uniform loading determines the Unadjusted Allowable Uniform Load at the tested span

Applying the effect adjustments on strength (Moment Capacity) from Tables 1b – 1e determines the adjusted Load/Span Performance Ratings.

The results ratings are summarized on the following page.

Table 6: – Determination of Allowable Deck Board Load/Span Performance Ratings

ASTM D 7032-17

Element Sample No.: 22-06-P0087 – A & B

Sample ID	Load at Span/180, lbf	Unadjusted Allowable Load, psf	Most Restrictive Temperature and Moisture Effect per Section 4.5.3	UV Resistance Effect in Excess of 10% per Section 4.6.3	Freeze-Thaw Resistance Effect in Excess of 10% per Section 4.7.2	Allowable Load/Span Performance Rating psf / Span (in.)
WEATHERED OAK						
16 in. (406 mm) Span	118	180	- 20%	- 6 %	- 7%	121 / 16
12 in. (305 mm) Span	228	466				312 / 12
ENHANCED GRAIN						
16 in. (406 mm) Span	132	226	- 20%	- 6%	- 7%	151 / 16
12 in. (305 mm) Span	220	534				358 / 12

4.0 CONCLUSIONS

The Weathered Oak and Enhanced Grain composite deck boards submitted by *The Millboard Company Ltd.* were tested in accordance with the ASTM D7032-17 test methods identified in this report. The results presented in Section 3 of this summary report indicate the following:

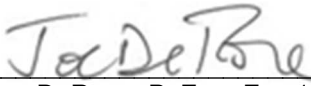
- The deck board Load / Span Performance Ratings exceed 100 psf on a support spacing of 16 in. or 12 in.
- The Creep Recovery performance satisfies the Percent Recovery and Unrecovered Deflection requirements for both the tested 16 in. support span and the better case 12 in. support span.
- The Stair Tread performance satisfies the deflection and sustained load requirements on a support span spacing of 8 in.

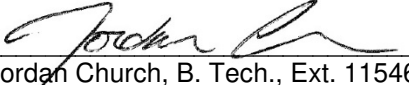
5.0 REVISION HISTORY

Date	Rev. No	Comments
2022-03-16	Original Document	N/A
2022-10-17	RV1	Addition of stair tread results.

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