



8 September 2010

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Doc. No 4940-0152/1

MATERIAL EVALUATION REPORT

Client: INTEGRATED PACKAGING
Subject: FASTENER EXTRACTION TESTING
Client Reference: Mr. J CASTILLO
Client's Order No.: TBC
Correlation/Report No.: 4940-0152/1

1.0 INTRODUCTION.

It was requested that a series of fastener extraction tests be performed on sections of plastic lumber made from recycled plastics. All the testing was to be performed in based on ASTM D6177 "Standard Method for Testing Mechanical Fasteners in Plastic Lumbar and Shapes" – 2005 method "A" on 104mm diameter round "logs" and 90mm x 42mm rectangular sections.

2.0 FASTENER EXTRACTION TESTS

Each of the submitted sections was tested in a variety of directions multiple times using both nails and screws as detailed below and results in the tables on the following pages;

Nails used: Flat head 3.75 x 75mm galvanized
Nail penetration: 32mm (minimum) hammered by hand
Screws used: Bugle batten CL3 14-10 x 50mm square drive
Screw predrilled hole: 3.3mm diameter 13mm deep
Screw penetration: 25mm (min)
Number of tests per face: 6
Fastener spacing: 50mm from ends and 50mm from other fasteners, central to sample
Test speed: 2.5mm/min
Sample storage prior to test: 23°C and 55% RH for 48 hours
Test temperature at time of test: 15°C
Space between sample grips: 60mm

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2.1 Nail test results

Sample section	Test face	Test number	Peak load (newtons)	Peak load (kg)
Rectangular 90 x 42	End face	1	360	37
		2	370	38
		3	310	32
		4	340	35
		5	310	32
		6	310	32
		Average	333	34
Sample section	Test face	Test number	Peak load (newtons)	Peak load (kg)
Rectangular 90 x 42	Wide face	1	600	61
		2	630	64
		3	530	54
		4	610	62
		5	660	67
		6	680	69
		Average	618	63
Sample section	Test face	Test number	Peak load (newtons)	Peak load (kg)
Rectangular 90 x 42	Short face	1	890	91
		2	970	99
		3	930	95
		4	840	86
		5	980	100
		6	970	99
		Average	930	95
Sample section	Test face	Test number	Peak load (newtons)	Peak load (kg)
104mm diameter round	Round face	1	840	86
		2	990	101
		3	970	99
		4	980	100
		5	910	93
		6	1010	103
		Average	950	97

End face extraction tests were not performed on the round sample as the extraction load was less than 10kg.



2.2 Screw test results

Sample section	Test face	Test number	Peak load (newtons)	Peak load (kg)
Rectangular 90 x 42	End face	1	1980	202
		2	1650	168
		3	2220	227
		4	2030	207
		5	1310	134
		6	1800	184
		Average	1832	187
Sample section	Test face	Test number	Peak load (newtons)	Peak load (kg)
Rectangular 90 x 42	Wide face	1	3030	309
		2	2870	293
		3	2760	282
		4	2630	268
		5	2790	285
		6	2810	287
		Average	2815	287
Sample section	Test face	Test number	Peak load (newtons)	Peak load (kg)
Rectangular 90 x 42	Short face	1	3470	354
		2	3910	399
		3	3760	384
		4	3720	380
		5	3650	372
		6	3560	363
		Average	3678	375
Sample section	Test face	Test number	Peak load (newtons)	Peak load (kg)
104mm diameter round	Round face	1	3610	368
		2	3350	342
		3	3640	371
		4	3320	339
		5	3870	395
		6	3830	391
		Average	3603	368

End face extraction tests were not performed on the round sample as the extraction load was less than 10kg.



3.0 REMARKS

3.1 The extraction test of the “end on” samples were significantly lower than the side samples. This would most likely be due to the lower density material present in the core of the samples supplied.

3.2 The round samples results were consistent around the circumference with no significant preference observed.

3.3 The rectangular samples showed a significant increase in extraction load (30 – 40%) along the short side compared to the wide side.