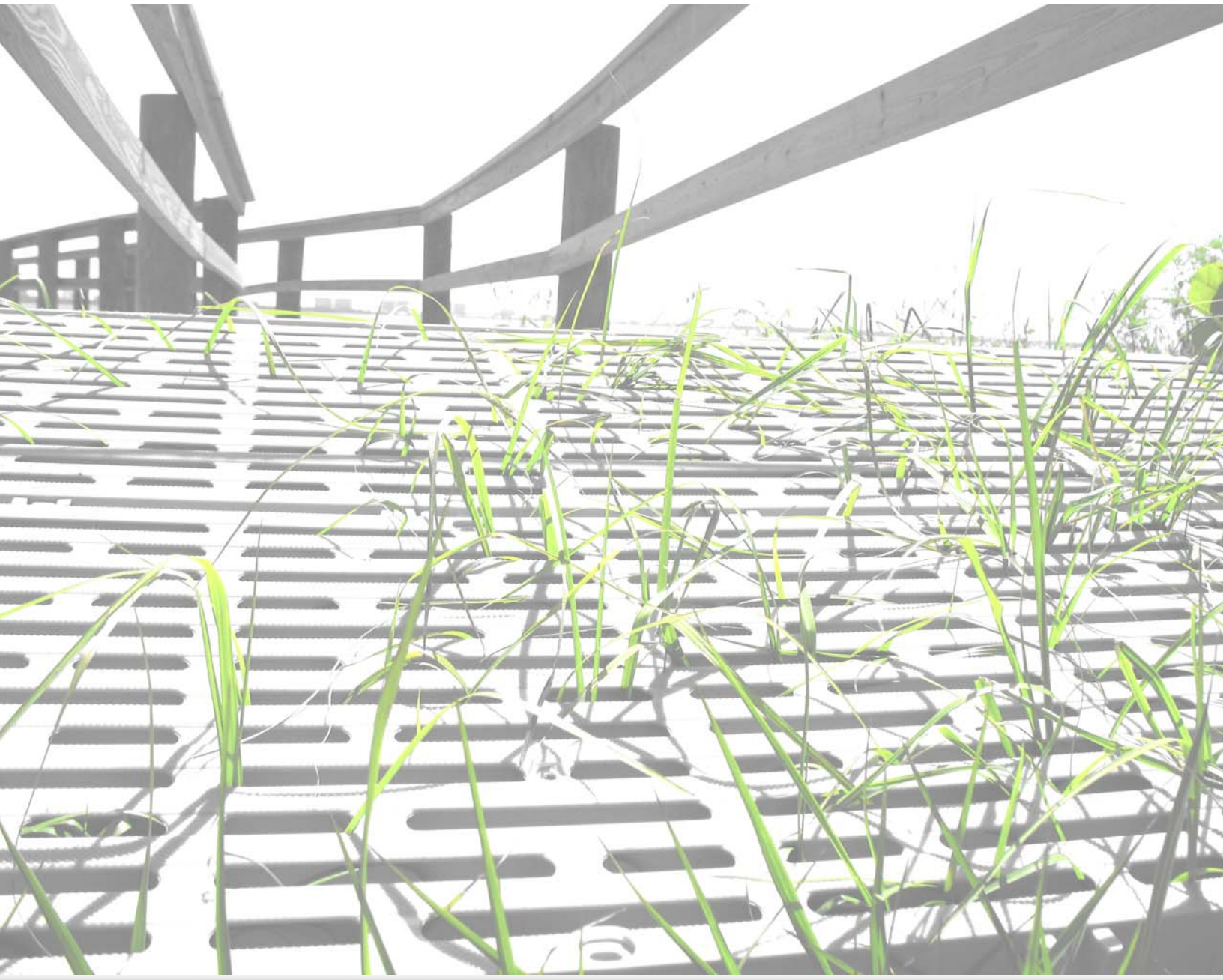
ThruFlow™ Inc.

Technical Reports for
ThruFlow™ Interlocking Panels



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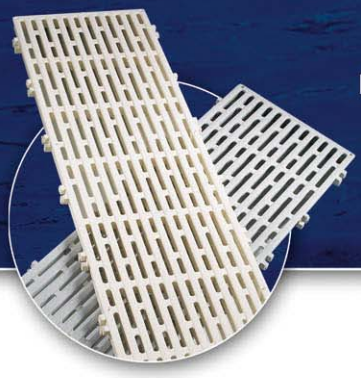

THRUFLOW™ Interlocking Panels

Detailed Technical Reports

- Light Penetration
- Load Capacity
- Simulated Uniformly Distributed Load/Concentrated Load
- Izod Impact
- Coefficient of Linear Thermal Expansion
- Creep Relaxation
    - 3 foot panel
    - 4 foot panel
    - 5 foot panel
- Baseline Flexural Properties
    - 3 foot panel
    - 4 foot panel
    - 5 foot panel
- Flexural Properties at Elevated Temperatures
- Coefficient of friction
- Oil-Wet Ramp Slip Resistance
- Wet Slip Resistance
    - Slider Rubber 96
    - Slider Rubber 55
- Wet/Barefoot Ramp

Compiled by Karen Dunlop
August 29th, 2007
ThruFlow Inc.

Cambridge
materials testing limited

Product Development
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Mississauga, Ontario L5N 6B9
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Report For:	**Thruflow Inc.** P.O. Box 40 760 Lowe Avenue Wallaceburg, ON Canada N8A 4Z9 Phone: 519 627 7960 Fax: 519 627 7969	**Laboratory #:** **Report Date:** **Received Date:** **Customer P.O.#:**	354661-04 March 10, 2004 March 10, 2004 2
Attention:	Derek McGivern		

TEST REPORT

LIGHT AVAILABILITY
OTRON THRUFLOW DOCK PANEL

1. INTRODUCTION

Otron requested the assistance of Cambridge Materials Testing Limited (CMTL) to estimate the amount of sunlight which would be available under a 4' x 4' section of dock surfaced with their ThruFlow Flooring System. The amount of available light under the dock is an important factor with regard to the sustainability of plant and animal life under dock structures.

Otron supplied an assembled 4' x 4' dock section for this testing. The section consisted of four ThruFlow panels (12" x 48") fastened to a metal frame.

Two dock surface heights were tested:

- eighteen (18) inches (tested under CMTL Lab. No. 304167-02)
- sixty (60) inches (tested under CMTL Lab. No. 307535-02).

A graph extrapolating the expected light availability over the dock height range of 0 to 60 inches is provided in this report.

Cambridge Materials Testing Limited

Per _____ *QUALITY ASSURANCE*

Per _____ *TECHNICIAN*

2. *BACKGROUND to TEST PROCEDURE*

Two routes for sunlight to irradiate the area under a 4' x 4' dock section were considered by CMTL.

Surface Light - light which passed through the slots on surface of dock

- the slots accounted for a reported 43% of the dock surface
- surface light passed through the slots in the surface of the dock and created a Partially Illuminated Area (PIA) under the dock
- the PIA consisted of illuminated and dark shadow areas corresponding to the Otron ThruFlow panel
- the frame supporting the dock panels created solid bands of frame shadow which occupied part of the area under the dock
- the PIA covered 100% of the area under the dock when the sun was directly overhead (90 degrees) minus the Frame Shadow Area (FSA)
- as the sun moved from 90 degrees to higher or lower incident light angles the PIA cast by the dock surface covered progressively less area under the dock
- the FSA changed with the incident light angle
- eventually at very low and very high incident light angles the PIA and FSA under the dock became zero.

Edge Light - light which strikes the edge plane of the dock

- incident light at sun angles below 90^{O} illuminated the area under the edge of the dock
- the percentage of area illuminated from the side plane increased from zero for incident light close to 90^{O} to 100% for low and high incident angles

3. TEST PROCEDURE

The 4' x 4' dock section was mounted so that the top surface of the dock was 18 inches and so inches above ground level. A 150 watt (120 volt) incandescent light source was sequentially positioned at the following incident light angles: 90, 75, 60, 45, 30, 20 and 10 degrees relative to the mid point of the dock section at ground level. The light source at 90 degrees simulated sunlight at noon. The light source at 0 degrees simulated sunrise or sunset.

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3.0 TEST PROCEDURE (CON'D)

At each incident light angle the width of the area under the dock illuminated by Edge Light was measured. This length was used to calculate the ***Edge Light Area***. The light intensity in the Edge Light Area was the same with and without the dock in place and was assigned as 100%.

Light Availability due to Edge Light was calculated as Edge Light Area multiplied by the light intensity.

Light passing through the openings in the ThruFlow panel created a Partially Illuminated Area (PIA) under the dock. The PIA was calculated as the total dock area minus the Edge Light Area. The Frame Shadow Area (FSA) was subtracted from the PIA to determine the **Corrected PIA** under the dock.

At each incident light angle a Sekonic Illuminometer (Model 246) light meter was used to measure the light intensity at ground level at the mid point of the dock section with and without the dock in place. The reading with the dock in place was measured as the average between the illuminated and shadow areas.

The reading with the dock in place was divided by the reading without dock to calculate the Light Intensity Ratio. The distance of the light source from the mid point of the dock was kept constant for the measurements at each incident angle.

Light Availability due to Surface Light was calculated as the Corrected PIA multiplied by the average light intensity.

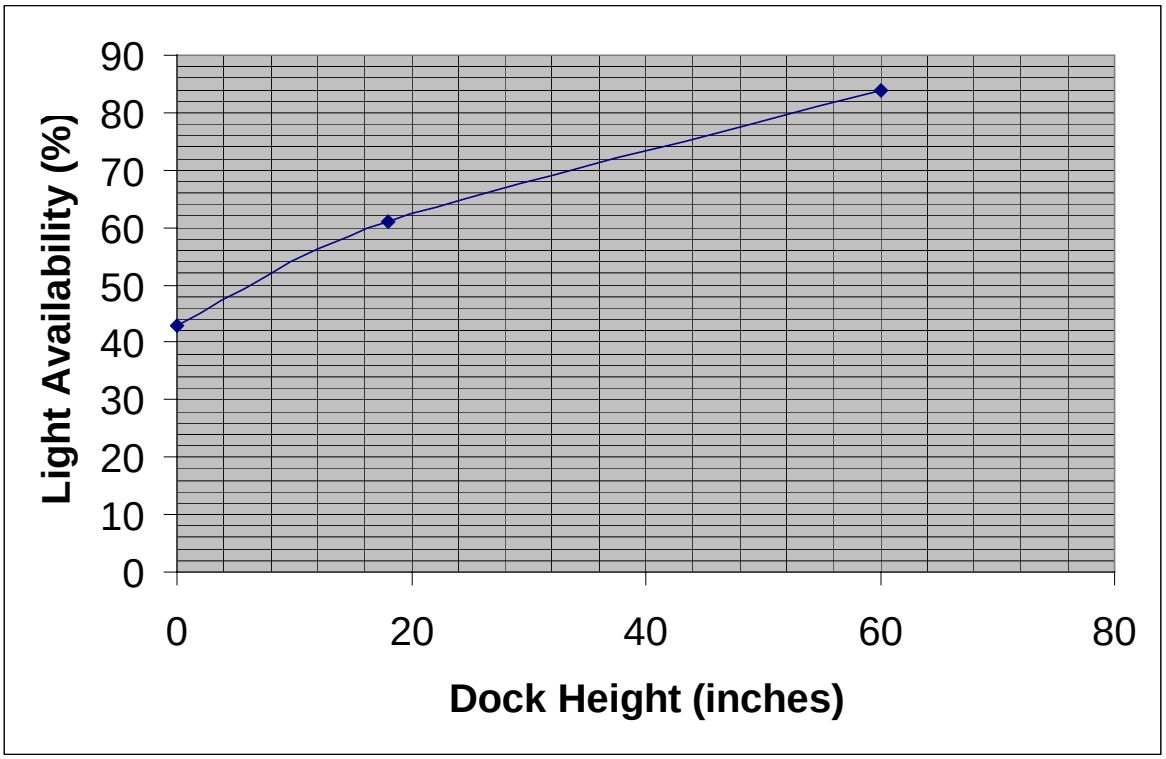
Total Average Light Availability (%) From 0 to 90 Degrees was calculated by adding the Light Availability Due to Edge Light and Light Availability Due to Surface Light and averaging across the 0 to 90 degree incident light range. Actual sunlight would act over a 0 to 180 degree arc but the percent light availability would be identical to the 0 to 90 degree arc.

4. RESULTS

The measurements and calculations for estimating the light availability under the Otron ThruFlow dock panels are summarized in Tables 1 and 2. The averaged light availability measured was:

18" Dock Height	61%
60" Dock Height	84%

A graph extrapolating the expected light availability over the dock height range of 0 to 60 inches is provided below.



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Otron Tech Inc.
Lab. No. 354661-04

Table 1
Light Availability – Otron Thruflow Panel
18 inch dock height

Incident Light Angle	**0**	**10**	**20**	**30**	**45**	**60**	**75**	**90**
Surface Light								
Partially Illuminated Area (%)	0	0	0	42	73	89	97	100
Frame Shadow Area (%)				8	21	22	12	6
Corrected Partially Illuminated Area				34	52	66	85	94
Light Intensity								
Light Intensity (Lx)- without dock				160	380	410	440	220
Light Intensity (Lx) - with dock				40	140	160	180	100
Light Intensity Ratio				25	37	39	41	45
Light Availability due to Surface Light (%)	**0**	**0**	**0**	***8***	***19***	***26***	***35***	***43***
Edge Light								
Edge Illumination (inches)	48.0	48.0	48.0	28.0	13.0	5.5	1.4	0.0
Edge Illumination (%)	100	100	100	58	27	11	3	0
Light Availability due to Edge Light (%)	**100**	**100**	**100**	**67**	**46**	**37**	**38**	**43**

Total Average Light Availability (%), 0 - 90^{O} 61%

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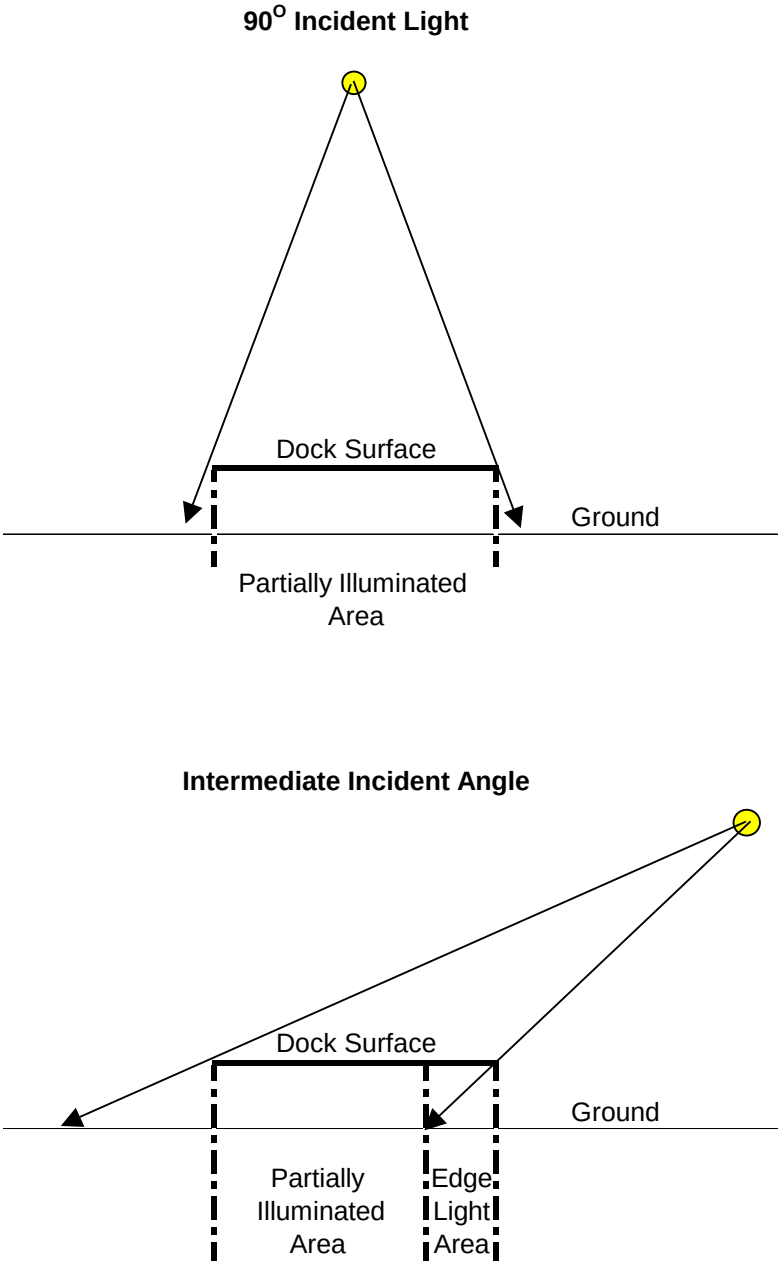
Otron Tech Inc.
Lab. No. 354661-04

Table 1
Light Availability – Otron Thruflow Panel
5 foot dock height

	Angle of Incidence (degrees) of Light Source							
Incident Light Angle	**0**	**10**	**20**	**30**	**45**	**60**	**75**	**90**
Surface Light								
Total Grid Shadow Area (%)	0	0	0	0	0	10	74	100
Zero Light Area- frame effect				0	0	3	9	6
Partially Illuminated Area - ThruFlow panel effect				0	0	8	65	94
Partially Illuminated Area								
Light Intensity (Lx)- without dock						115	340	310
Light Intensity (Lx) - with dock						60	115	115
Light Intensity Ratio						52	34	37
Light Intensity Ratio x Partially Illuminated Area						4	22	35
Edge Light								
Edge Illumination (inches)	48.0	48.0	48.0	48.0	48.0	39.5	12.5	0.0
Edge Illumination (%)	100	100	100	100	100	82	26	0
Light Availability (%)	100	100	100	100	100	86	48	35

Average Light Availability, 0 - 90^{O}, 5 Foot Dock Height - 84 %

Figure 1 – Schematic of Test Procedure for Light Availability



WSTC Reference #:ThruFlow0609-1

REPORT

Load Capacity Testing of ThruFlow™ Decking Panel

Submitted to:

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Reviewed by:

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Manager

September 28, 2006

PREFACE

The University of New Brunswick Wood Science and Technology Centre (WSTC) has been assessed under the authority of the *Standards Council of Canada Act* and found to comply with the requirements of ISO/IEC 17025 and other conditions established by the Standards Council of Canada. WSTC is recognized as an *Accredited Testing Laboratory* for specific tests or types of tests listed in our scope of accreditation approved by the Standards Council of Canada. For the current status of our laboratory and scope of accreditation visit www.scc.ca, accredited laboratory number 108.

1.0 INTRODUCTION

AXIS Polymer Services, on behalf of ThruFlow™, has requested that the Wood Science and Technology Centre (WSTC) conduct load capacity testing on injection moulded deck perforated deck panels.

2.0 TEST MATERIALS

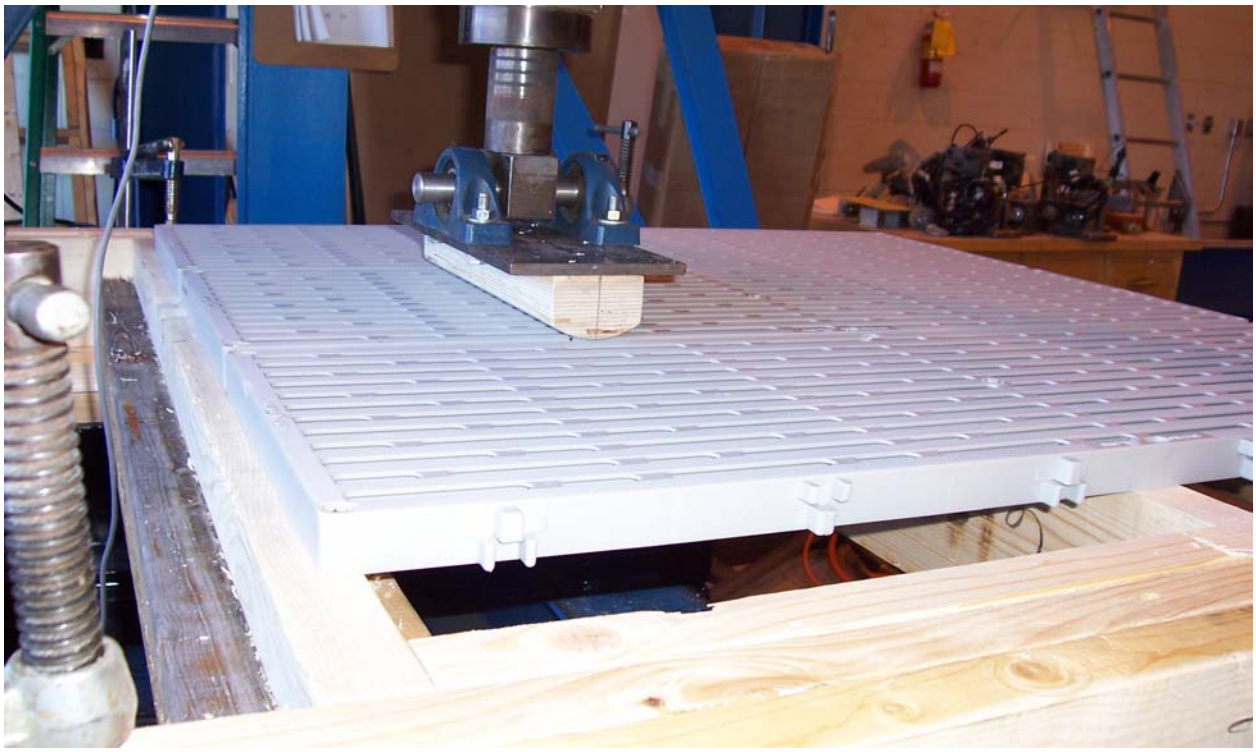
The test material was sent to us by Thru-Flow, login number of 6287 on 2006-09-11. Three different product sizes were tested, each product had a thickness of one and three sixteenths of an inch and a width of 11.5 inches. The lengths were five, four and three feet with each having different mounting support spans. Fasteners for mounting the planks were pan-head steel two and a half inch screws.

3.0 TESTING

3.1 Bending Test Frame

Load Capacity tests were conducted using a single span wood frame. traditional wood deck. Each deck had three panels mounted to it with the center panel the intended test piece as shown in Picture. 1. The loading head was machined from laminated veneer lumber to have a four inch diameter loading surface and length of 11.5 inches. The bending test frame had a load rate of four mm/min and recorded both cross-head movement and force.

Picture. 1



3.2 Load Capacity Results

The load-deflection curves for the samples tested are shown in Charts 1-6. The point on the curves at which the panel could no longer support the load was recorded as the Load Capacity and Deflection at Failure. These values are provided in Table 1.

Table 1.

Date Tested: September 12, 2006

ThruFlow Panel	Support Span inches (mm)	Replicate	Load Capacity		Deflection at Failure	
			lbf	kN	inches	mm
3'	**18" (457)**	1	1567	6.97	1.00	25.52
		2	1491	6.63	1.14	28.91
		Average	**1529**	**6.80**	**1.07**	**27.22**
4'	**16" (406)**	1	1457	6.48	0.81	20.68
		2	1437	6.39	0.69	17.46
		Average	**1447**	**6.44**	**0.75**	**19.07**
5'	**15" (381)**	1	1915	8.52	0.98	24.98
		2	1828	8.13	1.01	25.55
		Average	**1872**	**8.33**	**0.99**	**25.27**

Chart 1.

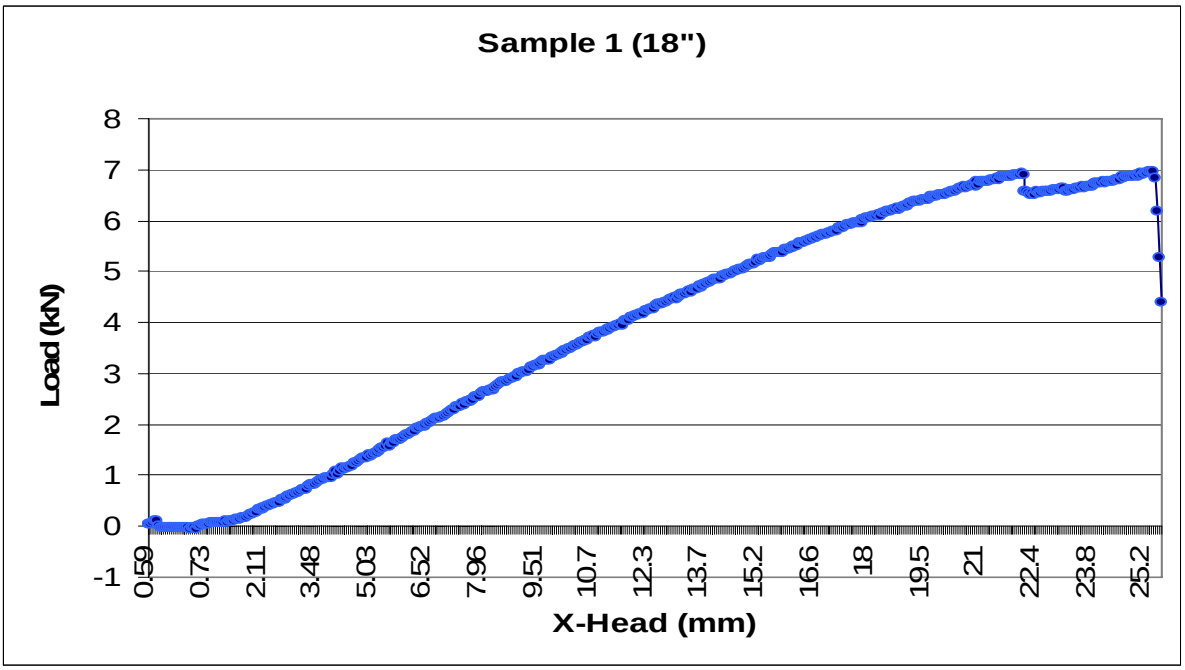


Chart 2.

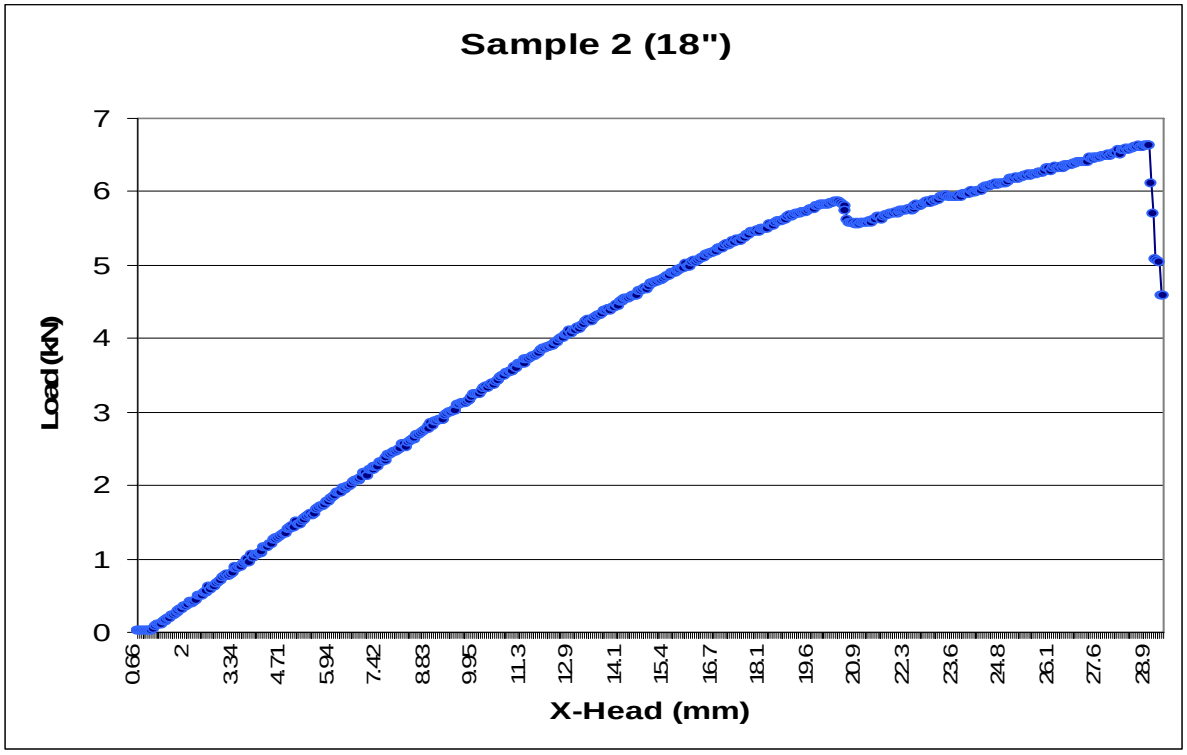


Chart 3.

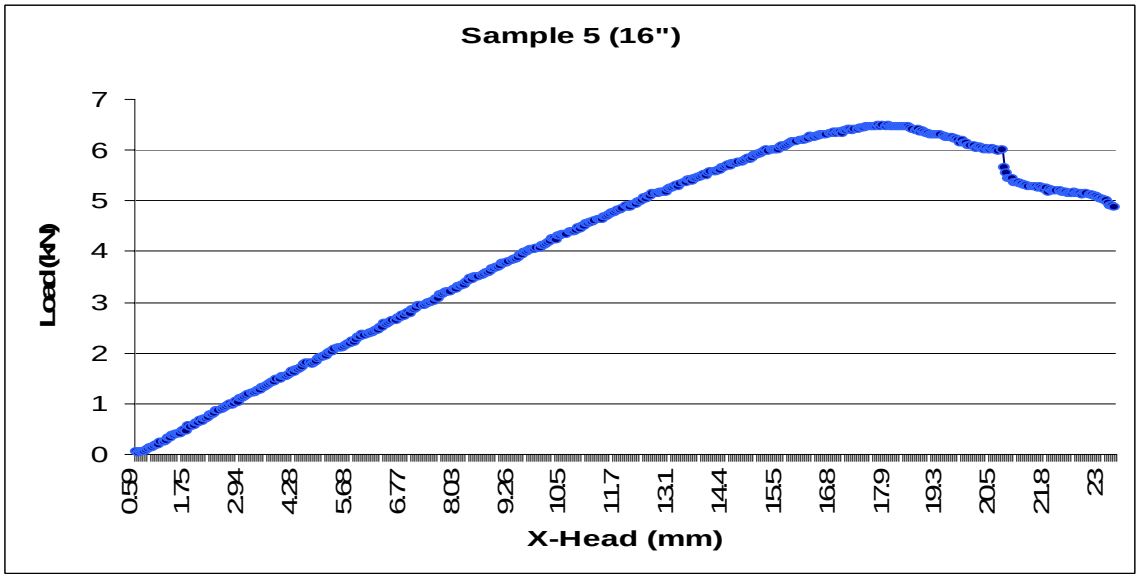


Chart 4.

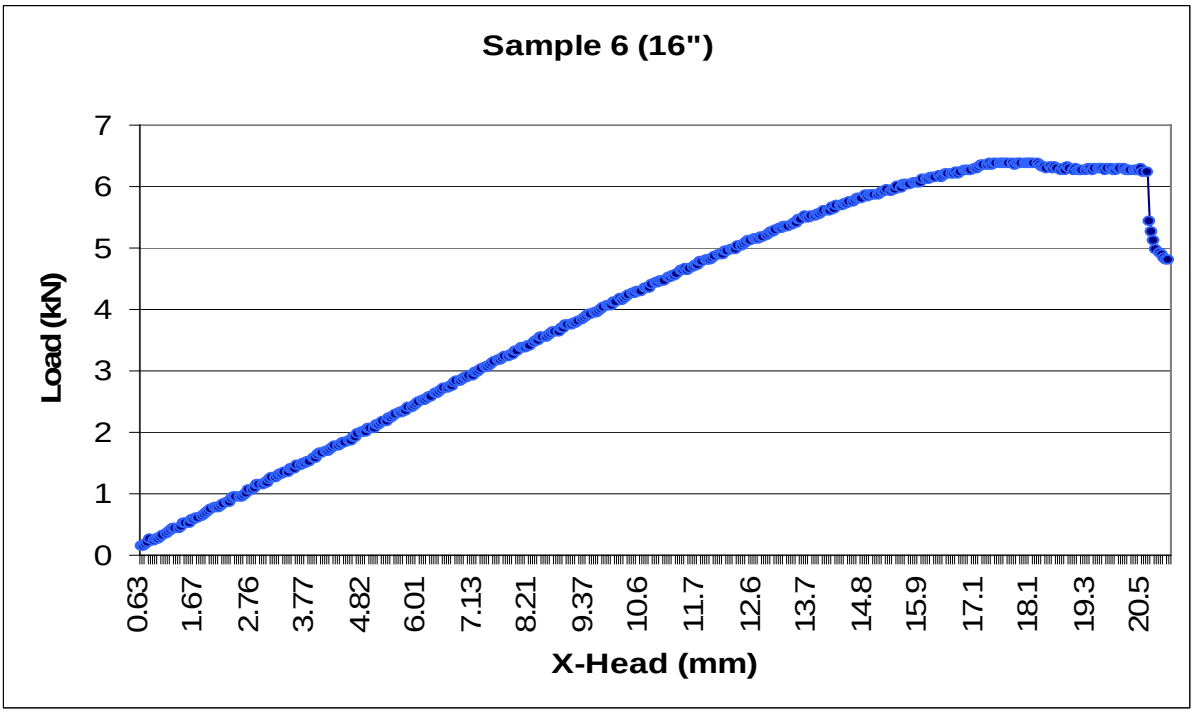


Chart 5.

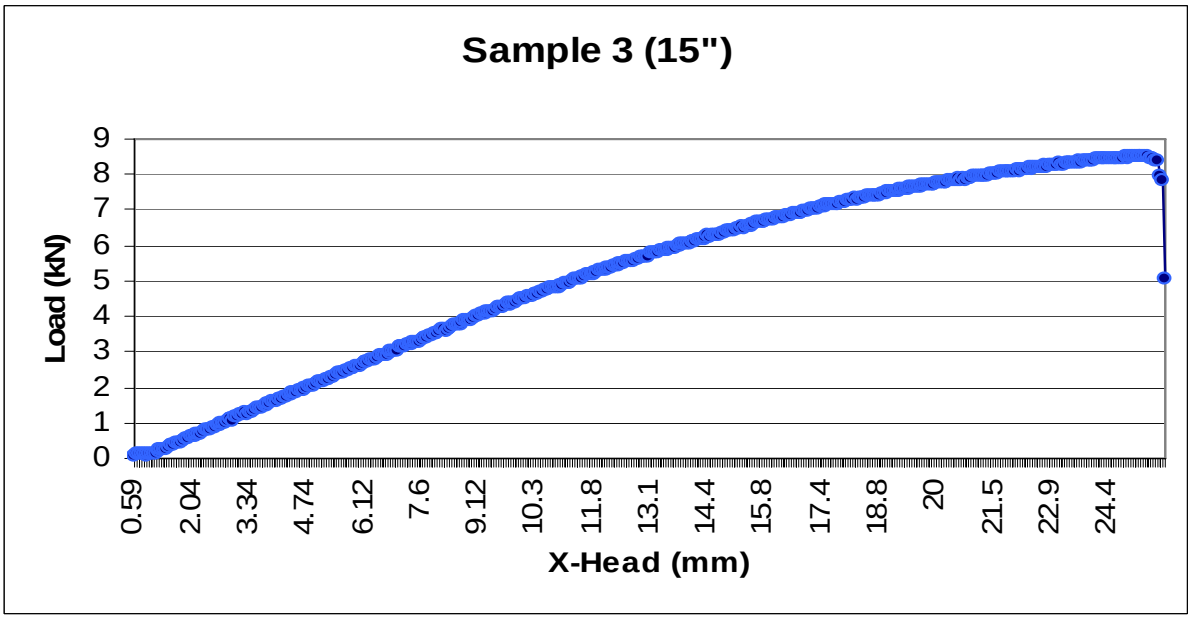


Chart 6.

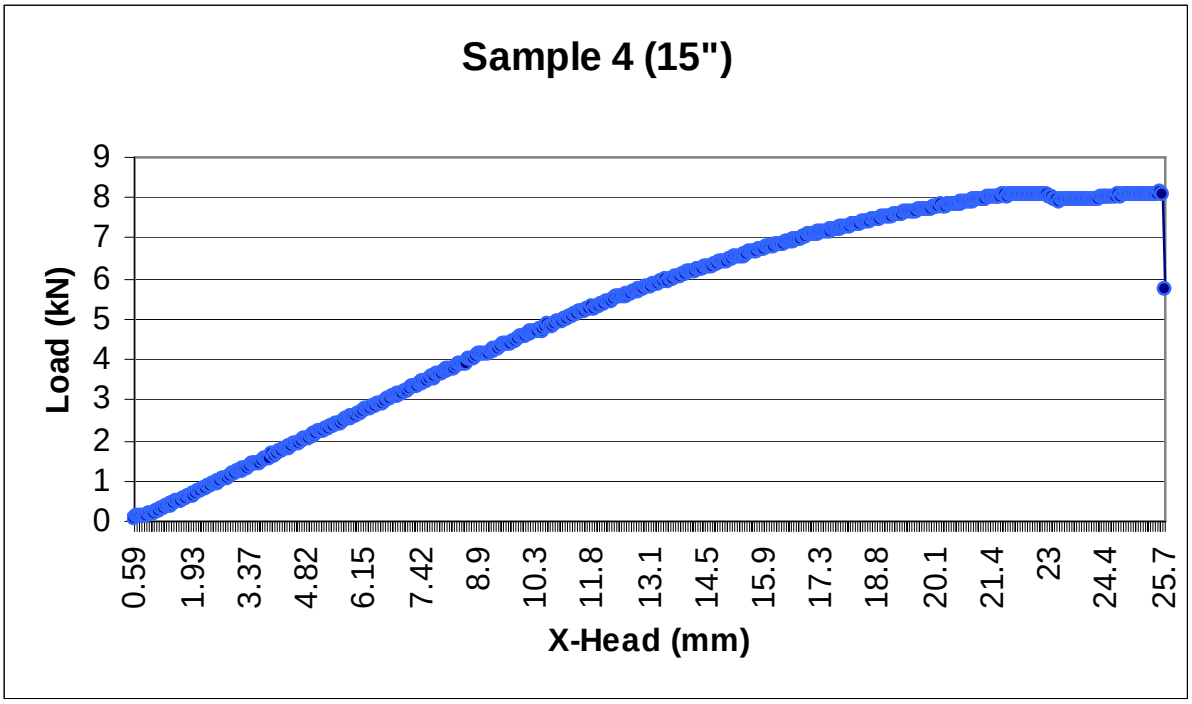


Table A1 - Test Equipment and Calibration Information

Equipment	Asset No.	Capacity	Calibrated	Accuracy
Mayes	020-1	100 kN	May. 17/06	± 1%

Melbourne Testing Services

Unit 1/15 Pickering Road
Mulgrave Victoria 3170
Telephone 03 9560 2759
Mobile 0419 116 733

IN CONFIDENCE TO THE CLIENT

REPORT NO: MT-06/169

TESTING OF THRUFLOW WALKWAY PANELS

CLIENT: **DAVID PADFIELD**
ATTAR
PO BOX 286
SPRINGVALE VIC 3171

DATE OF TESTING: MAY 25TH 2006

DATE OF REPORT: MAY 25TH 2006

TEST SYNOPSIS:

Two ThruFlow walkway panels were delivered to the Melbourne Testing Services laboratory for load testing (See Fig.1). Upon arrival at the laboratory the test items were measured and the following dimensions were recorded:

Length: 1220mm

Width: 300mm

Depth: 30mm

At the request of the client load testing was to be conducted on the ThruFlow panels to determine if the panels could support test loads commensurate with the requirements of:

- AS/NZS 1170.1 STRUCTURAL DESIGN ACTIONS. PART 1: PERMANENT, IMPOSED AND OTHER ACTIONS.
- AS 3962-2001 GUIDELINES FOR MARINAS.

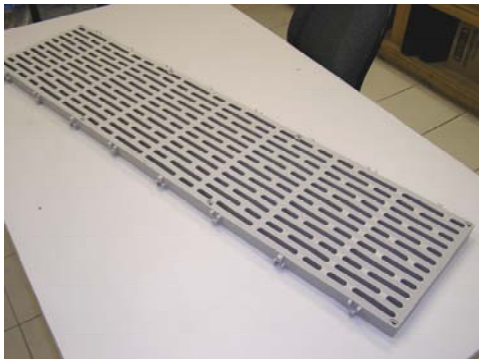


FIG.1.
TEST ITEM

TEST PROCEDURES:

Two tests were conducted in accordance with the following procedures:

1. A Simulated Uniformly Distributed Load (UDL) commensurate with a factored uniform pressure of 7.5kPa.
2. Concentrated load test of 2.1kN over an area of 350mm^2 (See Fig.2). *(Note that this test was conducted strictly in accordance with the clients, own clients instructions, using a linear load applicator measuring 58.3mm long x 6.0mm wide (350mm^2). Load was applied in the mid-span region of the panel and bearing over three of the panels longitudinal ribs).*

Both tests were conducted for 15 minutes during which time the applied load and panel deflection was recorded. At the completion of testing the test panels were visibly inspected for signs of failure and the residual deflection was calculated.

Melbourne Testing Services Pty Ltd
ABN: 71353261540

TEST OBSERVATIONS:

UDL Test

The test panel supported the test load 2.75kN (7.5kPa) without visible sign of failure or excessive permanent deflection. The residual deflection recorded at completion of testing was calculated to be 2.8%. This is less than the maximum allowable value of 5.0% as specified in AS 3962:2001 Appendix B.

Concentrated Load Test

The test panel supported the factored test load of 2.1kN as required by AS/NZS 1170.1:2002 Table B1, without visible sign of failure. The residual deflection recorded at completion of testing was calculated to be 4.5%. This is less than the maximum allowable value of 5.0% as specified in AS 3962:2001 Appendix B.

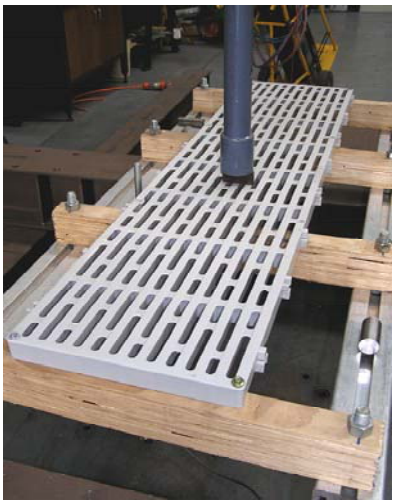


FIG.2.
CONCENTRATED LOAD TEST

Notes:

1) This report only indicates compliance of the ThruFlow walkway panel for uniform loading in its state at the time of testing. It should not be taken as a statement that all similar walkway panels or components of walkway panels in all states of repair, would also be found to comply.
2) It remains the responsibility of the client to ensure that the samples tested are representative of the entire product batch.
3) This report only covers the structural integrity of the ThruFlow walkway panel as tested and as described herein.
4) This report does not cover the actual walkway support structure or fixing of ThruFlow walkway panels.
5) Melbourne Testing Services shall take no responsibility for the results of testing or conformance of the ThruFlow walkway panel where the panel was tested for concentrated loading.

R. Wilkie

RODNEY WILKIE
AUTHORISED SIGNATORY

Melbourne Testing Services Pty Ltd
ABN: 71353261540

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Report For:	**Thruflow Inc.** P.O. Box 40 760 Lowe Avenue Wallaceburg, ON Canada N8A 4Z9 Phone: 519 627 7960 Fax: 519 627 7969	**Laboratory #:**	356155E-04 **Report Date:** April 20, 2004 **Received Date:** March 29, 2004 **Customer P.O.#:** 4
Attention:	Derek McGivern		

TEST REPORT

IZOD IMPACT

THRUFLOW 4' GFPP DOCK PANEL

1. INTRODUCTION

Six specimens from the 4' GFPP dock panel identified as "new 4' panel, beige, 356155-3" were machined, notched and tested for Izod Impact testing in accordance with ASTM D256-03, Method A using a 2 lb pendulum. The Izod specimens were taken from the rib of the panel. The width of the specimens had a taper of 0.018 – 0.031 in. and as such are considered non-conforming as per ASTM D256-03 Sec 7.2. Results were calculated using the average width of each Izod specimen. The specimens were conditioned a minimum of 16 hours at –34.4 ± 2°C or 40 hours at 23 ± 2°C and 50 ± 5% R.H. as appropriate, prior to testing. At the cold temperature specimens were impacted within 5 seconds of removal from the cold chamber. The average width of the specimens was 0.116 to 0.120 inches.

2. RESULTS

16 Hours @ -34.4 ± 2°C

Impact Strength (ft·lb/in)	Type of Failure
1.16	Complete Break
1.40	Complete Break
1.12	Complete Break
Avg. = 1.23 ft·lb/in	

Ambient

Impact Strength (ft·lb/in)	Type of Failure
2.48	Partial Break
2.51	Partial Break
2.68	Partial Break
Avg. = 2.62 ft·lb/in	

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Attention:	Derek McGivern		

TEST REPORT

COEFFICIENT OF LINEAR THERMAL EXPANSION

THRUFLOW 4' GFPP DOCK PANEL

1. INTRODUCTION

Two specimens from the 4' GFPP dock panel identified as "new 4' panel, beige, 356155-3" were tested to determine the Coefficient of Linear Thermal Expansion (CLTE) in accordance with ASTM D696-03. The test specimens were prepared by milling the edges to a nominal finished dimension of 50.9 mm x 12.8 mm x 3.2 mm.

2. RESULTS

SPECIMEN	TEMPERATURE RANGE (°C)	RESULTS
1	-29.2 to +28.8 to –28.8	2.68×10^{-5} 1°C
2	-28.7 to +30.2 to –29.8	2.35×10^{-5} 1°C
Mean		2.52×10^{-5} 1°C 1.40×10^{-5} 1°F

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	Phone: 519-627-7428 Ext.112 Fax: 519-627-7428 E-Mail: derekm@thruflow.com	**Customer P.O. #:**	**613**
Attention:	Derek McGivern		

TEST REPORT

PROPERTIES OF THRUFLOW DECKING PANELS

CREEP RELAXATION

1. INTRODUCTION

On August 24th, 2006, CMTL received, a three (3) foot Thruflow Reinforced Polypropylene (RPP) dock panel to determine the creep relaxation properties at 73°F as per the request of AXIS Polymer Services Inc.

2. TEST METHOD

The Thruflow dock panel was tested according to the creep relaxation requirements outlined in ICC AC174 (Approved Feb. 2005) and ASTM D7032-05, Section 5.4. The testing was conducted using a support span of 18 inches on center for three (3) foot panels.

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2. TEST METHOD (Cont'd)

Three (3) boards were tested as per ASTM D6109-05 modified for quarter point loading. The boards were placed across the support noses. A calibrated dial gauge was secured under the deck boards and the initial deflection at the mid-span was recorded. A pre-weighed loading nose assembly was placed on the boards. Weights were added to the assembly until a load corresponding to 100 psf, 120 psf, 140 psf, 160 psf and 200 psf (2x design load) were applied. The 200 psf load was left in place for 24 hours and the total deflection was recorded. The load was removed and deflection was recorded immediately. The boards were allowed to recover for 24 hours at which time the deflection was measured. The percent recovered deflection was calculated as follows:

Percent recovered deflection =

$$\frac{\text{(total deflection after 24hr loading period – residual deflection after 24hr recovery period)}}{\text{total deflection after 24hr loading period}} \times 100$$

3. RESULTS

18" Support Span

	Deflection (inches)			
	Board 1	**Board 2**	**Board 3**	**Mean**
100 psf	0.0893	0.0872	0.0807	0.0857
120 psf	0.1087	0.1058	0.0987	0.1044
140 psf	0.1253	0.1227	0.1163	0.1214
160 psf	0.1440	0.1428	0.1365	0.1411
– total deflection after 24hr loading period	0.2377	0.2304	0.2205	0.2295
– residual deflection after 24hr recovery period	0.0168	0.0144	0.0127	0.0146
– percent recovered deflection	+93%	+94%	+94%	+94%

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Report for:	THRUFLOW P.O. Box 40, Stn. Main 1239 Dufferin Avenue, Suite B WALLACEBURG, Ontario N8A 2W3	**Laboratory #:**	**427785E-06** REVISED
		Report Date:	October 19th, 2006
		Received Date:	August 24th, 2006
	Phone: 519-627-7428 Ext.112 Fax: 519-627-7428 E-Mail: derekm@thruflow.com	**Customer P.O. #:**	**613**
Attention:	Derek McGivern		

TEST REPORT

PROPERTIES OF THRUFLOW DECKING PANELS

CREEP RELAXATION

1. INTRODUCTION

On August 24th, 2006, CMTL received, a four (4) foot Thruflow Reinforced Polypropylene (RPP) dock panel to determine the creep relaxation properties at 73°F as per the request of AXIS Polymer Services Inc.

2. TEST METHOD

The Thruflow dock panel was tested according to the creep relaxation requirements outlined in ICC AC174 (Approved Feb. 2005) and ASTM D7032-05, Section 5.4. The testing was conducted using a support span of 16 inches on center for four (4) foot panels.

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2. TEST METHOD (Cont'd)

Three (3) boards were tested as per ASTM D6109-05 modified for quarter point loading. The boards were placed across the support noses. A calibrated dial gauge was secured under the deck boards and the initial deflection at the mid-span was recorded. A pre-weighed loading nose assembly was placed on the boards. Weights were added to the assembly until a load corresponding to 100 psf, 120 psf, 140 psf, 160 psf and 200 psf (2x design load) were applied. The 200 psf load was left in place for 24 hours and the total deflection was recorded. The load was removed and deflection was recorded immediately. The boards were allowed to recover for 24 hours at which time the deflection was measured. The percent recovered deflection was calculated as follows:

Percent recovered deflection =

$$\frac{\text{(total deflection after 24hr loading period – residual deflection after 24hr recovery period)}}{\text{total deflection after 24hr loading period}} \times 100$$

3. RESULTS

16" Support Span

	Deflection (inches)			
	Board 1	**Board 2**	**Board 3**	**Mean**
100 psf	0.0516	0.0539	0.0467	0.0507
120 psf	0.0653	0.0682	0.0605	0.0647
140 psf	0.0745	0.0783	0.0701	0.0743
160 psf	0.0857	0.0906	0.0812	0.0858
– total deflection after 24hr loading period	0.1244	0.1300	0.1212	0.1252
– residual deflection after 24hr recovery period	0.0010	0.0154	0.0063	0.0076
– percent recovered deflection	+99%	+88%	+95%	+94%

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Report for:	THRUFLOW P.O. Box 40, Stn. Main 1239 Dufferin Avenue, Suite B WALLACEBURG, Ontario N8A 2W3	**Laboratory #:**	**427785F-06** REVISED
		Report Date:	October 19th, 2006
		Received Date:	August 24th, 2006
	Phone: 519-627-7428 Ext.112 Fax: 519-627-7428 E-Mail: derekm@thruflow.com	**Customer P.O. #:**	**613**
Attention:	Derek McGivern		

TEST REPORT

PROPERTIES OF THRUFLOW DECKING PANELS

CREEP RELAXATION

1. INTRODUCTION

On August 24th, 2006, CMTL received, a five (5) foot Thruflow Reinforced Polypropylene (RPP) dock panel to determine the creep relaxation properties at 73°F as per the request of AXIS Polymer Services Inc.

2. TEST METHOD

The Thruflow dock panel was tested according to the creep relaxation requirements outlined in ICC AC174 (Approved Feb. 2005) and ASTM D7032-05, Section 5.4. The testing was conducted using a support span of 15 inches on center for five (5) foot panels.

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2. TEST METHOD (Cont'd)

Three (3) boards were tested as per ASTM D6109-05 modified for quarter point loading. The boards were placed across the support noses. A calibrated dial gauge was secured under the deck boards and the initial deflection at the mid-span was recorded. A pre-weighed loading nose assembly was placed on the boards. Weights were added to the assembly until a load corresponding to 100 psf, 120 psf, 140 psf, 160 psf and 200 psf (2x design load) were applied. The 200 psf load was left in place for 24 hours and the total deflection was recorded. The load was removed and deflection was recorded immediately. The boards were allowed to recover for 24 hours at which time the deflection was measured. The percent recovered deflection was calculated as follows:

Percent recovered deflection =

$$\frac{\text{(total deflection after 24hr loading period – residual deflection after 24hr recovery period)}}{\text{total deflection after 24hr loading period}} \times 100$$

3. RESULTS

15" Support Span

	Deflection (inches)			
	Board 1	**Board 2**	**Board 3**	**Mean**
100 psf	0.0397	0.0355	0.0313	0.0355
120 psf	0.0469	0.0438	0.0397	0.0434
140 psf	0.0546	0.0516	0.0481	0.0514
160 psf	0.0632	0.0590	0.0553	0.0591
– total deflection after 24hr loading period	0.0970	0.0938	0.0901	0.0936
– residual deflection after 24hr recovery period	0.0094	0.0074	0.0076	0.0081
– percent recovered deflection	+90%	+92%	+92%	+91%

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Report for:	THRUFLOW P.O. Box 40, Stn. Main 1239 Dufferin Avenue, Suite B WALLACEBURG, Ontario N8A 2W3	**Laboratory #:**	**427785A-06** REVISION 3
		Report Date:	October 19th, 2006
		Received Date:	August 24th, 2006
	Phone: 519-627-7428 Ext.112 Fax: 519-627-7428 E-Mail: derekm@thruflow.com	**Customer P.O. #:**	**613**
Attention:	Derek McGivern		

TEST REPORT

PROPERTIES OF THRUFLOW DECKING PANELS

BASELINE FLEXURAL PROPERTIES

1. INTRODUCTION

On August 24th, 2006, CMTL received, a three (3) foot Thruflow Reinforced Polypropylene (RPP) dock panel to determine baseline flexural properties at 73°F as per the request of AXIS Polymer Services Inc.

2. TEST METHOD

The baseline flexural properties were determined in accordance with ASTM D6109-05, Method A procedures modified for quarter point loading and ASTM D7032-05, Section 4.4. The testing parameters used for all ASTM D6109-05 tests are outlined below.

Testing Position	Flatwise	Radius of Support Noses	2”
Nominal Sample Size	36” x 12” x 1.25”	Radius of Loading Noses	1”
Support Span	18”	Testing Machine	United SFM20
Support Span to Depth Ratio	14.4:1	Operating Software	Satec Partner
Testing Speed	0.479 “/minute	Moment of Inertia (I)	0.395 in^4
		Distance from Neutral Axis (Y)	0.731 in

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2. TEST METHOD (Cont'd)

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. The software calculated the slope of the load-deflection curve between the pre-selected limits corresponding to 10% and 40% of ultimate stress. A counter number was assigned to each sample tested. This counter number is identified in the results.

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 was extrapolated from the load-deflection curve at the point where the board samples either ruptured or reached the three percent strain limit

Load at L/180 measured in pounds-force (lbf) – this property was 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 was calculated using the following equation:

$$MOR = \frac{(\text{Peak Load} \times \text{Support Span} \times \text{Distance from Neutral Axis})}{(8 \times \text{Moment of Inertia})}$$

Slope of Tangent measured in lbf/in – this property was recorded from the load-deflection curve between 10% and 40% of the ultimate stress.

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

$$MOE = \frac{(\text{Support Span}^3 \times \text{Slope of Tangent to Load-Deflection Curve} \times \text{Distance from Neutral Axis})}{(34.9 \times \text{Depth} \times \text{Moment of Inertia})}$$

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3. RESULTS

18" Support Span

Sample I.D.*	Counter Number	Load at Rupture (lbf)	Load at L/180 (lbf)	MOR (psi)	Slope of Tangent (lbf/in)	MOE (psi)
1	19105	1,846	239	7,680	1,825	452,000
2	19107	1,847	234	7,690	1,689	418,000
3	19109	1,856	235	7,730	1,688	418,000
4	19111	1,965	241	7,180	1,805	447,000
5	19113	1,884	246	7,850	1,813	449,000
Mean		**1,879**	**239**	**7,830**	**1,764**	**437,000**
Standard Deviation +/-		**50**	**5**	**209**	**69**	**17,300**

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Report for:	THRUFLOW P.O. Box 40, Stn. Main 1239 Dufferin Avenue, Suite B WALLACEBURG, Ontario N8A 2W3	**Laboratory #:**	**427785B-06** REVISION 3
		Report Date:	October 19th, 2006
		Received Date:	August 24th, 2006
	Phone: 519-627-7428 Ext.112 Fax: 519-627-7428 E-Mail: derekm@thruflow.com	**Customer P.O. #:**	**613**
Attention:	Derek McGivern		

TEST REPORT

PROPERTIES OF THRUFLOW DECKING PANELS

BASELINE FLEXURAL PROPERTIES

1. INTRODUCTION

On August 24th, 2006, CMTL received, a four (4) foot Thruflow Reinforced Polypropylene (RPP) dock panel to determine baseline flexural properties at 73°F as per the request of AXIS Polymer Services Inc.

2. TEST METHOD

The baseline flexural properties were determined in accordance with ASTM D6109-05, Method A procedures modified for quarter point loading and ASTM D7032-05, Section 4.4. The testing parameters used for all ASTM D6109-05 tests are outlined below.

Testing Position	Flatwise	Radius of Support Noses	2”
Nominal Sample Size	48” x 12” x 1.25”	Radius of Loading Noses	1”
Support Span	16”	Testing Machine	United SFM20
Support Span to Depth Ratio	12.8:1	Operating Software	Satec Partner
Testing Speed	0.378 “/minute	Moment of Inertia (I)	0.395 in^4
		Distance from Neutral Axis (Y)	0.731 in

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2. TEST METHOD (Cont'd)

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. The software calculated the slope of the load-deflection curve between the pre-selected limits corresponding to 10% and 40% of ultimate stress. A counter number was assigned to each sample tested. This counter number is identified in the results.

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 was extrapolated from the load-deflection curve at the point where the board samples either ruptured or reached the three percent strain limit

Load at L/180 measured in pounds-force (lbf) – this property was 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 was calculated using the following equation:

$$MOR = \frac{(\text{Peak Load} \times \text{Support Span} \times \text{Distance from Neutral Axis})}{(8 \times \text{Moment of Inertia})}$$

Slope of Tangent measured in lbf/in – this property was recorded from the load-deflection curve between 10% and 40% of the ultimate stress.

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

$$MOE = \frac{(\text{Support Span}^3 \times \text{Slope of Tangent to Load-Deflection Curve} \times \text{Distance from Neutral Axis})}{(34.9 \times \text{Depth} \times \text{Moment of Inertia})}$$

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3. RESULTS

16" Support Span

Sample I.D.*	Counter Number	Load at Rupture (lbf)	Load at L/180 (lbf)	MOR (psi)	Slope of Tangent (lbf/in)	MOE (psi)
1	19083	2,046	289	7,570	2,792	485,000
2	19085	2,340	280	8,660	2,873	499,000
3	19087	2,312	325	8,560	2,851	495,000
4	19089	1,913	287	7,080	2,695	468,000
5	19091	2,091	267	7,740	2,770	481,000
Mean		**2,141**	**289**	**7,920**	**2,796**	**486,000**
Standard Deviation +/-		**182**	**22**	**674**	**70**	**12,200**

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Report for:	THRUFLOW P.O. Box 40, Stn. Main 1239 Dufferin Avenue, Suite B WALLACEBURG, Ontario N8A 2W3	**Laboratory #:**	**427785C-06** REVISION 3
		Report Date:	October 19th, 2006
		Received Date:	August 24th, 2006
	Phone: 519-627-7428 Ext.112 Fax: 519-627-7428 E-Mail: derekm@thruflow.com	**Customer P.O. #:**	**613**
Attention:	Derek McGivern		

TEST REPORT

PROPERTIES OF THRUFLOW DECKING PANELS

BASELINE FLEXURAL PROPERTIES

1. INTRODUCTION

On August 24th, 2006, CMTL received, a five (5) foot Thruflow Reinforced Polypropylene (RPP) dock panel to determine baseline flexural properties at 73°F as per the request of AXIS Polymer Services Inc.

2. TEST METHOD

The baseline flexural properties were determined in accordance with ASTM D6109-05, Method A procedures modified for quarter point loading and ASTM D7032-05, Section 4.4. The testing parameters used for all ASTM D6109-05 tests are outlined below.

Testing Position	Flatwise	Radius of Support Noses	2”
Nominal Sample Size	60” x 12” x 1.25”	Radius of Loading Noses	1”
Support Span	15”	Testing Machine	United SFM20
Support Span to Depth Ratio	12:1	Operating Software	Satec Partner
Testing Speed	0.333 “/minute	Moment of Inertia (I)	0.395 in^4
		Distance from Neutral Axis (Y)	0.731 in

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2. TEST METHOD (Cont'd)

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. The software calculated the slope of the load-deflection curve between the pre-selected limits corresponding to 10% and 40% of ultimate stress. A counter number was assigned to each sample tested. This counter number is identified in the results.

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 was extrapolated from the load-deflection curve at the point where the board samples either ruptured or reached the three percent strain limit

Load at L/180 measured in pounds-force (lbf) – this property was 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 was calculated using the following equation:

$$MOR = \frac{(\text{Peak Load} \times \text{Support Span} \times \text{Distance from Neutral Axis})}{(8 \times \text{Moment of Inertia})}$$

Slope of Tangent measured in lbf/in – this property was recorded from the load-deflection curve between 10% and 40% of the ultimate stress.

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

$$MOE = \frac{(\text{Support Span}^3 \times \text{Slope of Tangent to Load-Deflection Curve} \times \text{Distance from Neutral Axis})}{(34.9 \times \text{Depth} \times \text{Moment of Inertia})}$$

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3. RESULTS

15" Support Span

Sample I.D.*	Counter Number	Load at Rupture (lbf)	Load at L/180 (lbf)	MOR (psi)	Slope of Tangent (lbf/in)	MOE (psi)
1	19093	2,774	334	9,620	3,113	446,000
2	19095	2,321	329	8,050	2,926	419,000
3	19097	2,714	354	9,420	2,953	423,000
4	19099	2,734	348	9,490	2,980	427,000
5	19101	2,703	337	9,380	2,910	417,000
Mean		**2,649**	**340**	**9,190**	**2,976**	**426,000**
Standard Deviation +/-		**185**	**11**	**645**	**81**	**11,600**

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Report for:	THRUFLOW P.O. Box 40, Stn. Main 1239 Dufferin Avenue, Suite B WALLACEBURG, Ontario N8A 2W3	**Laboratory #:**	**427785G-06** REVISION 3
		Report Date:	October 19th, 2006
		Received Date:	August 24th, 2006
	Phone: 519-627-7428 Ext.112 Fax: 519-627-7428 E-Mail: derekm@thruflow.com	**Customer P.O. #:**	**613**
Attention:	Derek McGivern		

TEST REPORT

PROPERTIES OF THRUFLOW DECKING PANELS

FLEXURAL PROPERTIES AT ELEVATED TEMPERATURES

1. INTRODUCTION

On August 24th, 2006, CMTL received, a four (4) foot Thruflow Reinforced Polypropylene (RPP) dock panel to determine flexural properties at 126°F as per the request of AXIS Polymer Services Inc.

2. TEST METHOD

The flexural properties were determined in accordance with ASTM D6109-05, Method A procedures modified for quarter point loading and ASTM D7032-05, Section 4.4. The testing parameters used for all ASTM D6109-05 tests are outlined below.

Testing Position	Flatwise	Radius of Support Noses	2”
Nominal Sample Size	48” x 12” x 1.25”	Radius of Loading Noses	1”
Support Span	16”	Testing Machine	United SFM20
Support Span to Depth Ratio	12.8:1	Operating Software	Satec Partner
Testing Speed	0.378 “/minute	Moment of Inertia (I)	0.395 in^4
		Distance from Neutral Axis (Y)	0.731 in

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2. TEST METHOD (Cont'd)

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. The software calculated the slope of the load-deflection curve between the pre-selected limits corresponding to 10% and 40% of ultimate stress. A counter number was assigned to each sample tested. This counter number is identified in the results.

Five (5) boards were tested at 126+/-3°F. The key properties recorded and calculated for each board sample tested were:

Load at Rupture measured in pounds-force (lbf) – this property was extrapolated from the load-deflection curve at the point where the board samples either ruptured or reached the three percent strain limit

Load at L/180 measured in pounds-force (lbf) – this property was 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 was calculated using the following equation:

$$MOR = \frac{(\text{Peak Load} \times \text{Support Span} \times \text{Distance from Neutral Axis})}{(8 \times \text{Moment of Inertia})}$$

Slope of Tangent measured in lbf/in – this property was recorded from the load-deflection curve between 10% and 40% of the ultimate stress.

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

$$MOE = \frac{(\text{Support Span}^3 \times \text{Slope of Tangent to Load-Deflection Curve} \times \text{Distance from Neutral Axis})}{(34.9 \times \text{Depth} \times \text{Moment of Inertia})}$$

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3. RESULTS

16" Support Span

Sample I.D.	Counter Number	Load at Rupture (lbf)	Load at L/180 (lbf)	MOR (psi)	Slope of Tangent (lbf/in)	MOE (psi)
1	19115	1,883	226	6,970	2,222	386,000
2	19117	1,334	251	4,940	1,978	344,000
3	19119	1,736	239	6,430	1,973	343,000
4	19123	1,720	244	6,370	1,920	334,000
5	19125	1,355	237	5,020	2,009	349,000
Mean		**1,606**	**239**	**5,950**	**2,020**	**351,000**
Standard Deviation +/-		**247**	**9**	**913**	**117**	**20,200**

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Report For:	**Thruflow Inc.** P.O. Box 40 760 Lowe Avenue Wallaceburg, ON Canada N8A 4Z9 Phone: 519 627 7960 Fax: 519 627 7969	**Laboratory #:**	356155J-04
		Report Date:	April 30, 2004
		Received Date:	March 29, 2004
		Customer P.O.#:	4
Attention:	Derek McGivern		

TEST REPORT

COEFFICIENT OF FRICTION

4' GFPP THRUFLOW DOCK PANEL

One panel section was subjected to friction testing to determine the static and kinetic coefficients of friction. Three replicates per condition were tested. A sled with Topy brand shoe sole rubber sample was used. Testing was performed in accordance with ASTM D2394-83(1999) with a test speed of 0.05"/minute for the static coefficient of friction and 2"/minute for the kinetic coefficient of friction. The sled weight was 24 lbs.

RESULTS

Sample ID	Replicate	Static Coefficient of Friction	Kinetic Coefficient of Friction
4' GFPP	1-A	0.772	0.758
	1-B	0.826	0.751
	1-C	0.739	0.767
	Average	**0.779**	**0.759**

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A.B.N. 14 006 554 785

ATTAR TEST REPORT NUMBER: 06/0826.3

June 7, 2006 **Total Pages: 1**

OIL-WET RAMP SLIP RESISTANCE

Job No: M06/0826

Prepared for:	Arrk Australia & New Zealand Pty Ltd. 5 Lynch Street HAWTHORN VIC 3122	
Attention:	Mr Tim Lawson	
Test Site:	ATTAR, Unit 27, 134 Springvale Road, Springvale.	
Test Date:	May 31, 2006	
Manufacturer:	Thruflow	
Test Specimen, Size & Quantity Received:	Thruflow walkway panel, 122cm x 29.5cm, 2 off.	
Sampling & Direction of Testing:	Sampling conducted by client. Tested in the longitudinal direction.	
Test Personnel:	Marcus Braché & David Padfield	
Preparation:	As received, 2 off panels mounted on a 900 x 450 mm piece of 12 mm thick chip board.	
Joint Width:	N/A	
Air Temperature:	21ºC	
Test Standard:	AS/NZS 4586 - 2004 Slip resistance classification of new pedestrian surface materials – Appendix D.	
Surface Structure :	Ribbed	
Classification Criteria: (TABLE D3 in AS/NZS 4586- 2004)	**Corrected Mean Overall Acceptance Angle**	**Slip Resistance Assessment Group**
	6° to 10°	R9
	Over 10° to 19°	R10
	Over 19° to 27°	R11
	Over 27° to 35°	R12
	Over 35°	R13
Displacement Space:	Not Measured	
Displacement Space Assessment Group:	N/A	
Mean Overall Acceptance Angle:	**18.1°**	
Slip Resistance Assessment Group:	**R10**	

These results apply only to the specimens tested and it is recommended that before selection of flooring or paving materials the effect of service conditions, including maintenance procedures and wear on their slip-resistance be checked.

NOTE: Any specimens supplied will be disposed of in two (2) months time, unless otherwise instructed.

ATTAR

D. Padfield

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ATTAR
Advanced Technology Testing and Research

*Acoustic Emission * Slip Resistance Testing
*Materials Failure Analysis *Corrosion Monitoring
*Non-Destructive Testing Training

A Division of Engineering Materials Evaluation Pty. Ltd.
A.B.N. 14 006 554 785

ATTAR TEST REPORT NUMBER: 06/0826.1

June 7, 2006

Total Pages: 1

WET SLIP RESISTANCE

Job No: M06/0826

Prepared for:	Arrk Australia & New Zealand Pty Ltd. 5 Lynch Street HAWTHORN VIC 3122
Attention:	Tim Lawson
Test Site:	ATTAR, Unit 27, 134 Springvale Road, Springvale.
Test Date:	May 30, 2006
Test Specimens, Size & Quantity:	Thruflow walkway panels, 122cm x 29.5cm, 2 off.
Sampling & Direction of Testing:	Sampling conducted by client. Tested in the longitudinal direction.
Test Personnel:	John Dimopoulos
Preparation:	As received, washed in tap water and methylated spirits and dried.
Fixed/Unfixed:	Unfixed.
Air Temperature:	21ºC
Test Equipment:	Stanley Skid Resistance Tester (Pendulum) Serial Number 8117, Calibrated 11/04/2006.
Test Standard:	AS/NZS 4586 - 2004 Slip resistance classification of new pedestrian surface materials – Appendix A.
Slider Rubber:	Slider 96 (Four S) Batch No. 14
Classification Criteria:	Refer Appendix 3 – Classification Criteria, attached.

British Pendulum Number	**Specimen Number**					**Mean**
	1	2	3	4	5	
	44	45	45	46	49	46
Classification:	**W**					

These results apply only to the specimens tested and it is recommended that before selection of flooring or paving materials the effect of service conditions, including maintenance procedures and wear on their slip-resistance be checked.

NOTE: Any specimens supplied will be disposed of in two (2) months time, unless otherwise instructed.

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ATTAR TEST REPORT NUMBER: 06/0826.2

June 7, 2006

Total Pages: 1

WET SLIP RESISTANCE

Job No: M06/0826

Prepared for:	Arrk Australia & New Zealand Pty Ltd. 5 Lynch Street HAWTHORN VIC 3122
Attention:	Tim Lawson
Test Site:	ATTAR, Unit 27, 134 Springvale Road, Springvale.
Test Date:	May 30, 2006
Test Specimens, Size & Quantity:	Thruflow walkway panels, 122cm x 29.5cm, 2 off.
Sampling & Direction of Testing:	Sampling conducted by client. Tested in the longitudinal direction.
Test Personnel:	John Dimopoulos
Preparation:	As received, washed in tap water and methylated spirits and dried.
Fixed/Unfixed:	Unfixed.
Air Temperature:	21ºC
Test Equipment:	Stanley Skid Resistance Tester (Pendulum) Serial Number 8117, Calibrated 11/04/2006.
Test Standard:	AS/NZS 4586 - 2004 Slip resistance classification of new pedestrian surface materials – Appendix A.
Slider Rubber:	Slider 55 (TRL) Batch No. 14
Classification Criteria:	Refer Appendix 3 – Classification Criteria, attached.

British Pendulum Number	**Specimen Number**					**Mean**
	1	2	3	4	5	
	80	80	79	79	81	80
Classification:	**V**					

These results apply only to the specimens tested and it is recommended that before selection of flooring or paving materials the effect of service conditions, including maintenance procedures and wear on their slip-resistance be checked.

NOTE: Any specimens supplied will be disposed of in two (2) months time, unless otherwise instructed.

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Registered Testing Authority - Building Code of Australia

5 June 2006 Our Ref. EN13 / 46 03/0212

TEST REPORT No. 3568s

Requested by:	ATTAR
on (date):	1 June 2006
Manufacturer:	Unknown
Product Desc.:	Thru-Flow Interlocking Panels 1200mm x 600mm
Sampling details:	
Where:	Delivered
Date:	1 June 2006
By whom:	Courier
How (methods):	N/A

This test report consists of 3 pages

SUMMARY OF SLIP RESISTANCE TESTS PERFORMED:

		Result	Class
AS/NZS 4586:2004	Slip resistance classification of new pedestrian surface materials		
	Appendix C: WET/BAREFOOT Ramp		
	Mean angle of inclination:	29°	C

In order to interpret the classifications, please refer to Standards Australia Handbook 197, An Introductory Guide to the Slip Resistance of Pedestrian Surface Materials, which recommends minimum classifications for a wide variety of locations.

It is important to realise that test results obtained on unused factory-fresh samples may not be directly applicable in service, where proprietary surface coatings, contamination, wear and subsequent cleaning all influence the behaviour of the pedestrian surface.

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Telephone: 61 3 9252 6000 Facsimile: 61 3 9252 6244 Email: tiles@csiro.au Web: http://www.cmit.csiro.au

REPORT NO: 3568s
ISSUE DATE: 5 June 2006
MANUFACTURER: Unknown
PRODUCT DESC: Thru-Flow Interlocking Panels
1200mm x 600mm

SLIP RESISTANCE CLASSIFICATION OF NEW PEDESTRIAN SURFACE MATERIALS

WET/BAREFOOT RAMP TEST METHOD

TEST CARRIED OUT IN ACCORDANCE WITH
AS/NZS 4586:2004 (Appendix C)

Test Date: 5 June 2006

.ocation: Slip Resistance Laboratory

Sample Fixed

Joint width: N/A mm

Surface structure:
[ ] Smooth
[ ] Profiled
[X] Structured

RESULTS

		Actual mean	Reported mean
Mean angle of inclination:	**Calibration Board A:**	**11.01 °**	**11 °**
	Calibration Board B:	**17.41 °**	**17 °**
	Calibration Board C:	**26.14 °**	**26 °**
Mean angle of inclination of Test Board:		**29.31 °**	**29 °**

CLASSIFICATION:

Quality Group: **C**

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REPORT NO: 3568s
ISSUE DATE: 5 June 2006
MANUFACTURER: Unknown
TILE DESC: Thru-Flow Interlocking Panels
1200mm x 600mm

Date and Place 5 June 2006, Highett, Vic

Name, Title and Signature:

PETER WESTGATE
Senior Laboratory Technician

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Consulting services are available if further detailed analysis of the test results are required.