



Industrial Research Services

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Registered Testing Authority - Building Code of Australia

04 April 2007

Our Ref. EN13/1073 03/0211

TEST REPORT No. 3834

Requested by: Guardian Tactile Systems
on (date): 15 March, 2007
Manufacturer: Guardian Tactile Systems
Product Desc: Polyurethane Tactile Ground Surface Indicators
Yellow 300 x 300mm
Terracotta 300 x 300mm
Charcoal 300 x 300mm
Ivory 300 x 300mm

Sampling details:
Where: Delivered
Date: 15 March, 2007
By Whom: Client
How (methods): N/A

The results reported relate only to the sample(s) tested and the information received. No responsibility is taken for the accuracy of the sampling unless it is done under our supervision. CSIRO cannot accept responsibility for deviations in the manufactured quality and performance of the product. While CSIRO takes care in preparing the reports it provides to clients, it does not warrant that the information in this particular report will be free of errors or omissions or that it will be suitable for the client's purposes. CSIRO will not be responsible for the results or any actions taken by the client or any other person on the basis of the information contained in the report or any opinions expressed in it.

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This test report consists of 9 pages

Executive Summary

- Guardian Tactile Systems engaged CSIRO MMT to assess the properties of the polyurethane tactile ground support indicator samples within a defined test program:

ISO 10545-3	Determination of water absorption
AS 4459-4:1997	Determination of modulus of rupture and breaking strength
AS/NZS 4586:2004	Determination of Slip resistance
AS 1428.4-2002	Luminance
AS 1428.4-2002	Design for access and mobility – Tactile indicators
- The measured outcome of each assessment is stated in the Summary.

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SUMMARY OF TESTS PERFORMED:

ISO 10545-3 Determination of water absorption

Water Absorption – ISO10445-3	Tactile			
	Yellow	Terracotta	Charcoal	Ivory
Average water absorption	0.22%	0.21%	0.02%	0.20%
Apparent porosity	0.26%	0.26%	0.03%	0.23%
Apparent relative density	1.19	1.22	1.21	1.17
Bulb density	1.19	1.22	1.21	1.16

AS 4459-4:1997 Determination of modulus of rupture and breaking strength

Flexural Strength - AS 4459.4	Tactile			
	Yellow	Terracotta	Charcoal	Ivory
Breaking Load (N)	14	16	12	15
Breaking Strength (N)	13	15	12	14
Modulus of Rupture (N/mm ²)	8.29	9.79	7.70	9.51
Mean travel length of test arm (mm)	45.0	49.9	49.7	47.3

The test samples were deformed until they were dislodged from the test apparatus. The test samples did not crack or fracture as a result of the load placed upon them.

AS/NZS 4586:2004 Slip resistance of new pedestrian surfaces

Appendix D, Oil-wet ramp	Tactile			
	Yellow	Terracotta	Charcoal	Ivory
Mean overall acceptance angle:	28.0°	25.7°	28.9°	29.4°
Classification	R12	R11	R12	R12

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SUMMARY OF TESTS PERFORMED (cont)

AS 1428.4-2002 Appendix F - Luminance

Luminance	Tactile			
	Yellow	Terracotta	Charcoal	Ivory
Mean Contrast Dry	49.56	18.25	3.43	66.71
Contrast Range Dry	34.7 – 64.4	12.8 – 23.7	2.4 – 4.5	46.7 – 86.7
Mean Contrast Wet	48.31	16.7	2.21	65.17
Contrast Range Wet	33.8 – 62.8	11.7 – 21.7	1.6 – 2.9	45.6 – 84.7
Contrast Range	33.8 – 64.4	11.7 – 23.7	1.6 – 4.5	45.6 – 86.7

AS 1428.4-2002 Design for access and mobility – Tactile indicators

Section 2, Clause 2.2.3.3 Design requirements	Requirement	
Centre spacing of indicators	50 ±1mm	
Direction A		49.89mm
Direction B		49.90mm
Edge to side of indicator	7.5 ±1mm	
Direction A		7.99mm
Direction B		7.98mm
Inside warning to warning indicators	15.0 ±1mm	
Direction A		14.89mm
Direction B		14.90mm
Height of indicator	4 to 5 mm	
Direction A		3.91mm
Direction B		3.91mm
Diameter of indicator upper	25 ±1mm	
Direction A		25.19mm
Direction B		24.14mm
Diameter of indicator base	35 ±1mm	
Direction A		34.43mm
Direction B		34.51mm

Direction B is at right angles to Direction A

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**DETERMINATION OF WATER ABSORPTION, APPARENT POROSITY,
 APPARENT RELATIVE DENSITY AND BULK DENSITY**

TEST CARRIED OUT IN ACCORDANCE WITH
 ISO 105454-3:1995 [Equiv. to AS 4459-3:1999]

Test Date 16 March 2007

RESULTS:

Location: Ceramic Tile Laboratory Method: Vacuum
 Manufacturer Type: Polyurethane TGSI

Individual Values:

Tile	Water Abs.(%)	App. Porosity(%)	App. Rel. Density	Bulk Density
Yellow				
1	0.22	0.26	1.19	1.19
2	0.22	0.26	1.19	1.18
3	0.22	0.26	1.19	1.19
4	0.22	0.27	1.19	1.19
5	0.22	0.26	1.19	1.19
Average:	0.22	0.26	1.19	1.19
Terracotta				
1	0.21	0.25	1.21	1.21
2	0.21	0.26	1.22	1.22
3	0.21	0.26	1.22	1.22
4	0.21	0.26	1.22	1.22
5	0.20	0.25	1.22	1.21
Average:	0.22	0.26	1.22	1.22
Charcoal				
1	0.02	0.03	1.20	1.20
2	0.02	0.03	1.21	1.21
3	0.02	0.03	1.21	1.21
4	0.03	0.03	1.21	1.20
5	0.03	0.03	1.21	1.21
Average:	0.02	0.03	1.21	1.21
Ivory				
1	0.20	0.23	1.17	1.16
2	0.20	0.23	1.16	1.15
3	0.19	0.23	1.17	1.16
4	0.20	0.23	1.17	1.16
5	0.19	0.22	1.17	1.16
Average:	0.20	0.23	1.17	1.16

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DETERMINATION OF MODULUS OF RUPTURE AND BREAKING STRENGTH

TEST CARRIED OUT IN ACCORDANCE WITH
 AS 4459-4:1997 [Equiv. to ISO 10545-4:1994]

Test Date 23 March 2007

RESULTS:

Location: Ceramic Tile Laboratory
 Work size: Length: 300mm Width: 300mm Thickness: 1.5mm

Number of specimens 3 per colour group

Diameter of rod: 20 mm
 Thickness of rubber: 5 mm
 Overlap of tile beyond the edge supports: 10 mm
 Span of the support rods: 280 mm
 Average minimum thickness along ruptures: 1.5mm
 Width of the test specimen: 300 mm

Tile	Breaking Load (N)	Breaking Strength (N).	Modulus of Rupture (N/mm ²)
Yellow			
1	14.71	14	9.15
2	14.95	14	9.30
3	13.32	12	8.29
Mean	14.32	13	6.42
Terracotta			
1	15.26	14	9.50
2	15.55	14	9.68
3	16.41	15	10.21
Mean	15.74	14	9.80
Charcoal			
1	12.86	12	8.00
2	12.30	12	7.65
3	11.97	11	7.45
Mean	12.38	12	7.70
Ivory			
1	14.98	14	9.32
2	16.55	15	10.30
3	14.33	13	8.92
Mean	15.29	14	9.51

The test samples were deformed until they were dislodged from the test apparatus. The test samples did not crack or fracture as a result of the load placed upon them.

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SLIP RESISTANCE CLASSIFICATION OF NEW PEDESTRIAN SURFACE MATERIAL

OIL-WET RAMP TEST METHOD

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

Test Date: 19 March 2007

RESULTS: Location: Slip Resistance Laboratory

Sample Fixed
Joint width: 0 mm

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

RESULTS

Tactile Colour	Yellow	Terracotta	Charcoal	Ivory
Mean overall acceptance angle:	28.0°	25.7°	28.9°	29.4°
Classification:	R12	R11	R12	R12

Displacement Space Assessment Group: Not assessed

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LUMINANCE CONTRAST ASSESSMENT

TEST CARRIED OUT IN ACCORDANCE WITH
 AS 1428.4-2002 (Appendix F)

Test Date: 22 March 2007

RESULTS: Location: Slip Resistance Laboratory

Instrument: Gardner Gmbh Color-guide having the following settings
 45°/0° geometry
 Y x y colour system
 Illuminate observer angle of D65/2°

Luminance equation: $C = \frac{Y_2 - Y_1}{0.5(Y_1 + Y_2)}$

No. of samples: 15 readings from 15 random tactile heads.

Assessment	Luminance			
	Yellow	Terracotta	Charcoal	Ivory
Mean Contrast Dry	49.56	18.25	3.43	66.71
Contrast Range Dry	34.7 – 64.4	12.8 – 23.7	2.4 – 4.5	46.7 – 86.7
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DETERMINATION OF DESIGN REQUIREMENTS

TEST CARRIED OUT IN ACCORDANCE WITH
AS 1428.4:2002 Clause 2.2.3.3 Design Requirements

Test Date 03 April 2007

RESULTS:

Location: Ceramic Tile Laboratory

Number of specimens 1

Measurement	Requirement (mm)	Direction A (mm)		Direction B (mm)
		Mean of six measurements		
Centre to centre	50 ± 1	49.89	49.90	49.90
Edge to warning indicator	7.5 ± 1	7.99	7.98	7.98
Inside warning to warning indicators	15 ± 1	14.89	14.90	14.90
Edge to warning indicator	7.5 ± 1	7.5	7.5	7.5
Height base to upper	4 to 5	3.91	3.91	3.91
Warning indicator upper	25 ± 1	25.19	24.14	24.14
Warning indicator base	35 ± 1	34.43	34.51	34.51

Direction B is at right angles to Direction A



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Date and Place 04 April 2007 Highett, VIC

Name, Title and Signature

A handwritten signature in black ink, appearing to read "David Weeks".

DAVID WEEKS
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