Test Report No. 7191172028 -MEC17-LZS
dated 3 NOV 2017

PSB Singapore

Choose certainty.
Add value.

SUBJECT:

Testing of Solid Surfacing Material

TESTED FOR:

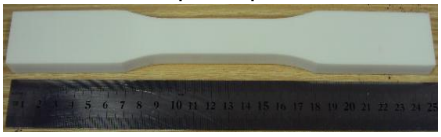
V Surf Pte Ltd
51 Tannery Lane
#06-01 Sharely Warehouse
Singapore 347798

Attn: Claudia Chang

SAMPLE DESCRIPTION:

The following test specimens without gel coat (typical as shown below) were submitted by V Surf Pte Ltd on 26 September 2017 for testing. Detail information of the sample is as follows :

Product : 100% Acrylic Solid Surface material
Brand : Tristone
Country of origin : Korea
Color : A-104 Pure White

Nominal Specimen Dimensions	Quantity	Photograph
400 mm x 150 mm x 12 mm	2 pcs	 Typical Specimen
250 mm x 250 mm x 12 mm	5 pcs	
200 mm x 200 mm x 12 mm	2 pcs	
150 mm x 150 mm x 12 mm	4 pcs	
76 mm x 25 mm x 12 mm	6 pcs	 Izod Impact Specimen
50 mm x 50 mm x 12 mm	40 pcs	
50 mm x 25 mm x 12 mm	2 pcs	
6 mm x 6 mm x 6 mm	4 pcs	 Tensile Specimen

TÜV SÜD PSB

Laboratory:
TÜV SÜD PSB Pte. Ltd.
No.1 Science Park Drive
Singapore 118221

Phone : +65-6885 1333
Fax : +65-6776 8670
E-mail: enquiries@tuv-sud-psb.sg
www.tuv-sud-psb.sg
Co. Reg : 199002667R

Regional Head Office:
TÜV SÜD Asia Pacific Pte. Ltd.
1 Science Park Drive, #02-01
Singapore 118221

TEST METHODS:

PS 18 : 1966
International Association of Plumbing and Mechanical Officials - Material and Property Standard for Cultured Marble Lavatory

1. Density
   ASTM D792 : 2013
   Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

Nominal Specimen Dimensions	:	50 mm x 25 mm x 12 mm
No. of Determinations	:	2

2. Impact Resistance
   PS 18, Clause 5.3

Nominal Specimen Dimensions	:	250 mm x 250 mm x 12 mm
Dropped Height	:	6” of reverse side
No. of Determination	:	1

3. Barcol Hardness
   PS 18, Clause 5.4

Nominal Specimen Dimensions	:	200 mm x 200 mm x 12 mm
No. of Determinations	:	12

4. Oven Test for Cracking and Crazing
   PS 18, Clause 5.5

Nominal Specimen Dimensions	:	150 mm x 150 mm x 12 mm
Test Condition	:	74 ± 2 °C for 10 days
No. of Determinations	:	2

5. Water Absorption
   PS 18, Clause 5.6

Nominal Specimen Dimensions	:	76 mm x 25 mm x 12 mm
Pre-Condition	:	50 ± 3 °C for 24 hrs
Water Immersion	:	23 ± 1 °C for 24 hrs
Reconditioning	:	50 ± 3 °C for 24 hrs
No. of Determinations	:	3

6. Stain
   PS 18, Clause 5.8

Nominal Specimen Dimensions	:	250 mm x 250 mm x 12 mm
Test Condition	:	23 ± 2°C for 24 hrs
No. of Determination	:	1

TEST METHODS: (CONT'D)

7. Cigarette Test
PS 18, Clause 5.8

Nominal Specimen Dimensions	:	200 mm x 200 mm x 12 mm
Burning Time	:	3 mins
No. of Determination	:	1

8. Scrub Test
PS 18, Clause 5.9

Nominal Specimen Dimensions	:	400 mm x 150 mm x 12 mm
No. of Cycles	:	40,000
No. of Determinations	:	2

9. Izod Impact Strength (Notched)
ASTM D256 : 2010
Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics

Nominal Specimen Dimensions	:	64 mm x 13 mm x 12 mm
Capacity of Pendulum	:	2.75 J
No. of Determinations	:	10

10. Tensile Properties
ASTM D638 : 2014
Standard Test Method for Tensile Properties of Plastics

Nominal Specimen Dimensions	:	ASTM D638, Type III
Initial Gauge Length	:	50 mm
Length of Grip Separation	:	115 mm
Crosshead Speed	:	5 mm/min
No. of Determinations	:	5

11. Coefficient of Thermal Expansion
ASTM E831 : 2014
Standard Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis

Instrument used	:	Thermomechanical Analyzer
Test condition	:	Ambient to 200 ºC
Nominal thickness	:	6 mm
Heating rate	:	5 °C/min
Load	:	0.02 N
Atmosphere	:	Nitrogen

12. Chemical Resistance

Nominal Specimen Dimensions	:	50 mm x 50 mm x 12 mm
Test Condition	:	23 ± 2°C for 24 Hrs
No. of Determination	:	1

TEST RESULTS:

S/No.	Characteristics	Test Results / Observations	PS 18 : 1966 Test Requirements
1	Density (g/cm^3), average	1.76	NA
2	Impact Resistance	No visible cracks were observed	Shall not show cracks
3	Barcol Hardness, average	59	40 min.
4	Oven test for Cracking or Crazing	No visible cracks or crazing was observed	Shall not show evidence of cracking or crazing
5	Water Absorption (%), average	0.05	Shall not absorb water in excess of 0.58% in 24hrs
6a	Stain (a) Coffee (b) Washing Detergent (c) Acetone (d) Olive Oil (e) Lipstick (f) Fly Spray (g) 6% Urea (h) Alcohol (i) Shoe Polish (paste form) (j) 10% Household Ammonia Solution (k) 10% Citric Acid solution (l) Amy Acetate (m) Trisodium Phosphate	 No effect No effect No effect No effect * Noticeable mark was observed No effect No effect No effect * Noticeable mark was observed No effect No effect No effect No effect	Shall be unaffected
6b	Stain (a) Tea (b) Ink Washable (c) 1% Iodine (d) Vinegar (e) Bluing	 No effect No effect ** Noticeable mark was observed No effect ** Noticeable mark was observed	Shall be unaffected (except for superficial stains which are easily removed by a light application of a mild abrasive)
7	Cigarette Test (mm)	0.02	Shall not be more than 0.38 mm gel removed
8	Scrub Test	Very slight brush marks were observed on the two tested solid surface panels	Shall withstand 40,000 cycles. Only slight brush marks are allowed.

TEST RESULTS: (CONT'D)

S/No.	Characteristics	Test Results / Observations	PS 18 : 1966 Test Requirements
9	Izod Impact Strength (J/m), average	19.3	NA
10	(a) Maximum Tensile Strength (MPa), average (b) Elongation at Break (%), average	38.6 1.0	NA NA
11	Coefficient of Thermal Expansion (µm/m·°C), α1 (50°C to 70°C) α2 (130°C to 170°C)	 65.0 130 (Figure 1)	NA

Chemical Resistance	Test Results / Observations	
	Results	Test Requirements
1) Hydrofluoric Acid (48%)	3.0	0
2) Hydrofluoric Acid (40%)	3.0	0
3) Hydrofluoric Acid (20%)	3.0	0
4) Nitric Acid (Conc)	3.0	1.0
5) Nitric Acid (20%)	2.0	0
6) Sulphuric Acid (98%)	1.0	3.0
7) Sulphuric Acid (20%)	1.0	0
8) Perchloric Acid (80%)	1.0	0
9) Perchloric Acid (12%)	1.0	0
10) Phosphoric Acid (85%)	1.0	0
11) Phosphoric Acid (17%)	1.0	0.5
12) Sodium Hydroxide (sat. aq)	1.0	0.5
13) Sodium Hydroxide (20%)	1.0	2.0
14) Potassium Hydroxide (30%)	1.0	0.5
15) Potassium Hydroxide (10%)	0.5	0
16) Alcoholic Potassium Hydroxide (30%)	0.5	0

TEST RESULTS: (CONTINUE)

Chemical Resistance	Test Results / Observations	
	Results	Test Requirements
17) Ammonia (0.89%)	0	0
18) Acetone	1.0	0.5
19) Chloroform	1.0	0
20) Toluene	1.0	0
21) Iso-propyl-alcohol (IPA)	0	0
22) Tetra hydro furan	0.5	0
23) Ethyl acetate	1.0	0
24) Di-ethyl-ether	0.5	0
25) Bleach (Household)	0.5	0
26) Hydrogen peroxide (3%)	0	0
27) Iodine (3.5%) aq	1.0	0
28) Bromine (sat. aq)	3.0	0
29) Potassium permanganate (sat.)	0	0
30) Ferric chloride (25%)	0	0
31) Silver Nitrate (5%)	2.0	1.0
32) Lead acetate (sat. aq)	0	0
33) Writing ink (Common)	0	0
34) Gentian violet (1% aq)	3.0	0
35) Motor Oil	0.5	0
36) Methyl alcohol	1.0	0
37) Acetic Acid	1.0	0

REMARKS:

1. TMA thermogram was shown in Figure 1 and the result was based on the 2nd scan of the test specimen. The instrument is calibrated with Indium and Zinc as standard reference materials.

2. For stain test, "*" denotes that noticeable mark was observed but the stain was able to be removed by dry or wet tissue paper.

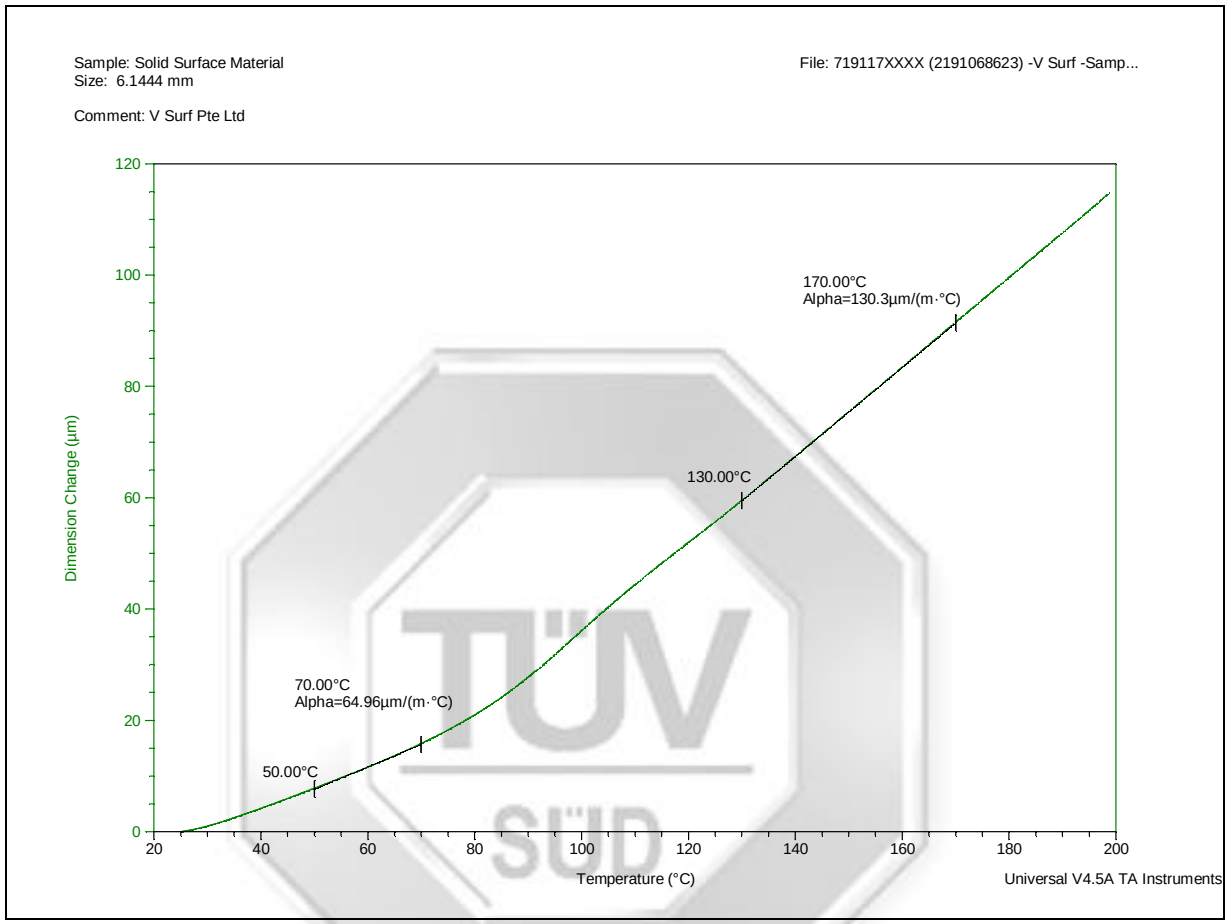
3. "**" denotes that the stain was easily removed by a light application of a mild abrasive.

4. For Chemical Resistance test, 0 denotes "No effect", 0.5 denotes "Faint Mark", 1.0 denotes "Noticeable Mark", 2.0 denotes "Obvious Mark" and 3.0 denotes "Severe Mark"

Ting Yeow Wah
Higher Associate Engineer

Kong Siew Yong
Product Manager
Polymer Products
Mechanical Centre

Figure 1: TMA thermogram of solid surfacing material test specimen



PSB Singapore

Please note that this Report is issued under the following terms :

1. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that TÜV SÜD PSB approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that TÜV SÜD PSB in any way "guarantees" the later performance of the product/equipment. Unless otherwise stated in this report, no tests were conducted to determine long term effects of using the specific product/equipment.

2. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. TÜV SÜD PSB therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

3. Nothing in this report shall be interpreted to mean that TÜV SÜD PSB has verified or ascertained any endorsement or marks from any other testing authority or bodies that may be found on that sample.

4. This report shall not be reproduced wholly or in parts and no reference shall be made by the Client to TÜV SÜD PSB or to the report or results furnished by TÜV SÜD PSB in any advertisements or sales promotion.

5. Unless otherwise stated, the tests were carried out in TÜV SÜD PSB Pte Ltd, No.1 Science Park Drive Singapore 118221.

July 2011