Test Report No. 7191114477-MEC15-ED
dated 16 Jun 2015

PSB Singapore

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SUBJECT:

Testing of liquid-applied waterproofing membrane

TESTED FOR:

Nipo International Pte Ltd
26 Jalan Buroh
Singapore 619482

Attn: Ms Amanda Khoo

SAMPLE DESCRIPTION:

The following item was received on 5 May 2015 as shown:

Sample	Size	Quantity
'Nipoclad Acrylic'	25 kg	1 pail

The test samples were prepared by TUV SUD PSB Pte Ltd.

Substrate	Area of application	Quantity
a. 286 mm x 219 mm release paper	275 mm x 210 mm	8 pcs
b. 200 mm x 200 mm x 50 mm concrete slab	200 mm x 200 mm	3 pcs
c. 75 mm x 40 mm x 25 mm concrete t-block	50 mm x 50 mm	3 pcs

TEST METHODS:

Material Identification/Verification

1. Material Identification/Verification By Fourier Transform Infra-Red Spectrometric Analysis (FTIR)

Volatile Content

2. Adopted ASTM D1644 : 2006 Standard Test Methods For Non-Volatile Content Of Varnishes

Method	:	A
Test conditions	:	105°C for 3 hours
No. of determinations	:	3

TÜV SÜD PSB

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Water Penetration

3. Adopted DIN 1048 Part 5 : 1991
Testing Concrete
Testing Of Hardened Concrete
(Specimens Prepared In Mould)
(Section 7.6 : Water Permeability)

Substrate	:	200 mm x 200 mm x 50 mm concrete slab
Test condition	:	0.2 kgf/cm^3 for 6 hours
Test area	:	∅ 97 mm (7390 mm^2)
No. of determination	:	1

Adhesion-to-substrate

4. Adopted ASTM D4541 : 2009 Standard Test Method For Pull-Off Strength Of Coatings Using Portable Adhesion Testers

Test Conditions:
a. Before immersion
b. After water immersion

Substrate	:	200 mm x 200 mm x 50 mm concrete slab
Test area	:	50 mm x 50 mm
Crosshead speed	:	5 mm/min
No. of determinations	:	3 per test condition

Tensile Properties

5. ASTM D412 : 2006 Standard Test Method For Vulcanized Rubbers And Thermoplastic Elastomers-Tension

Test Conditions:
a. Before ageing
b. After ageing at 50°C in oven for 2 weeks
c. After chemical immersion for 3 days
i) 0.5% NaOCl (Sodium Hypochlorite)
ii) 1.25% NH_4OH (Ammonium Hydroxide)
iii) 3.7% HCl (Hydrochloric Acid)

Test specimen	:	Dumbbell shape, die C
Gauge length	:	25 mm
Grip length	:	64 mm
Crosshead speed	:	500 mm/min
No. of determinations	:	5 per test condition

Crack Bridging

6. Adopted ASTM C836 : 2005 Standard Specification For High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane For Use With Separate Wearing Course
Section 5.7 : Crack Bridging

Substrate	:	75 mm x 40 mm x 25 mm concrete t-block
Width of gap	:	a. 2 mm b. 1 mm for 10 cycles
Crosshead speed	:	0.05 mm/min
No. of determinations	:	3 per gap width

Hardness

7. Adopted ASTM D2240 : 2005 Standard Test Method For Rubber Property (Durometer Hardness)

Apparatus	:	Durometer (Shore A)
Time interval between readings	:	1 second
No. of determinations	:	5

Set-to-touch

8. ASTM D1640 : 2009 Standard Test Methods For Drying, Curing Or Film Formation Of Organic Coatings At Room Temperature

CONDITIONING:

Unless otherwise specified, all test specimens were conditioned at 23 ± 2°C, 70 ± 15% relative humidity and tested at 23 ± 2°C, 65 ± 5% relative humidity. The tensile properties tests were conducted at 23 ± 2°C and 50 ± 5% relative humidity.

TEST RESULTS:

Test	Unit	'Nipoclad Acrylic'	HDB specification: Flexible Non-Cementitious Waterproof Membrane (Water-Based) For New Construction Project & Ceiling Leakage Repair
1. Material Identification/Verification By FTIR	-	styrene-acrylate co-polymer (refer to Figure 1)	Polymer which undergoes hydrolysis should not be used
2. Volatile Content, average	%	34.6	<50%
3. Water Penetration	mm	0, no water penetration	Depth of penetration should be 0
4. Adhesion-to-substrate, average	N/mm^2		
a. Before immersion		0.8	≥ 0.2 N/mm^2
b. After water immersion		0.6	≥ 0.2 N/mm^2

TEST RESULTS:

Test	Unit	'Nipoclad Acrylic'	HDB specification: Flexible Non-Cementitious Waterproof Membrane (Water-Based) For New Construction Project & Ceiling Leakage Repair
5.			
a. Maximum Tensile Strength, median	N/mm^2		
i. Before ageing		1.3	≥ 1.2 N/mm^2
ii. After ageing at 50°C in oven for 2 weeks		1.2	
change in tensile strength	%	-7.7	≥ 1.0 N/mm^2 and -ve change ≤ 20% No limit for +ve change
iii. After chemical immersion for 3 days			
0.5% NaOCl		1.2	
change in tensile strength	%	-7.7	
1.25% NH4OH		1.5	
change in tensile strength	%	+15.4	
3.7% HCl		1.3	
change in tensile strength	%	0	
b. Elongation At Break, median	%		
i. Before ageing		738.9	≥ 150%
ii. After ageing at 50°C in oven for 2 weeks		852.7	
change in elongation	%	+15.4	≥ 120% and -ve change ≤ 20% No limit for +ve change
iii. After chemical immersion for 3 days			
0.5% NaOCl		606.9	
change in elongation	%	-17.9	
1.25% NH4OH		756.3	
change in elongation	%	+2.4	
3.7% HCl		696.3	
change in elongation	%	-5.8	
c. Elongation At Break, displacement	mm		
i. Before ageing		184.7	
ii. After ageing at 50°C in oven for 2 weeks		213.2	
iii. After chemical immersion for 3 days			
0.5% NaOCl		151.7	
1.25% NH4OH		189.1	
3.7% HCl		174.1	
6. Crack Bridging	-		
a. 2 mm		No cracks	No cracking at 2 mm width
b. 1 mm		No cracks	No cracks after 10 cycles of stretching and closing to a width of 1 mm
7. Hardness (Shore A), median	-	43	≥ 30
8. Set-to-touch (based on one coat)	mins	50	Should touch dry within 60 mins

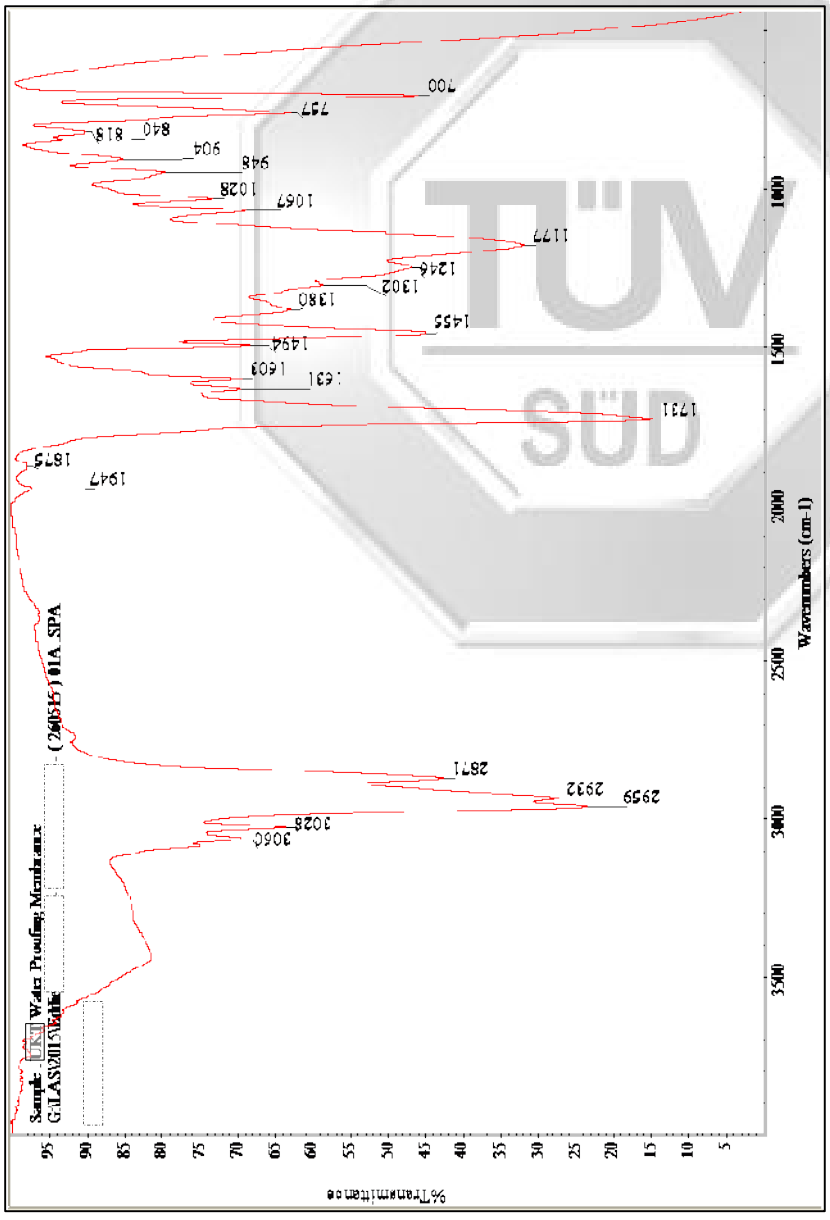
REMARKS:

Test age : 14 days cured in air minimum prior to test unless otherwise specified.

Eddie Suwand
Senior Associate Engineer

Eng Aik How
Product Manager
Building
Mechanical Centre

Figure 1 : IR spectrum of 'Nipoclad Acrylic'



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July 2011