ALSEAL MARKETING SDN. BHD. (625140-D)
LOT PT 2291, JALAN KAMPUNG BARU, KAMPUNG BARU SUNGAI BULOH,
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TEL: 603-6157 9698, 603-6157 6398 **FAX:** 603-6157 8002
EMAIL: Info@alsealmarketing.com **WEBSITE:** http://www.alsealmarketing.com
GST No.: 001625505792

Our reference: 12/I18/LTR/Y322

12th September 2018

Dear Valued Customer / Business Partners,

RE: "ALSEAL" AS-4002 Premier Construction Sealant - Product Performance

This is to confirm that the product performance of **"ALSEAL" AS-4002 Premier Construction Sealant** has been tested by ISO/IEC 17025 accredited independent third-party testing labs. The following standards were used to test the performance of AS-4002:

Test standard	Description	Report No.
ASTM C920	Standard Specification for Elastomeric Joint Sealants	7191188811-MEC18/A-ED (2191084112)

AS-4002 is classified as a **Type S** (single-component sealant), **Grade NS** (non-sag sealant), **Class 50** (±50% movement), Use **NT** (non-traffic), **A** (aluminium) according to ASTM C920.

Should you require further information concerning the above product, please do not hesitate to contact us.

Thank you.

Yours sincerely,
For Alseal Marketing Sdn. Bhd.

Prepared by: Yap Wai Hoong
(R&D Chemist)

Verified by: Alex Ng
(Technical Manager)

Test Report No. 7191188811-MEC18/A-ED (2191084112)
dated 5 Sep 2018

PSB Singapore

Choose certainty.
Add value.

SUBJECT:

Testing of sealant

TESTED FOR:

Alseal Marketing Sdn Bhd
No. 2291, Jalan Kampung Baru
Kg. Baru Sungai Buloh
47000
Selangor Darul Ehsan
Malaysia

Attn: Mr Cheong Chee Leong

SAMPLE DESCRIPTION:

The following items were received on 13 Jun 2018 as shown:

Sample	Size	Quantity
'AS-4002 Premier Construction Sealant'	600 ml/sausage	6 sausages

TEST METHODS:

Adopted ASTM C920 : 2014a Standard Specification For Elastomeric Joint Sealants

Staining And Colour Change, UV Exposure

1. Adopted ASTM C510 : 2016 Standard Test Method For Staining And Colour Change Of Single Or Multi-Component Joint Sealants

Test equipment	:	QUV Weatherometer
Lamp designation	:	Fluorescent UVA 340 mm
Test cycle	:	8 hours UV exposure at 55°C and 4 hours condensation at 45°C (ASTM G154)
Exposure duration	:	100 hours
No. of determinations	:	4 samples: 2 samples with sealant and 2 samples without sealant (For UV Exposure) 2 control samples: 1 sample with sealant and 1 sample without sealant (Standard Conditions)

TÜV SÜD PSB

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1 Science Park Drive, #02-01
Singapore 118221

Staining And Colour Change, Standard Conditions In Distilled Water

Test apparatus	:	Container with distilled water
Test condition	:	Distilled water immersion for 1 minute, once a day, (5 days per week)
Test duration	:	14 days
No. of determinations	:	2 samples: 1 sample with sealant and 1 sample without sealant (For distilled water immersion) 2 control samples: 1 sample with sealant and 1 sample without sealant (Standard Conditions)

Extrudability

2. Adopted ASTM C1183/C1183M : 2013 Standard Test Method For Extrusion Rate Of Elastomeric Sealants

Test pressure	:	40 psi
No. of determination	:	1

Flow Properties

3. ASTM C639 : 2015 Standard Test Method For Rheological (Flow) Properties Of Elastomeric Sealants

Method	:	Test method for 'Type II' sealant
Test conditions	:	a) 4.4°C in environmental chamber for 4 hours b) 50°C in oven for 4 hours
No. of determinations	:	2 for vertical and horizontal displacements

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Hardness

4. ASTM C661 : 2006 Standard Test Method For Indentation Hardness Of Elastomeric-Type Sealants By Means Of A Durometer

Test Conditions:
a) 23°C and 50% relative humidity for 7 days
b) 38°C and 95% relative humidity for 7 days
c) 23°C and 50% relative humidity for 7 days

No. of determinations	:	2, 3 points per test piece

Tack-Free Time

5. ASTM C679 : 2015 Standard Test Method For Tack-Free Time Of Elastomeric Sealants

No. of determinations	:	2

Cyclic Adhesion & Cohesion

6. Adopted ASTM C719 : 2014 Standard Test Method For Adhesion And Cohesion Of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)

Test Conditions:
a) 23°C and 50% relative humidity for 7 days
b) 38°C and 95% relative humidity for 7 days
c) 23°C and 50% relative humidity for 7 days
d) Immersion in distilled water at 23°C for 7 days
e) Drying in oven at 70°C for 7 days

Substrate	:	Aluminium
Test temperature	:	Room temperature
No. of determinations	:	3 for class 50

Effects Of Heat Ageing

7. ASTM C1246 : 2017 Standard Test Method For Effects Of Heat Ageing On Weight Loss, Cracking, And Chalking Of Elastomeric Sealants After Cure

Test Conditions:
a) 23°C and 50% relative humidity for 28 days
b) 70°C for 21 days

No. of determinations	:	3, 1 as control

Effects Of Accelerated Weathering

8. Adopted ASTM C793 : 2005 (2017) Standard Test Method For Effects Of Accelerated Weathering On Elastomeric Joint Sealants

Test equipment	:	QUV Weatherometer
Test cycle	:	8 hours UV exposure at 55°C and 4 hours condensation at 45°C (ASTM G154)
Lamp designation	:	Fluorescent UVA 340 mm
Exposure duration	:	250 hours
No. of determinations	:	3 (1 as control)
Bend test		
Apparatus	:	Steel mandrel
Test condition	:	-26°C for 24 hours
No. of determinations	:	3

Adhesion-In-Peel

9. Adopted ASTM C794 : 2015a Standard Test Method For Adhesion-In-Peel Of Elastomeric Joint Sealants

Test Conditions:
23°C and 50% relative humidity for 21 days

Substrate	:	Aluminium
Crosshead speed	:	50 mm/min
No. of determinations	:	4

Material Identification/Verification

10. ASTM E1252 : 2007 Standard Practice For General Techniques For Obtaining Infra-Red Spectra For Qualitative Analysis
Material Identification/Verification By Fourier Transform Infra-Red Spectrometric Analysis (FTIR)

CONDITIONING:

Unless otherwise specified, all test specimens were tested at 23 ± 2°C and 50 ± 5% relative humidity.
Standard Conditions parameters: 23 ± 2°C and 50 ± 5% relative humidity.

TEST RESULTS:

Test	'AS-4002 Premier Construction Sealant'	ASTM C920 : 2014a Standard Specification For Elastomeric Joint Sealants
1. Staining And Colour Change	No staining No colour change	The sealant shall not cause any visible stain on the top surface of a white cement mortar base
2. Extrudability	18.2 ml/min	Type S (single component), grade NS (non-sag or gunnable sealant) shall have an extrusion rate of not less than 10 ml/min
3. Rheological (Flow) Properties	Vertical displacement: 0 mm sag Horizontal displacement: No deformation	Grade NS (non-sag) or gunnable sealant shall have flow characteristics such that it does not sag more than 4.8 mm ($^3/_{16}$ in.) in vertical displacement. Also the sealant shall show no deformation in horizontal displacement (refer to Types II and IV in the tests)
4. Indentation Hardness	test piece 1, average : 22.8 test piece 2, average : 21.6 average of 2 test pieces : 22.2	Use T_1 (traffic) sealant shall have a hardness reading, after being properly cured, of not less than 25 Use T_2 (traffic) sealant shall have a hardness reading, after being properly cured, of less than 25 Use NT (non-traffic) sealant shall have a hardness reading, after being properly cured, of less than 60
5. Tack-Free Time	No transfer of test specimens to the polyethylene film	There shall be no transfer of the sealant to the polyethylene film when tested at 72 hours
6. Adhesion & Cohesion Under Cyclic Movement, Class 50	No loss in bond	The total loss in bond and cohesion areas among the three specimens tested for each surface shall be no more than 9 cm^2 ($1^1/_2$ $in.^2$) with standard mortar, glass, and aluminium or any other specified substrates

TEST RESULTS:

Test	'AS-4002 Premier Construction Sealant'	ASTM C920 : 2014a Standard Specification For Elastomeric Joint Sealants
7. Effects Of Heat Ageing On Weight Loss, Cracking And Chalking, average	1.1% No cracking and chalking	The sealant shall not lose more than >7% of its original weight or show any cracking and chalking
8. Effects Of Accelerated Weathering	No cracks after UV exposure and bend test	The sealant shall show no cracks greater than those shown in example #2 of Figure 1 in ASTM C793 after the specified UV exposure and shall show no cracks greater than those shown in example #2 of Figure 2 in ASTM C793 after exposure at cold temperature and the bend test (refer to Photo 1)
9. Adhesion-In-Peel, average	60.8 N (13.7 lbf) cohesive failure within the sealant and no adhesive bond loss between sealant and substrate for each test piece	The peel strength for each individual test shall not be less than 22.2 N (5 lbf) when tested with standard mortar, glass, and aluminium or any other specified substrate. In addition, the sealant shall show no more than 25% adhesive bond loss for each individual test
10. Material Identification/ Verification By FTIR	Phthalate-based material (refer to Figure 1)	-

REMARKS:

1. The test conditions for staining and colour change tests and effects of accelerated weathering test were adopted from ASTM G154 : 2016 Standard Practice For Operating Fluorescent Light Apparatus For UV Exposure Of Non-Metallic Materials.
2. For effects of accelerated weathering test, in ASTM C793, Photo 1 consists of Figure 1 which indicate the presence of cracks after UV exposure and Figure 2 which indicate the presence of cracks after bend test.
3. The class 50 joint movement for cyclic adhesion/cohesion test was specified by the client.
4. The type of substrate was specified by the client for cyclic adhesion/cohesion and adhesion-in-peel tests.
5. The substrates do not require priming prior to application of the sealant as specified by the client.

Eddie Suwand
Testing Officer
Senior Associate Engineer

Fabien Tan
Engineer
Real Estate & Infrastructure
Mechanical Centre

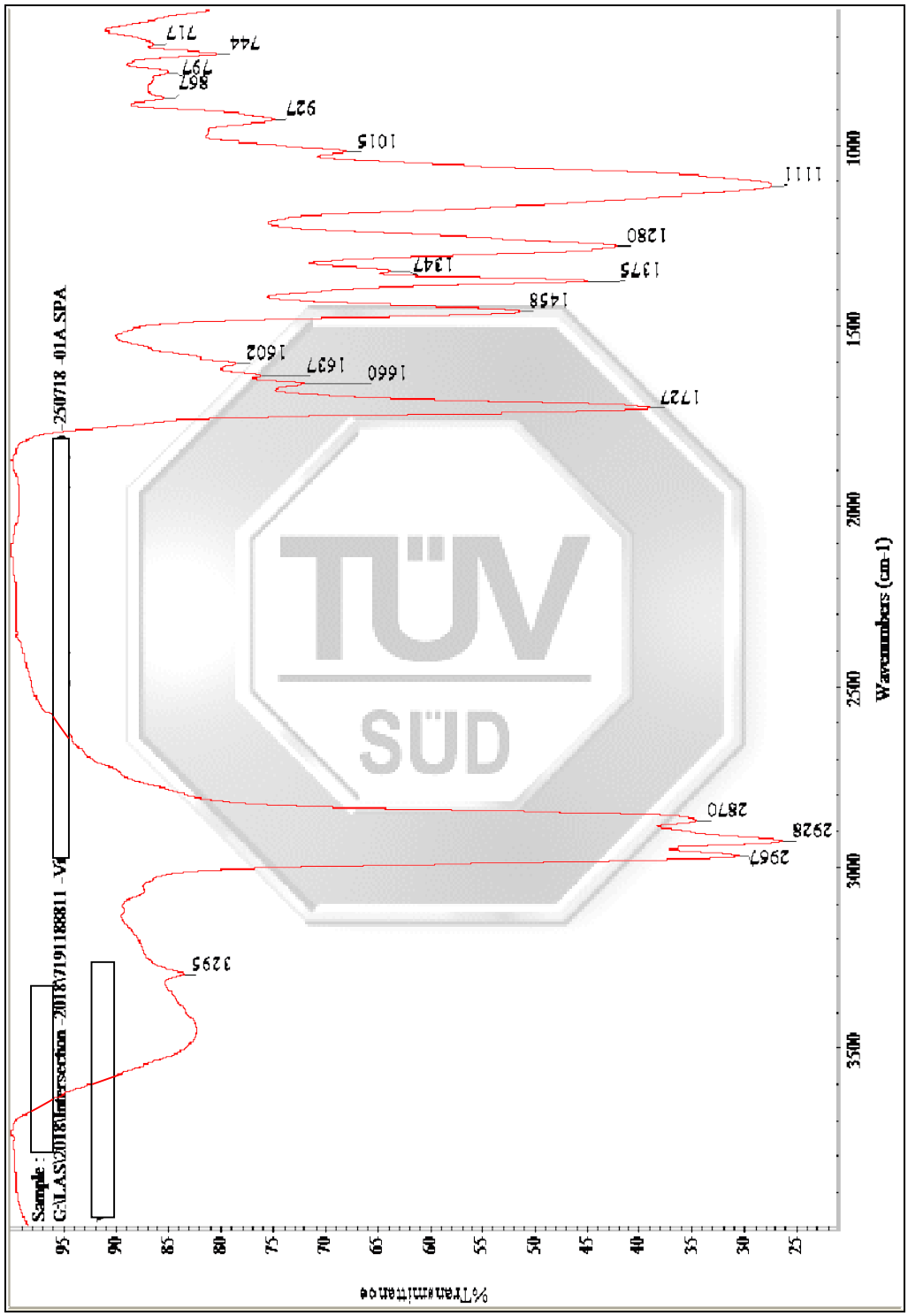
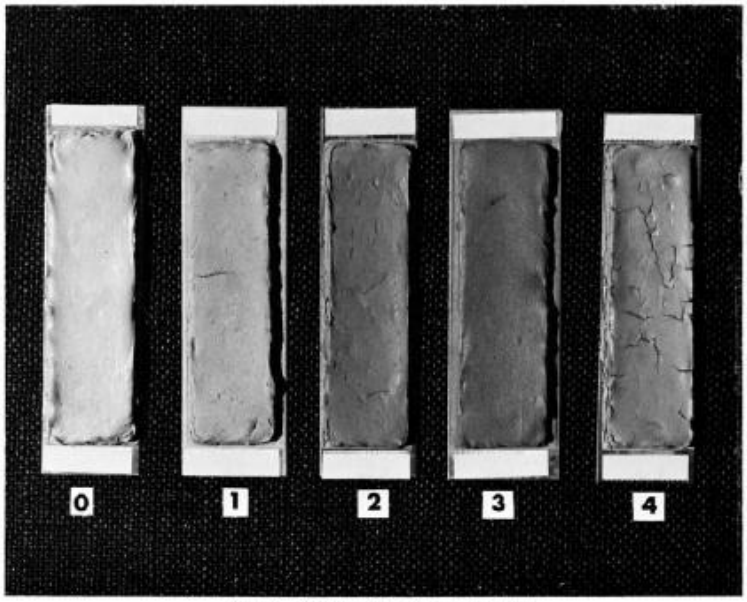
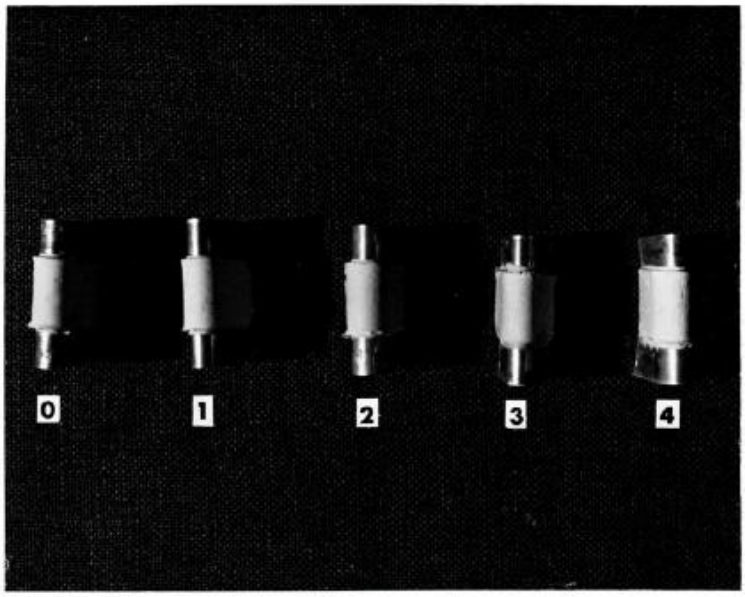


Figure 1 : IR spectrum of 'AS-4002 Premier Construction Sealant'



NOTE 1—Number *0* represents no cracks.
FIG. 1 Examples of Cracking Obtainable After the Weathering Test



NOTE 1—Number *0* represents no cracks.
FIG. 2 Examples of Cracking Obtainable After the Bend Test

Photo 1 : Figures 1 and 2 showing presence of cracks after UV exposure and after bend test respectively (taken from ASTM C793 as a guide and are not client's samples)

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July 2011