SUBJECT:

Testing of sealant

TESTED FOR:

PFE Technologies Pte Ltd
No. 9 Gul Street 4
Singapore 629238

Attn: Mr Hans Goh

SAMPLE DESCRIPTION:

The following items were received on 28 Jul 2017 as shown:

<table>
<thead>
<tr>
<th>Sample</th>
<th>Size</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Pereseal Polyurethane Sealant (Photo 1)’</td>
<td>600 ml/ sausage</td>
<td>10 sausages</td>
</tr>
</tbody>
</table>

TEST METHODS:

HDB Specification: Sealant - Semi-Precast Construction

Staining And Colour Change


   Test cycle: 8 hours UV exposure at 55°C and 4 hours condensation at 45°C
   Exposure duration: 100 hours
   No. of determination: 1 for staining test, 1 for colour change test, 1 as control

Extrudability


   Test pressure: 40 psi
   No. of determination: 1
Flow Properties


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

Hardness


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


No. of determinations : 2

Cyclic Adhesion & Cohesion


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
Test temperature : Room temperature
No. of determinations : 3 for class 25

Effects Of Heat Ageing


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


Test cycle : 8 hours UV exposure at 55°C and 4 hours condensation at 45°C
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


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 water at 23°C for 7 days
Crosshead speed : 50.8 mm/min
No. of determinations : 4

Material Identification/Verification


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 65 ± 5% relative humidity.

TEST RESULTS:

<table>
<thead>
<tr>
<th>Test</th>
<th>‘Pereseal Polyurethane Sealant’</th>
<th>Sealant - Semi-Precast Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Staining And Colour Change</td>
<td>No staining and no colour change</td>
<td>No visible staining on white cement mortar base</td>
</tr>
<tr>
<td>2. Extrudability</td>
<td>14.8 ml/min</td>
<td>&gt;10 ml/min</td>
</tr>
<tr>
<td>3. Rheological (Flow) Properties</td>
<td>Vertical displacement: 0 mm sag Horizontal displacement: No deformation</td>
<td>Vertical displacement &lt;4.8 mm Horizontal displacement : No deformation</td>
</tr>
<tr>
<td>4. Indentation Hardness</td>
<td>test piece 1, average : 35.6 test piece 2, average : 36.0 average of 2 test pieces : 35.8</td>
<td>25 to 50 (traffic) 15 to 50 (non-traffic)</td>
</tr>
</tbody>
</table>
TEST RESULTS:

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<tr>
<td>5. Tack-Free Time</td>
<td>No transfer of test specimens to the polyethylene film</td>
<td>No transfer of sealant to PE film</td>
</tr>
<tr>
<td>6. Adhesion &amp; Cohesion Under Cyclic Movement, class 25</td>
<td>No loss in bond</td>
<td>Total loss in bond and adhesion &lt;9 cm²</td>
</tr>
<tr>
<td>7. Effects Of Heat Ageing On Weight Loss, Cracking And Chalking, average</td>
<td>1.1% No cracking and chalking</td>
<td>Loss in weight &lt;7% No cracking and chalking</td>
</tr>
<tr>
<td>8. Effects Of Accelerated Weathering</td>
<td>No cracks after UV exposure and bend test</td>
<td>No cracks</td>
</tr>
<tr>
<td>9. Adhesion-In-Peel, average</td>
<td>60.7 N cohesive failure within the sealant and no adhesive bond loss between sealant and substrate for each test piece</td>
<td>Peel strength &gt;22.2 N Bond loss &lt;25%</td>
</tr>
<tr>
<td>10. Material Identification/Verification By FTIR</td>
<td>Polyurethane-based material (Figure 1)</td>
<td>PU/Silicone</td>
</tr>
</tbody>
</table>

REMARKS:

The test conditions for staining and colour change tests and effects of accelerated weathering test were adopted from ASTM G154 : 2006 Standard Practice For Operating Fluorescent Light Apparatus For UV Exposure Of Non-Metallic Materials.

Eddie Suwand
Testing Officer
Senior Associate Engineer

Fabien Tan
Engineer
Real Estate & Infrastructure
Mechanical Centre

Photo 1 : 'Pereseal Polyurethane Sealant'
Figure 1: IR spectrum of ‘Pereseal Polyurethane Sealant’
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