Next Generation Liquid Applied Roofing Membrane

**NEW COOL BARRIER** Roofing Membrane based on Polyurethane Dispersion tailored for **durable waterproofing**

Jouko Vyörykkä, Cristina Miotto Dow Europe
Prokopis Perdikis  Abolin Co Europe
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Building the future starts here.
Liquid Applied Membranes Waterproofing: Overview

- Monolithic or seamless
- In most cases are cold applied
- Complete solutions for the new build and refurbishment sectors
- Full line of coating products: primers, basecoats and topcoats
- Liquid Applied Membranes extend the useful life of roof

More Than 1 Chemistry

- Polyureas/Polyaspartics
- SB Silicones
- Asphaltic coatings
- WB Acrylic
- SB 1k Polyurethanes
- WB Styrene/Acrylics
- 2k Polyurethanes...
Emerging Trends: Liquid Applied Roof Waterproofing

- Demand for durability and certified systems
- Maintenance needs for existing bitumen roofs
- More sustainable solutions
- Health and Safety

Today products meeting ETAG 005 are mainly solvent borne 1K PU

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New Liquid Applied Membrane: Development

- **Low Performance**
- **High Performance**

**Cost**
- Pure Acrylics
- Cool Barrier Coatings
- Novel PU Water - Based

**New Technologies**
- Novel WB PU Development
- WB Polyurethane

**Applications**
- Cool Barrier Roof Coatings
- High Performance WP with ETAG 005
- High Solar Reflective, Maintenance Coatings

**Materials**
- Styrene Acrylics
- Pure Acrylics
- PU 1K
- PU 2K
- Poly ester
- PMMA
New Liquid Applied Membranes: Taking The Benefits

- Adhesion to multiple substrates
- 1K Water-based
- Waterproofing
- Easy to apply
- Performance to price ratio
- Reflective Coatings
- Minimal Environmental impact
- Re-Coatability

PROVIDES:

- Seamless surface with no potential leaks in joints or welds
- Higher quality types resist impact damage and foot traffic
- Excellent to refurbish existing roofs without replacing them
- Good solution for small and complicated roofs
Key benefits of liquid applied roofing membranes

- Seamless with no potential leaks in joints or welds
- Simple application procedure
- Higher quality types resist impact damage and foot traffic
- Excellent to refurbish existing roofs without replacing them
- Good solution for small and complicated roofs
Not a paint – comparison in application

Roof coating - membrane
Applied with a higher film thickness
~ 2mm

Roof paint
Applied with a lower film thickness
~ 0.1mm
Common application methods

Roller

Brush

Spray

Recommended application quantity: 3+, kg/m² with fleece
Our approach

Focus of Abolin novel WB
Polyurethane membrane development
– ETAG 005 requirements
– Mechanical performance after aging
– Cold temperature flexibility - 20°C
– Adhesion to granulated bitumen and concrete
– Water resistance

1K PU competitive solution
– Pros: limited water swelling
– Cons: safety, performance after thermal aging, adhesion on moist substrate
Value proposition of novel waterproofing membrane from Abolin

When properly applied, the novel liquid applied WB PU roofing membrane can offer:

**Cost Efficiency**
Liquid cold applied on aged membranes to renovate and extend useful lifetime of the roof

**Sustainability**
Waterborne system with no use of solvent*, low odor and no EH&S concerns

**Durability**
Meets ETAG 005 durability tests, exceeds performance of 1K PU, easy to apply and maintain
COOL BARRIER WB PU Polyurethane: Technical properties

When properly applied, the novel liquid applied WB PU roofing membrane can offer:

- Very good mechanical properties in broad temperature range
  - Low temperature flexibility at - 20°C
  - High tensile strength and elongation at > 20°C
- Excellent aging performance (UV/thermal/water)
  - Stable elongation also after accelerated aging tests
- High water resistance:
  - Low water swelling
  - No blistering observed on concrete or bitumen
- Good dirt pick-up properties thanks to high hardness
Test results: water swell, perms, wet adhesion, water proofing and ignitability

<table>
<thead>
<tr>
<th></th>
<th>Water Swell 7 day (%)</th>
<th>Water Swell 14 day (%)</th>
<th>PERMS</th>
<th>Wet Peel Adh; SBS</th>
<th>Water tightness 7d* (EN 14891 A.7)</th>
<th>Ignitability (EN ISO 11925-2**, 15s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1-58 - White</td>
<td>8.6%</td>
<td>7.8%</td>
<td>5.75</td>
<td>5.25</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pass, no burning droplets</td>
</tr>
<tr>
<td>F1-58 – Light Gray</td>
<td>7.5%</td>
<td>6.9%</td>
<td>4.9</td>
<td>5.25</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>

*Pressure ramp: 24h 0.5 bar, 24h 1 bar, 24h 1.5 bar, 24h 2.0 bar, 3d 2.5 bar
** surface test with 3 parallel points deviating from standard

Test performed in Dow labs in 2015-2016
Test results: tensile strength
100mm/min, rectangular specimen, 500 µm DFT

Test performed in Dow labs in 2015-2016
Test results: elongation @ RT
100mm/min, rectangular specimen, 500 µm DFT

Test performed in Dow labs in 2015-2016

- Elongation values are very stable after thermal, water and WOM aging.
- Earlier test comparing 30d and 100d 80°C thermal aging showed only ca. 30% reduction in elongation.
- Earlier test comparing 1000h and 2000h showed <20% change in elongation.

Total Elongation, Initial  | Total Elongation, 30d 70°C Oven | Total Elongation, 30d 70°C Water | Total Elongation, 1000h WOM
--- | --- | --- | ---
F1-58 - White | 245.8 | 359.4 | 233.6
F1-58 – Light Gray | 229 | 386.5 | 230.2
Test results: elongation @ -20°C
100mm/min, rectangular specimen, 500 µm DFT

- Elongation values at -20°C are very stable after thermal, water and WOM aging.

Test performed in Dow labs in 2015-2016

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<th>Total Elongation, Initial</th>
<th>Total Elongation, 30d 70°C Oven</th>
<th>Total Elongation, 30d 70°C Water</th>
<th>Total Elongation, 1000h WOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1-58 - White</td>
<td>59</td>
<td>37</td>
<td>45</td>
<td>39</td>
</tr>
</tbody>
</table>
Accelerated aging* with acrylic polyurethane

- *4000h exposure time is approx. 2 yr equivalent and exceeds ETAG 005 10 yr lifetime test for UV exposure.
- Acrylic polyurethane meets or exceed 1.5 N/mm² strength and 150 % elongation at break after aging up to 4000h.
- Mechanical performance maintained after extended UV aging.

*Test performed in Dow labs in 2015-2016*
# Abolin New WB Polyurethane Liquid Applied Membrane

## Classification for use by the client:

<table>
<thead>
<tr>
<th><strong>Useful life:</strong></th>
<th>Category W2, expected useful life 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Climate zones:</strong></td>
<td>Category M &amp; S, moderate and severe climate</td>
</tr>
<tr>
<td></td>
<td>Category TL3, severe low temperature</td>
</tr>
<tr>
<td></td>
<td>Category TH4, severe high temperature</td>
</tr>
<tr>
<td><strong>Roof Slope:</strong></td>
<td>Category S1 – S4 Slope (&lt;5 till &gt;30) %</td>
</tr>
<tr>
<td><strong>User load:</strong></td>
<td>Category P3, normal</td>
</tr>
</tbody>
</table>

Please note that the values shown are typical values for your guidance. They are not to be taken as specifications.
Test results: reflectivity and emissivity
500 µm DFT

Total Spectrum Reflect.
(380-1220nm)  Emissivity
(Ɛ)

F1-58 - White  80.6       86
F1-58 – Light Gray  44.5       86

Test performed in internal labs in 2016-2017
Cool Roofing and Energy Savings

Energy savings from installing a Cool Roofing Product depends on the local climate, existing insulation levels, the type of roof replaced, the type of roof installed, and maintenance. In the best applications, cool roofs have no incremental cost and deliver a nearly instant payback.

Winter Penalty, also known as heating penalty. Just as cool roofs reflect solar radiation throughout the summer, they also reflect wintertime sunlight. Thus, the winter penalty is the potential for increased heating demand in winter due to reflected solar radiation by light colored roofs.

Over an entire year, decreases in summer energy use typically exceed any wintertime increases. (US Environmental Protection Agency – EPA)
Energy Efficiency Modeling: Barcelona

Roof Area = 733m²

- Building type
- HVAC schedule
- People Occupancy
- Lighting and equipment
- Air Infiltration

Building Stratigraphy

Roof
- Coated / uncoated Concrete (200mm)
- Air space
- Acoustic tile (19mm)

Wall
- Stucco (25mm)
- Concrete (200mm)
- Air space
- Gypsum (12mm)

Floor
- Carpet pad
- Concrete (100mm)

Glass window = 3mm
With shading (curtains) during Summer time
Modeling Output
Roof Surface Temperature Data Barcelona

Outside roof surface temperature for one year

20°C max reduction on roof surface temperature with Cool Roof

Roof without coating
Roof with cool roof coating
# Modeling Output Energy Saving Barcelona

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Cool roof</th>
<th>Savings</th>
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</thead>
<tbody>
<tr>
<td>Heating (kWh)</td>
<td>29,800</td>
<td>36,966</td>
<td>-7,166</td>
</tr>
<tr>
<td>Cooling (kWh)</td>
<td>26,433</td>
<td>16,672</td>
<td>9,761</td>
</tr>
<tr>
<td>Total (kWh)</td>
<td>56,233</td>
<td>53,638</td>
<td>2,595</td>
</tr>
<tr>
<td>Total Energy Saving (%)</td>
<td></td>
<td></td>
<td>4.6%</td>
</tr>
<tr>
<td>Energy consumption (kWh/m²)</td>
<td>139.7</td>
<td>136.2</td>
<td>3.5</td>
</tr>
</tbody>
</table>

**Cool Roof coating provides**

- 4.6% energy saving

Best case scenario considering only topmost floor
Cool Barrier Roof Case Studies: Insulated Buildings

**GREECE** Athens, Egaleo
Insulated Building, Heat Pumps
Roof made of concrete slab with glass wool insulation layer sealed with black bituminous

- Energy consumption for cooling is reduced by at least 18% under the observed operation schedule and reaching a 49% reduction for a common operation schedule. Thermal comfort conditions below the cool roof are improved by approx. 35%

**ITALY** Milan: Carrefour
Insulated, A/C Building
The roof is made of 0.15 m thick concrete slab with a 0.04 m insulation layer sealed with black bituminous

- "We are about 25% reduction in electricity consumption for air conditioning"  "Around 65.000€ savings per year"  "Payback period: 2.5 Years"  Energy Manager: Mr. Giovanni Piano

**UNITED KINGDOM**, London, Brunel Insulated, Non A/C Building
The roof is made of 0.15 m thick concrete slab with a 0.04 m insulation layer sealed with black bituminous

- Thermal comfort can be improved by as much as 2.5 °C but heating demand could be increased by 10%. Cooling load is decreased. although the overall contribution is positive

Report: Carrefour Energy Manger
Report: National Renewable energy Center
Report: Btunel University
Cool Barrier Roof Case Studies: Non Insulated Buildings

GREECE School building in Kesariani, Athens, Non Insulated - No A/C

The load bearing structure of the building is made of reinforced concrete and an overall concrete masonry construction which is not insulated. The school building is occupied by 120 children and 15 adults (the school staff) and is non-cooled and naturally ventilated. There is an installed heating system using natural gas. Walls: U value = 2.846 W/m²K, Roof: U value = 1.971 W/m²K, Windows: U value = 2.95 W/m²K.

<table>
<thead>
<tr>
<th>(kWh/m²)</th>
<th>Annual Cooling Loads</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Loads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Un-insulated building</td>
<td>+40%</td>
<td></td>
</tr>
<tr>
<td>+10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulated building</td>
<td>-35%</td>
<td></td>
</tr>
<tr>
<td>+ 4%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Monitoring internal temperatures and Modeling with scenario U-value of 0.417 W/m²K for walls and U-value of 0.302 W/m²K for roof.

Report: University of Athens
Infrared Camera Depiction: Athens Case Study

GREECE Athens, Egaleo Insulated Building

Without Cool Roof

Cool Roof

Measurements demonstrate an indoor air temperature reduction by about 2.5°C,
Summary

Novel COOL BARRIER WB Polyurethane key benefits:

**Cost efficiency**
Liquid cold applied on aged membranes to renovate and extend lifetime of the roof

**Sustainability**
Waterborne system with no use of solvent*, low odor and no EH&S concerns

**Durability**
Meeting ETAG 005 durability tests, exceeding the performance of 1K PU, whilst being easy to apply and maintain

* Solvent is not intentionally added and not knowingly introduced from another raw material.
Benefit from our deep technical knowhow and let us help you develop liquid applied roofing materials that meet high quality standards.

For more information:
Abolin Co Europe
abolin@abolinco.com

THANK YOU