High Performance, EcoLabel 2015 Compliant

Acrylic Universal Primer Technology

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Decorative / Architectural Polymers
Engineered Polymer Solutions (EPS)

Science Simplified
Market Segment
- Decorative / Architectural
- Interior & Exterior

Purpose of a Primer
- Bonds to problematic substrates
- Improves adhesion
- Enhances exterior durability
- Blocks stains
- Protects the paint from the substrate itself

Specialty Primers
Polymers designed for an individual performance attribute or substrate

Universal Primer
Polymer may be used as a specialty primer and / or replace several specialty polymers (raw mat consolidation)
New “Prime-One” Polymer Technology

Modified-Acrylic Polymer
- Hydrophobic barrier, locks in water-based stains.

Proprietary Adhesion Monomers
- Galvanized, cold-rolled steel, aluminum, etc.
- Concrete / masonry
- Wood and other construction materials
- Previously painted surfaces (chalky and glossy substrates)

Ammonia-Free
- Very low odor

Small Particle Size
- Penetrates to seal pores, enhances stain-blocking and adhesion performance.

High Performance + Regulatory Compliance

“Prime-One” is not a trade name
Formulating Primers with “Prime-One” Acrylic Technology

No need for:

✔ Coalescing solvents
✔ Plasticizers
✔ Zinc oxide
✔ Stain-blocking pigments / additives

(additives can reduce performance)
  • Very low VOC
  • Less hazardous paints
  • Can lower paint formulation cost

Paint Formulations

✔ Use readily-available raw materials
✔ Polymer-based performance
  • Lower PVC = Best Performance

<table>
<thead>
<tr>
<th>Suggested Formulation</th>
<th>%</th>
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<tbody>
<tr>
<td>Water</td>
<td>23.8</td>
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<tr>
<td>Orotan 165</td>
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<tr>
<td>Vantex T</td>
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<tr>
<td>Drewplus L-475</td>
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<tr>
<td>Nuosept 498</td>
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<tr>
<td>Nalzin FA-379</td>
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<td>Minex 4</td>
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<tr>
<td>R-902 TiO₂</td>
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<td>Polymer</td>
<td>31.7</td>
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<tr>
<td>Surfynol PSA-336</td>
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<tr>
<td>Optiflo L-100</td>
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<table>
<thead>
<tr>
<th>PARAMETERS</th>
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<tbody>
<tr>
<td>NVW</td>
<td>57.1%</td>
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<tr>
<td>NVV</td>
<td>40.3%</td>
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<tr>
<td>PVC</td>
<td>50.0%</td>
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<tr>
<td>VOC</td>
<td>&lt; 1 g/l*</td>
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Primer Evaluation Parameters

Three polymers were evaluated in primer formulations at 30, 50 and 70% PVC

Polymer 1) Prime-One
  • Modified-acrylic, no coalescing solvent or plasticizers used (< 1 g/l VOC)

Polymer 2) Competitive Acrylic Emulsion
  • 100% acrylic, requires 5% coalescing solvent

Polymer 3) EPS Standard Acrylic Emulsion
  • Modified-acrylic, requires 5% coalescing solvent

Tested versus four high-quality commercial primers used as benchmarks

**Primer A:** Acrylic emulsion based, formulated at 35% PVC
**Primer B:** Acrylic emulsion based, formulated at 34% PVC
**Primer C:** Acrylic emulsion based, formulated at 39% PVC
**Primer D:** Cationic based, formulated at 43% PVC
Adhesion (0-5, 5=best)
v Commercial Primers

Glossy Alkyd

Cold Rolled Steel

Galvanized

Aluminum

Prime-One

Primer A

Primer B

Primer C

Competitive 100% Acrylic Polymer

Primer D
Tannin Stain Resistance Mechanism

- **Prime-One (Formula 1)**
- **Prime-One (Formula 2)**
- **Commercial Primer (High TiO2)**
- **Prime-One (Formula 3)**

Tannin stain resistance after 24 hours humidity exposure
Tannin Stain Resistance
Merbau @ 72 Hours Humidity

![Graph showing Tannin Stain Resistance for different PVC and primer types. The x-axis represents different PVC and primer types, and the y-axis represents dE. The graph compares Prime-One and 100% Acrylic Competitive Polymer.](image-url)
Ink / Marker Stain Resistance

Markers applied to painted substrate
Ink / Marker Stain Resistance

Prime-One
100% Acrylic
Competitive Polymer

Apply primers side-by-side: 76 micron drawdown
Ink / Marker Stain Resistance

Prime-One

100% Acrylic
Competitive Polymer

Matte Finish Topcoat

Water-based paint applied over primers
**Ink / Marker Stain Resistance**

Ability to block water-soluble stains

<table>
<thead>
<tr>
<th>Material</th>
<th>dE</th>
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<tbody>
<tr>
<td>30 PVC</td>
<td>20</td>
</tr>
<tr>
<td>50 PVC</td>
<td>30</td>
</tr>
<tr>
<td>70 PVC</td>
<td>30</td>
</tr>
<tr>
<td>Primer A 35 PVC</td>
<td>30</td>
</tr>
<tr>
<td>Primer B 34 PVC</td>
<td>30</td>
</tr>
<tr>
<td>Primer C 39 PVC</td>
<td>30</td>
</tr>
<tr>
<td>Primer D 43 PVC</td>
<td>30</td>
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- **Prime One**
- **100% Acrylic Competitive Polymer**
Corrosion Resistance - 120 Hours 5% Salt Fog
Substrate: Cold-Rolled Steel Panels

<table>
<thead>
<tr>
<th>Primer</th>
<th>PVC</th>
<th>Primer</th>
<th>PVC</th>
<th>Primer</th>
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<th>Primer</th>
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<tbody>
<tr>
<td>Prime-One.</td>
<td></td>
<td>EPS Standard Technology</td>
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<td>EPS Economical 100% Acrylic</td>
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<td>100% Acrylic Competitive</td>
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<tr>
<td>Primer A</td>
<td>35</td>
<td>Primer B</td>
<td>34</td>
<td>Primer C</td>
<td>39</td>
<td>Primer D</td>
<td>Cationic</td>
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The images show the corrosion resistance of different primers and paints after 120 hours of exposure to 5% salt fog. The results indicate varying levels of corrosion resistance for each material.
**Efflorescence:**
Forms when water-soluble salts of calcium, sodium, potassium, etc. combine with carbon dioxide to form carbonates (CaCO$_3$).
Test Procedure for Alkaline Substrates

Day 1: Concrete / masonry mix made and poured into molds.

Day 2: Block removed from mold, paints applied
(paints tinted w/ quinacridone red + organic yellow)

Days 3-7: Lab testing or exterior exposures
Performance Directly to Highly Alkaline Substrates
versus 3 Premium Commercial Concrete Paints

Paint w/ Styrenated Acrylic

Paint w/ Vinyl Versatate / VA

Paint w/ 100% Acrylic

Paint w/ EPS Standard Technology

9 Months Exposure in Los Angeles, CA
Center chip represents original color
Performance Directly to Highly Alkaline Substrates
versus 3 Premium Commercial Concrete Paints

Paint w/ Styrenated Acrylic

Paint w/ Vinyl Versatate / VA

Paint w/ 100% Acrylic

Paint w/ EPS Standard Technology

9 Months Exposure in Chicago, IL
Center chip represents original color
Tint Retention
Highly Alkaline Substrate v Commercial Primers

Prime-One

Commercial Primer A
35% PVC

Commercial Primer B
34% PVC

Commercial Primer C
39% PVC

Center chip represents original color
Tint Retention (Alkali Burn)
Over an Alkaline Substrate

<table>
<thead>
<tr>
<th>PVC Level</th>
<th>Prime-One</th>
<th>100% Acrylic Competitive Polymer</th>
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<tbody>
<tr>
<td>30 PVC</td>
<td></td>
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<tr>
<td>50 PVC</td>
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<tr>
<td>70 PVC</td>
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The chart compares the tint retention over an alkaline substrate for different PVC levels using Prime-One and a 100% acrylic competitive polymer.
Tint Retention
Exterior Exposure over an Alkaline Substrate  (only 4 days exposure)
### Tint Retention

Exterior Exposure over an Alkaline Substrate: 5 months exposure

<table>
<thead>
<tr>
<th>Prime-One</th>
<th>EPS Standard</th>
<th>EPS Economical 100% Acrylic</th>
<th>100% Acrylic Competitive</th>
<th>Prime-One</th>
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Prime-One

EPS Standard

EPS Economical 100% Acrylic

100% Acrylic Competitive

Prime-One

Prime-One

<table>
<thead>
<tr>
<th>Prime-One</th>
<th>EPS Standard</th>
<th>Commercial Primer A 34 PVC</th>
<th>Commercial Primer B 35 PVC</th>
<th>Commercial Primer C 39 PVC</th>
<th>Prime-One</th>
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Prime-One

EPS Standard

Commercial Primer A 34 PVC

Commercial Primer B 35 PVC

Commercial Primer C 39 PVC

Prime-One

50 PVC
High Performance + EcoLabel Compliance
Performance Scorecard (0-5, 5=best)

Adhesion

EcoLabel 2015 Compliance

Corrosion Resistance

Tannin Stain-Block

Ink Stain-Block

Performance on Highly Alkaline Substrates

Prime One

100% Acrylic Competitive Polymer
Thank You

Science Simplified

Nuremberg, Germany, 21–23.4.2015
European Coatings SHOW 2015
Visit us at stand 356 in hall 7
Nicotine Stain Resistance

Heavily Stained Ceiling Tile

All primers did well at blocking nicotine stained ceiling tiles

<table>
<thead>
<tr>
<th>Primed Sections</th>
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</tr>
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<tbody>
<tr>
<td><strong>EPS Standard Technology</strong></td>
<td><strong>Prime One</strong></td>
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<tr>
<td><strong>EPS Economical 100% Acrylic</strong></td>
<td><strong>100% Acrylic Competitive Polymer</strong></td>
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Topcoated Section