# SETAL® 48-6093

# 1K Water Reducible  Epoxy Ester

## Launch Package

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# Overview and Value Proposition

**SETAL® 48-6093** is a new 1K water reducible epoxy ester, which has been developed for improved corrosion resistance and flexibility compared to competitive controls.

## Value Proposition

- Excellent **Cleveland Humidity** resistance (>3000 hr.)
- Excellent **Salt Fog** resistance (336 hr.+)
- Maintains Outstanding **Flexibility** over time* and full cure*
- Exceptional **Long Term Adhesion***
- **Adhesion** to multiple metal substrates and HIPS Plastic*

Extensive testing vs. competitive controls
*Adhesion and Flexibility tested at 7 and 30 days cure

## Target Applications

Metal Primers, Top Coats, Dry Fall

Dip Tanks (brake pads and other bulk parts)

Key Features

- Solids Content: approx. 70% in solvent
- Solvent: Butoxy Ethanol (Butyl Cellesolve)
- Gardner Holdt Viscosity As Supplied: Z5-Z7
- Acid Value : 45-55

# Generic Formula based on SETAL® 48-6093 Formula #1776
# Extensive testing vs. competitive controls

## GREY CORROSION RESISTANT METAL PRIMER

| *Pounds* | *Gallons* | *Raw Material* | *Supplier* | *Instructions* |
|---|---|---|---|---|
| ~300.0 | 35.80 | **Resin*** | Various | Add ingredients separately and in order |
| 6.0 | 0.73 | ADDITOL® XW 395 (leveling) | allnex | with good agitation |
| 33.0 | 4.39 | Butyl Cellosolve (EB) Solvent | | |
| 80.0 | 2.40 | Ti-Pure R-706 | Chemours | Add powders slowly with increasing |
| 80.0 | 3.56 | Atomite | Imerys | agitation |
| 40.0 | 1.72 | Heucophos ZPA | Huebach | |
| 40.0 | 1.72 | Mistron Ultramix | Imerys | |
| 15.0 | 0.36 | Bayferrox 318NM | Lanxess | |
| 5.0 | 0.25 | Attagel 50 | BASF | Increase speed and disperse to 6+ Hegman |
| 6.3 | 0.69 | ADDITOL® VXW 6206 (drier) | allnex | Add slowly under good agitation |
| 2.0 | 0.26 | ADDITOL® XL 297 (anti-skin) | allnex | ***Note: Control 2 required a different* |
| 10.0 | 1.48 | Sec-butanol | | *drier package for storage stability* |
| 21.0 | 3.47 | Triethylamine | | Add amine before increasing speed and |
| ~359.7 | 43.18 | Water | | adding water slowly |
| **~998.00** | **100.00** | ***Total*** | | *Note: Some variation in ~lbs. due to resin density* |

| *Formulation Parameters* | |
|---|---|
| Weight Solids, % | 47.93 |
| Volume Solids, % | 34.67 |
| Weight / Gallon, lbs./gal | ~9.98 |
| Pigment Volume Conc., % | 28.85 |
| Pigment / Binder | 1.19 |
| VOC, g/l | 335.64 |
| VOC, lbs./gal | 2.80 |

| *Typical Paint Properties* | |
|---|---|
| pH | 8.0-9.0 |
| Viscosity (Stormer, 25C, KU) | 90-100 |

***Resins: Control 1 **Control 2 SETAL® 48-6093**

All Tested Resins are 70% Solids in Butyl Cellosolve (EB) Solvent

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# 40°C Cleveland Humidity ASTM D 4585

## Cold Rolled Steel Q-Panel R36 (1.5-2mil DFT Spray Applied)

| Sample | Control 1 | Control 2 | SETAL® 48-6093 |
|---|---|---|---|
| Test Hours | <168 hr. | <168 hr. | >3000 hr. |

**Excellent Humidity Resistance >3000 hrs.**

**Compared to failures observed on both controls in less than 1 week (<168hr.)**



**FAIL-Blisters**


**PASS- No Blisters, No Rust**

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# Salt Fog ASTM B 117

## Cold Rolled Steel Q-panel R36 (1.5-2mil DFT Spray Applied)

| Sample | Control 1 | Control 2 | SETAL® 48-6093 |
|---|---|---|---|
| Test Hours | 336 hr. | Problems 168 hr., Fail 336 hr. | >336 hr. |

**Excellent Salt Fog Resistance >336 hrs.**

**Compared to blister development observed on both controls within 336 hrs.**


**Large Scribe Blisters**


**Face Rust and Blisters**


**PASS -Small Scribe Blisters Only**

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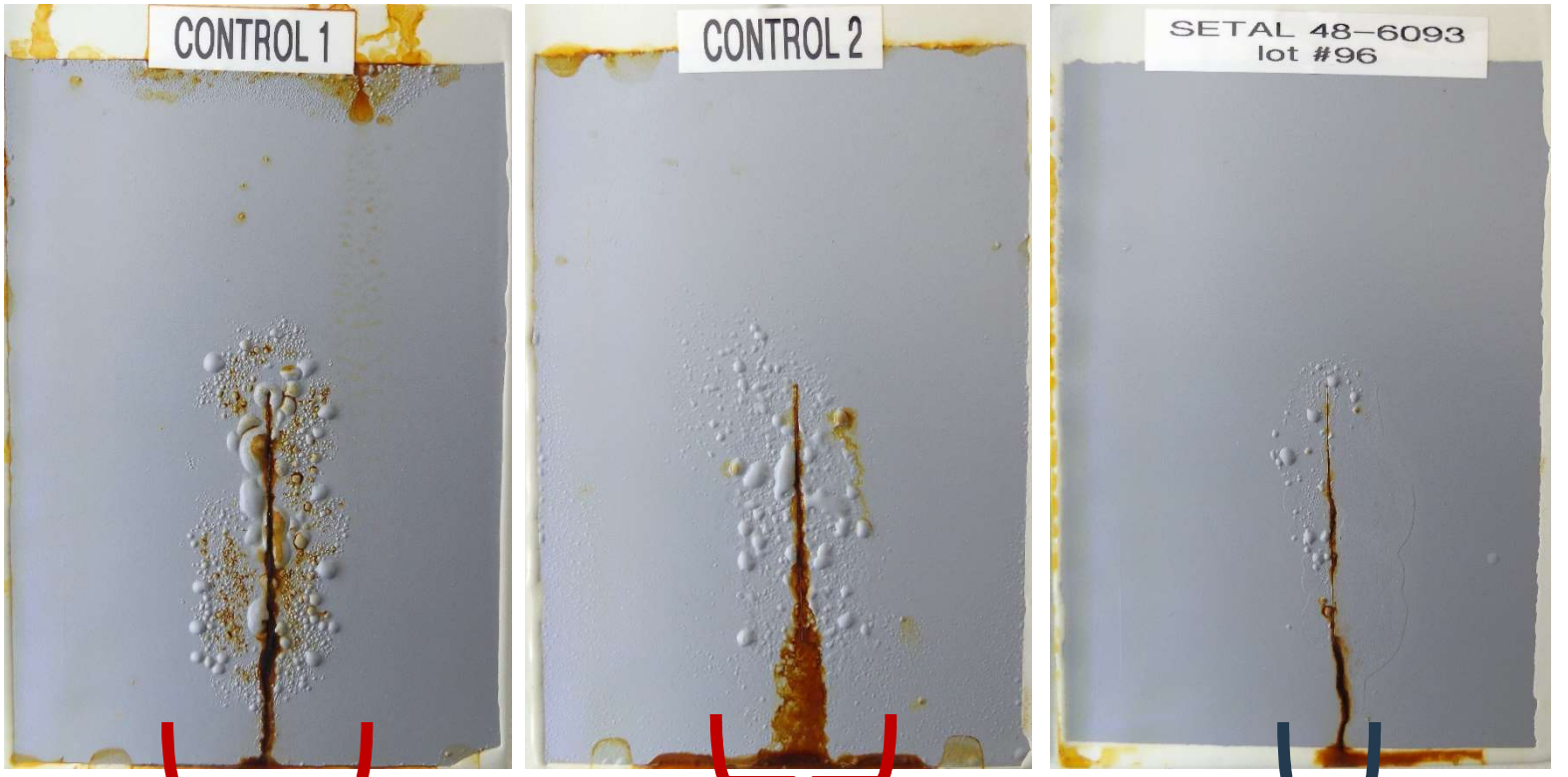
# Salt Fog ASTM B 117

## Sand Blasted Steel 4”x6” CCC&L 2mil Profile (2-4mil DFT Spray Applied)

| Sample | Control 1 | Control 2 | SETAL® 48-6093 |
|---|---|---|---|
| Test Hours | 336 hr. | 336 hr. | >336 hr. |

**Excellent Salt Fog Resistance >336 hrs.**

**Compared to blister development observed on both controls within 336 hrs.**




**Large and Small Scribe Blisters**

**PASS -Small Scribe Blisters Only**

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# Adhesion on Multiple Substrates

## Crosshatch Adhesion ASTM D3359-B (5B=Best) (~2mil DFT Drawdown Applied)

| Substrate | Cure Conditions Ambient Dry | Control 1 | Control 2 | SETAL® 48-6093 |
|---|---|---|---|---|
| **CRS** Cold Rolled Steel Q-Panel Type R | 7 Day (Dry/Wet) | 5B/5B | 5B/5B | 5B/5B |
| | 30 Day (Dry/Wet) | 5B/5B | 5B/5B | 5B/5B |
| **SB** Sand Blasted Steel CCC&L 2mil Profile | 7 Day (Dry/Wet) | 5B/5B | 5B/5B | 5B/5B |
| | 30 Day (Dry/Wet) | 5B/5B | 5B/5B | 5B/5B |
| **HDG** Hot Dipped Zinc Galvanized ACT | 7 Day (Dry/Wet) | 5B/5B | 5B/5B | 5B/5B |
| | 30 Day (Dry/Wet) | 5B/5B | 5B/5B | 5B/5B |
| **Al** Aluminum Q-Panel | 7 Day (Dry/Wet) | 5B/5B | 5B/5B | 5B/5B |
| | 30 Day (Dry/Wet) | 5B/5B | 5B/5B | 5B/5B |
| **HIPS** High Impact Polystyrene Plastic | 7 Day (Dry/Wet) | 5B/5B | 5B/5B | 5B/5B |
| | 30 Day (Dry) | 5B | 5B | 5B |
| **Other Plastics** ABS, PP, and HDPE Plastics | 7 Day (Dry) | 0B | 0B | 0B |

**Exceptional adhesion to multiple metal substrates and HIPS plastic**
**7 day dry and after significant cure time**

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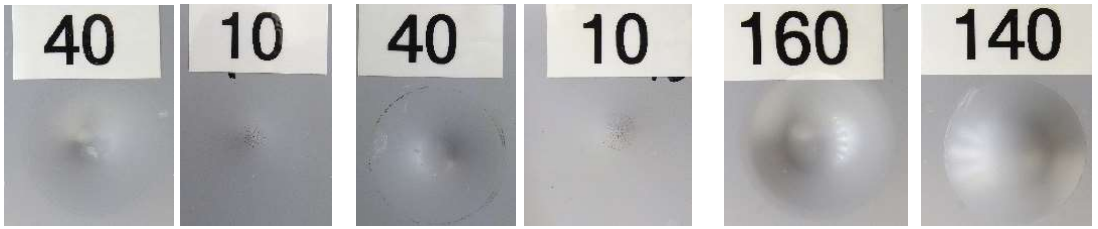
# Flexibility and Hardness Development (~2mil DFT Drawdown Applied)

*Impact results after cloth saturated with copper sulfate solution for at least 15 min. Examine for evidence of copper deposition, which highlight the film cracks using magnification per ASTM D2794.




| Test | Cure Conditions Ambient Dry | Control 1 | Control 2 | SETAL® 48-6093 |
|---|---|---|---|---|
| ***Direct Impact (inch-pounds)** ASTM D2794 | 7 Day | 30 | 30 | >160 |
| | 30 Day | 30 | 30 | 100 |
| ***Reverse Impact (inch–pounds)** ASTM D2794 | 7 Day | <10 | <10 | 140 |
| | 30 Day | <10 | <10 | 70-80 |
| **Cylindrical Mandrel Bend** ASTM D522 Method B | RT 7 Day | Pass 1/8” | Pass 1/8” | Pass 1/8” |
| | RT 30 Day | Pass 1/8” | Pass 1/8” | Pass 1/8” |
| **Konig Pendulum Hardness (sec)** ASTM D4366 | 1 Day | 13 | 21 | 10 |
| | 7 Day | 18 | 33 | 15 |
| | 14 Day | 24 | 37 | 19 |

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# Flexibility and Hardness Development – Direct Impact (~2mil DFT Drawdown Applied)

*Impact results after cloth saturated with copper sulfate solution for at least 15 min. **Examine for evidence of copper deposition, which highlight the film cracks using magnificatio**n per ASTM D2794.




| Test | Cure Conditions Ambient Dry | Control 1 | Control 2 | SETAL® 48-6093 |
|---|---|---|---|---|
| ***Direct Impact (inch-pounds)** ASTM D2794 | 7 Day | 30 | 30 | >160 |


**Outstanding direct impact resistance >160**

**Compared to both commercial control resins which fail at 40**

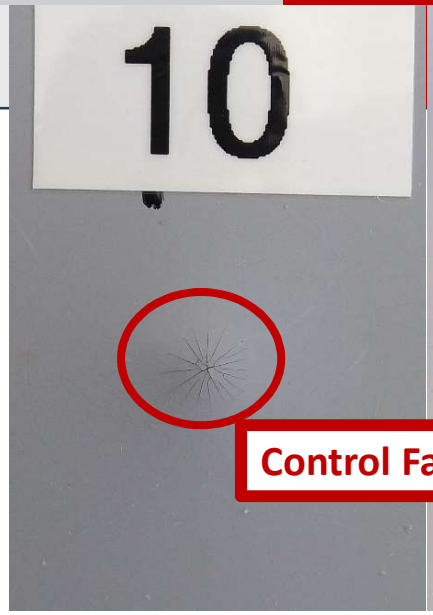
**Control Fail Point 40**

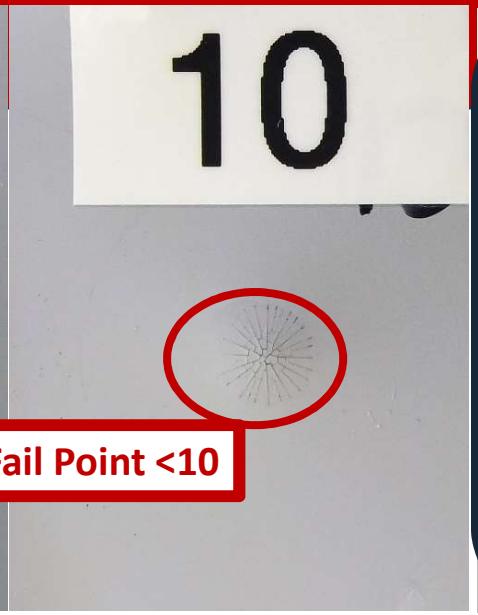
# Flexibility and Hardness Development – Reverse Impact (~2mil DFT Drawdown Applied)

*Impact results after cloth saturated with copper sulfate solution for at least 15 min. **Examine for evidence of copper deposition, which highlight the film cracks using magnification** per ASTM D2794.




| Test | Cure Conditions Ambient Dry | Control 1 | Control 2 | SETAL® 48-6093 |
|---|---|---|---|---|
| *Reverse Impact (inch–pounds) ASTM D2794 | 7 Day | <10 | <10 | 140 |





Control Fail Point <10

**Outstanding reverse impact resistance >140**

**Compared to both commercial control resins <10**

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# Flexibility Development Over Full Cure - 30 Days (~2mil DFT Drawdown Applied)

| Test | Cure Conditions Ambient Dry | Control 1 | Control 2 | SETAL® 48-6093 |
|---|---|---|---|---|
| *Direct Impact (inch-pounds) ASTM D2794 | 7 Day | 30 | 30 | >160 |
| | 30 Day | 30 | 30 | 100 |
| *Reverse Impact (inch–pounds) ASTM D2794 | 7 Day | <10 | <10 | 140 |
| | 30 Day | <10 | <10 | 70-80 |
| Cylindrical Mandrel Bend ASTM D522 Method B | RT 7 Day | Pass 1/8” | Pass 1/8” | Pass 1/8” |
| | RT 30 Day | Pass 1/8” | Pass 1/8” | Pass 1/8” |

Epoxy esters are oxidative drying resins that continue to cure and become brittle over time, which tends to lead to film failures over time.

In this case there is a minor reduction in impact resistance compared to the controls after the majority of cure at 30 days

**Maintains outstanding flexibility over full cure 30 days**

**Significantly higher flexibility than both commercial control resins**

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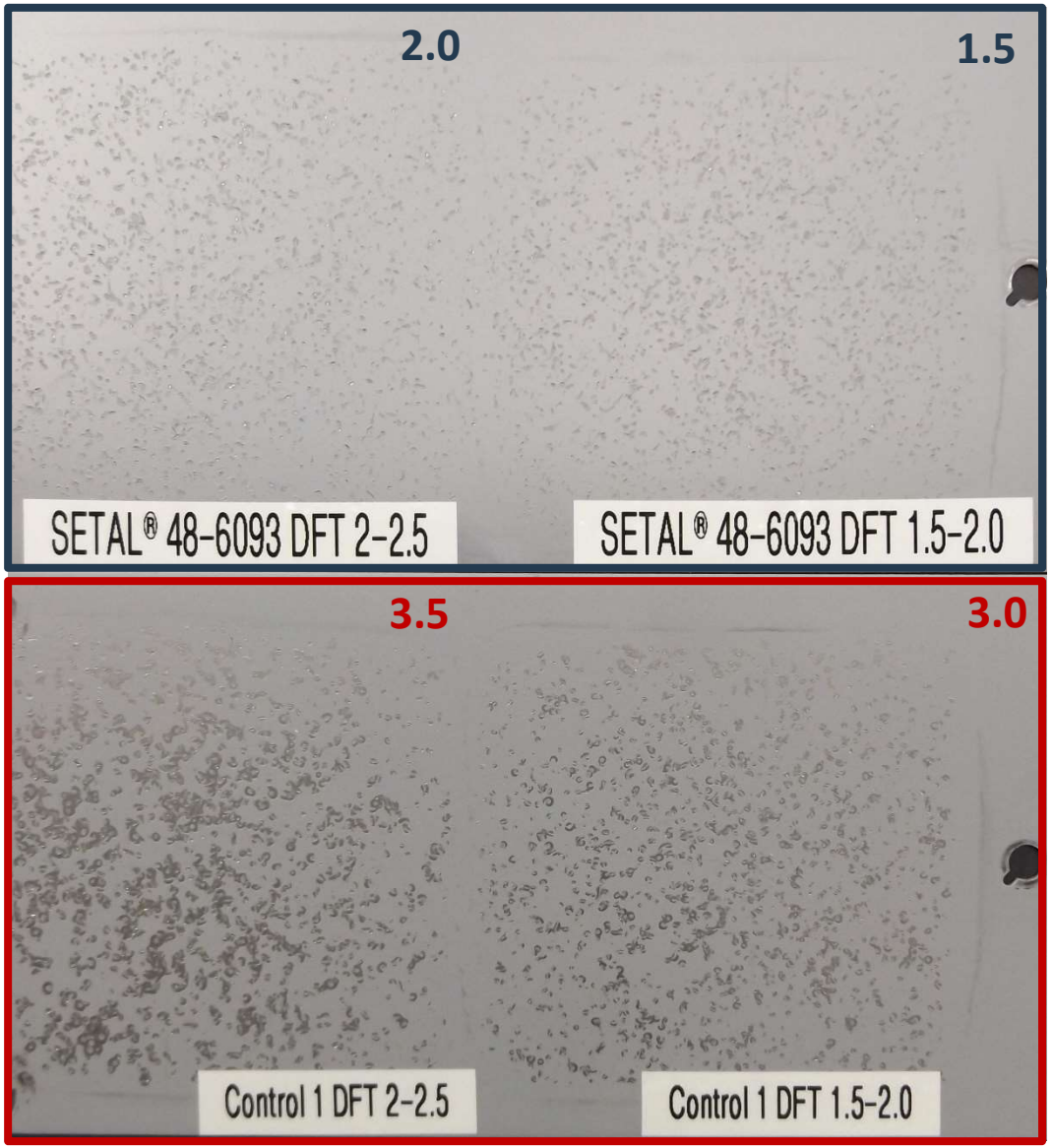
# Stone Chip Resistance ISO 20567-1* (0 = 0% Affected Area, 5 = >80%)
# Metal Primer over Cold Rolled Steel Q-Panel R48 (Spray Applied)




| SETAL® 48-6093 | Rating Average |
|---|---|
| 1.5-2.0 DFT | **1.5** (2.5% Affected Area) |
| 2.0-2.5 DFT | **2.0** (5.5% Affected Area) |

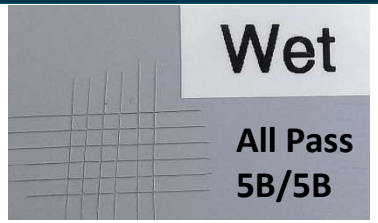
**Considerably better stone chip resistance than commercial Control 1**

| Control 1 | Rating Average |
|---|---|
| 1.5-2.0 DFT | **3.0** (19% Affected Area) |
| 2.0-2.5 DFT | **3.5** (29% Affected Area) |

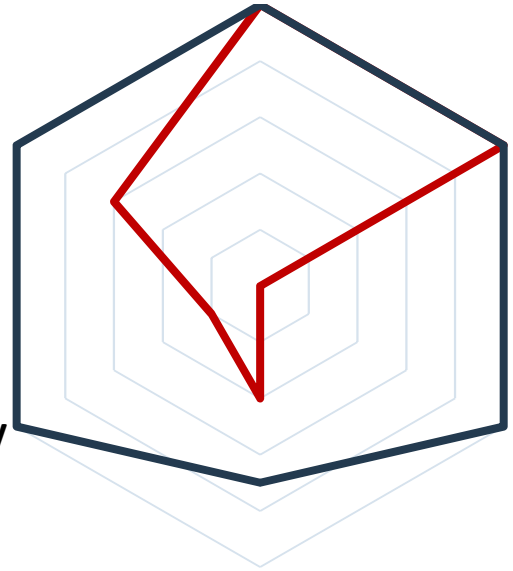
*Stone Chip Resistance by European Gravelometer testing method using a visual rating system similar to ASTM D3170

# SETAL® 48-6093 Metal Primer Formula #1776 Summary


336 hr. >336 hr.

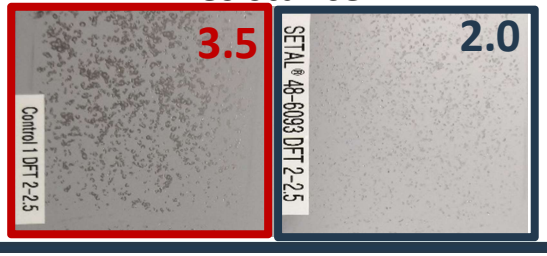


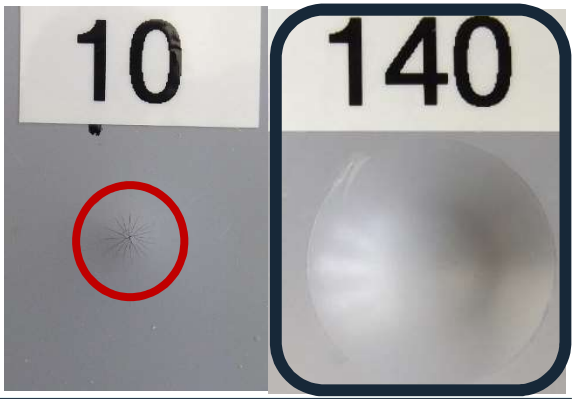

Multiple Metal Substrate Adhesion




<168 hr. >3000 hr.


Stone Chip Resistance



# SETAL® 48-6093 Formulations Available in Technical Bulletin

| Formula # | allnex Resins | Formula Type |
|---|---|---|
| #1776 | SETAL® 48-6093 | Ambient Cure Gray Metal Primer |
| #1778 | SETAL® 48-6093 and CYMEL® 385 | Light Gray Baking Enamel |

**Several formulations, raw material guidelines, and additional performance data are available in the Technical Bulletin – with new formulations & applications being evaluated for future consideration**

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# Additional Formulation – SPF #1778

## LIGHT GREY BAKING ENAMEL

| *Pounds* | *Gallons* | *Raw Material* | *Supplier* | *Instructions* |
|---|---|---|---|---|
| 40.0 | 4.80 | Water | | Add ingredients separately and in order |
| 9.0 | 1.03 | ADDITOL® XW 6588 (dispersant) | allnex | with good agitation |
| 3.0 | 0.40 | ADDITOL® VXW 4973 (defoamer) | allnex | |
| 150.0 | 4.50 | Kronos 2310 | Kronos | Add slowly with good agitation |
| 3.0 | 0.33 | Acrysol RM-2020 | Dow | Increase speed and disperse to 7+ Hegman |
| 357.0 | 42.00 | **SETAL® 48-6093** | allnex | Continue with letdown under good |
| 78.0 | 7.50 | **CYMEL® 385** | allnex | agitation |
| 12.0 | 1.64 | Dimethylethanolamine | | |
| 25.0 | 3.70 | Sec-butanol | | |
| 4.0 | 0.48 | ADDITOL® XW 6580 (leveling) | allnex | |
| 2.0 | 0.28 | ADDITOL® XL 123N (slip aid) | allnex | |
| 263.0 | 31.57 | Water | | Add slowly with increasing speed |
| 11.2 | 1.00 | Colortrend Lamp Black 888-9907 | Chromaflo | Add slowly to adjust viscosity & rheology |
| 7.0 | 0.76 | Acrysol RM-2020 | Dow | |
| **964.2** | **100.00** | ***Total*** | | |

**SETAL® 48-6093** can be crosslinked with an amino functional crosslinker such as **CYMEL® 385** for bake applications 300°F

# Additional Formulation – SPF #1778

## LIGHT GREY BAKING ENAMEL

| *Formulation Parameters* | |
|---|---|
| Weight Solids, % | 49.92 |
| Volume Solids, % | 39.25 |
| Weight / Gallon, lbs/gal | 9.64 |
| Pigment Volume Conc., % | 11.98 |
| Pigment / Binder | 0.47 |
| VOC, g/l | 300.71 |
| VOC, lbs/gal | 2.51 |

| *Typical Paint Properties* | |
|---|---|
| Bake Schedule | 10’ @ 300°F |
| pH | 8.0-8.5 |
| Viscosity (Stormer) | 85-90 KU |
| 20°/60° Gloss (1.5-2.0 mils DFT) | 53 / **86** |
| Hardness (König, oscillations) | **79** |
| MEK Double Rubs | **200+** |
| Pencil Hardness | **F** |
| Direct / Reverse Impact (in./lbs. passed) | **80 / 100** |

**High gloss >80**

**Excellent crosslink density / hardness**

**Outstanding impact resistance**

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# Thanks For Your Attention

- For further information please contact your local allnex sales rep
- allnex inquiries can also be sent via:
  - allnex website: https://www.allnex.com/en/contact-us
  - Email at :
    > Business@allnex.com
    > communications@allnex.com

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