



# Highland International, Inc.

## Engineered Paint Systems

### Chem-Temp 74-AR Series Hybrid Epoxy Novolac DTM Liner Coating

**Chem-Temp 74-AR Series** is a thin film 3-K Hybrid Epoxy Novolac Liner Coating formulated to provide excellent resistance to abrasion and erosion as well as exceptional temperature and chemical protection. Specifically formulated for tank linings, vessels, and pipelines, 74-AR Series provides superior barrier properties against acidic, caustic, and high heat environments. Chem-Temp 74-AR Series also offers excellent adhesion and corrosion resistance with a temperature rating of 300°F for immersion (350°F for some cargoes/services) and 450°F for dry heat, making it the premium choice for high performance against corrosive cargo.

<b>Vehicle Type:</b>	Hybrid Epoxy Novolac
<b>Pigmentation:</b>	Lead Free
<b>Reducer:</b>	Not necessary, if desired: #740S (slow) also reduces surface tension, #740M (medium), or #740F (fast) reducers
<b>Reducer for Hot Application:</b>	Highland #101 Reducer
<b>Mix Ratio:</b>	4:1:1 w/74-AHF-100 & 74-AR Component
<b>Pot Life:</b>	3 Hours @ 77°F (Decreases at higher temperatures)
<b>Volume Solids:</b>	70%
<b>Theoretical Coverage:</b>	1120 ft <sup>2</sup> /gal. @ 1mil DFT
<b>VOC:</b>	2.06 lbs/gal. (247 g/L)
<b>Flash Point:</b>	24°F (Lowest Flashing Component)
<b>Recommended DFT:</b>	10-16 mils DFT
<b>Dry-time:</b>	
<b>Recoat:</b>	3-36 Hours
<b>To Touch:</b>	4 hours
<b>To Handle:</b>	6 Hours
<b>Put in Service (Heat):</b>	24 Hours after final coat
<b>Cure Time:</b>	5-7 Days @ 77°F
<b>Shelf Life:</b>	2 Years from DOM
<b>Finish:</b>	Eggshell
<b>Color:</b>	Light Yellow, Red & Light Green

#### Advantages of 74-AR Series Chem-Temp

- Next generation polymer technology specifically engineered for heat stability and chemical resistance
- Proprietary abrasion component provides increased resistance to abrasion/erosion
- Dry heat stability up to 450°F, immersion up to 300°F (350°F for some cargoes/services)
- Superior resistance to a wide variety of chemicals and solvents
- Superior abrasion resistance
- Superior adhesion even over marginally prepared surfaces
- Excellent corrosion resistance
- Ease of application

- Specially engineered inert filler package provides superior barrier properties
- Superior substrate wetting provides excellent adhesion and corrosion protection
- Ultra-high crosslink density provides a tough durable film with long lasting protection
- Inclusion into recent Taber results

#### Performance Data

<b>Adhesion</b> (ASTM D 4541) – Commercial Blast	<b>&gt; 1800 psi</b>
<b>Abrasion Resistance</b> (ASTM D 4060) <b>1000</b> Cycles, 100g load	<b>Excellent – 43.1 mg loss</b>
<b>Humidity Resistance</b> (ASTM 4585) 3000 hours	<b>Excellent – No blistering or other defects observed</b>
<b>Salt Spray Resistance</b> (ASTM B 117) 3000 hours	<b>Excellent - &lt;1 mm creep from scribe, no blistering</b>
<b>Chemical Resistance</b> (ASTM D 1308)	<b>Excellent – MEK – No defects observed</b> <b>25% H<sub>2</sub>SO<sub>4</sub> – Slight discoloration, no other defects observed</b> <b>25% NaOH – slight loss of gloss, no other defects observed</b>
<b>Pencil Hardness</b> (ASTM D 3363)	<b>6H</b>
<b>Elongation</b> (ASTM D 522)	<b>5%</b>

#### Independent Test Data

##### RAE Engineering and Inspection Ltd. November 2012

ASTM D4060-07 - Standard Test Method for Resistance of Organic Coatings by Taber Abraser

##### Abrasion

Method: CS-17 Wheels, 1kg. Wheel, 1000 cycles

System: Highland 74-AR @ 8.2 mils DFT

Results: DFT loss (µm) Average Difference 12.5  
Mass loss (mg) Average Difference 43.1

System: Leading Competitor @ 7.1 mils DFT

Results: DFT loss (µm) Average Difference 27.9  
Mass loss (mg) Average Difference 37

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#### Independent Test Data – Continued

#### RAE Engineering and Inspection Ltd. May 2011

NACE TM0185 – Evaluation of Internal Plastic Coatings for Corrosion Control of Tubular Goods by Autoclave Testing.

#### Adhesion

**Method:** ASTM D4541 – Standard Test Method for Pull-Off Strength

**System:** Two coats 74 Series @ 8 mils DFT per coat applied to:  
1) SSPC-SP6 Commercial Blast prepared steel  
2) No surface preparation

**Result:** 1) No less than 1400 psi with SSPC-SP6 Commercial Blast  
2) No less than 1000 psi with no surface preparation.

#### Chemical Immersion

**Method:** Continuous Immersion at 93°C (200°F)

**System:** Two coats 74 Series @ 8 mils DFT per coat applied to SSPC-SP5 White Metal Blast prepared steel. Cured 14 days at 21°C (70°F).

**Result:** No cracking, lifting, or delamination after 60 days of continuous exposure.

**Reagents:** 10% methanol, 50% methanol, 10% sulfuric acid, 25% sulfuric acid, 10% sodium hydroxide, 50% Sodium hydroxide.

#### Heat Resistance

**Method:** Continuous heat exposure at 232°C (450°F)

**System:** Two coats 74 Series @ 8 mils DFT per coat applied to:  
1) SSPC-SP56 Commercial Blast prepared steel  
2) No surface preparation  
3) No surface preparation with tight rust.  
Cured 14 days at 21°C (70°F).

**Result:** No cracking, lifting, or delamination of the film after 3000 hours of continuous exposure.

#### Acid Condensation Bath

**Method:** Coated panels exposed to a condensation bath with 50% sulfuric acid and water. The test duration was 1000 hours total at 177°C (350°F) and the panels were scribed with an "X" to evaluate corrosion. The acid bath was performed in an enclosed apparatus that retained the sulfuric acid condensation, and the panels were suspended in the headspace.

**System:** Single coat as well as two coats 74 Series @ 8 mils DFT per coat applied to SSPC-SP6 Commercial Blast prepared steel. Cured 24 hours at 21°C (70°F).

**Result:** No rust creepage, softening, cracking or delamination of the film after 1000 hours of continuous exposure.

#### Sulfuric Acid Spot Testing

**Method:** Continuous heat at 177°C (350°F) for 1500 hours. After 1500 hours, spot testing was performed with 98% sulfuric acid for 72 hours.

**System:** Two coats 74 Series @ 8 mils DFT per coat applied to SSPC-SP6 Commercial Blast prepared steel. Cured 24 hours at 21°C (70°F).

**Result:** No softening or cracking of the film (some Discoloration was observed).

#### Charter Coating Services Ltd. July 2011

Method: NACE TM0185 – Evaluation of Internal Plastic Coatings for Corrosion Control of Tubular Goods by Autoclave Testing.

#### Test Conditions:

Temperature: 45°C/ 203°F

Pressure: 1800 psi

Gas Phase: 5% H<sub>2</sub>S, 5% CO<sub>2</sub>, 90% CH<sub>4</sub>

Organic Phase: Toluene: Xylene 1:1 ratio

Aqueous Phase: 5% NaCl

Duration: Cycle 1 - 96 hours/ Cycle 2 – additional 48 hours (rapid depressurization)

**System:** Two coats 74 Series @ 5-8 mils DFT per coat applied to SSPC-SP 5 White Metal Blast prepared steel.

#### Cycle 1 Results:

Blistering – the test panel remained free of blisters in all three phases

Adhesion – The maintained an A rating in all three phases

Depressurization – no effect from 1500psi to atmospheric over duration of 120 minutes

#### **Cycle 2 Results: (Additional 48 Hours Test with Rapid Decompression from 1800psi to atmospheric in 5 Minutes at 95°C/203°F)**

Blistering – The coating showed reactions to the rapid decompression condition as indicated by minor blistering (D#6), the blisters did not extend to substrate. No holidays were detected.

Adhesion – The coating maintained excellent adhesion (rating A) after exposure.

#### Typical Systems

#### Direct to Metal

74-AR Series (10-18 mils DFT @ 6-8 mils DFT/coat)

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#### Surface Preparation

- 1) For immersion, SSPC-SP5 White Metal Blast Cleaning is preferred; however, minimum acceptable surface preparation should be in accordance with SSPC-SP10 Near White Metal Blast Cleaning, with a 2.5-3 mil jagged profile. All Surfaces to be painted should be dry and free of all foreign contaminants.
- 2) For non-immersion service, surface preparation should be in accordance with SSPC-SP10 Near White Metal Blast Cleaning. When Near White Metal Blast is not an option, SSPC-SP6 Commercial Blast Cleaning may be acceptable – Consult a Highland Representative. All surfaces to be painted should be clean, dry and free of all foreign contaminants.

#### Mixing and Application Requirements

- 1) Mix full kits only.
- 2) Mixed material is ready for use after a 30 minute induction period.
- 3) Reduction is not necessary, but if desired, you may reduce up to 10% with a Highland #740 Series Reducer.
- 4) Apply 6-8 mils DFT per coat.
- 5) Apply at a rate of 65-112 square feet per gallon to obtain the recommended dry film thickness.
- 6) Allow one week @ 77°F before being put into service for immersion.
- 7) The second coat/topcoat must be applied within 36 hours @ 77°F or the surface will need to be scuffed.

#### Special Notes for Hot Surface Application

Chem-Temp 74 Hot Application formula may be applied directly to hot surfaces not exceeding 400°F.

- 1) Mix 1 Part “A” Activator & 1 Part Proprietary Abrasion Component with 4 parts “B” Base by volume. Mix full kits only.
- 2) Mixed material is ready for reduction after a 30 minute induction period.
- 3) Reduce 20% with Highland #101 Hot Application Reducer.
- 4) To achieve the recommended film thickness, apply in multiple subsequent coats not exceeding 2 mils DFT per coat.

#### Method of Application

<b>Conventional Gun:</b>	DeVilbiss MBC-510
Fluid Tip:	E
Air Cap:	704
Atomizing Pressure:	70 psi
Pot Pressure:	15-20 psi
Hose:	½ inch ID
<b>Airless Gun:</b>	Graco 205-591
Pump:	30:1/45:1/60:1, Gas pump acceptable
Tip Range:	3.013 – 4.017
Pump Pressure:	1800 psi minimum
Hose:	3/8 inch ID
Brush or Roller:	Natural or synthetic bristle
Clean Up:	Clean all equipment with MEK

#### Safety Precautions

- 1) Use normal precautions such as gloves, facemasks and barrier creams.
- 2) Adequate ventilation must be maintained. In confined areas, workmen must wear constant flow airline respirators.
- 3) If product comes into contact with skin, wash thoroughly with lukewarm water or diluted Boric Acid, and obtain immediate medical attention.
- 4) This product contains **FLAMMABLE** materials. Keep away from sparks and open flames. Observe **NO SMOKING** regulations.
- 5) All electrical equipment and installations should conform to NEC regulations. In areas where explosion hazards exist, workmen should be required to use non-ferrous tools, and to wear conductive, non sparking shoes.
- 6) Observe low flash regulations.
- 7) Refer to Material Safety Data Sheet (MSDS) for complete safety instructions.

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