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## TECHINICAL GUIDE

### Berman Resin Coatings

Joel Berman Glass Studios' Acrylic Coating system is a very high cross-linked system that offers excellent long term value. The most critical difference between high and low cross linked coatings is the actual number of chemical bonds holding the molecules together. The higher the cross linked density of a coating, the higher the overall film toughness and chemical resistance. Because Joel Berman Glass Studios' coatings are very high cross linked, it offers the best long term value and overall quality.

#### **Formula Characteristics**

##### **Film Hardness**

Aliphatic urethane coatings were introduced to the U.S in the 60's primarily for the Aerospace industry to protect surfaces that were subjected to sand and ice particles at hundreds of miles per hour. Joel Berman Glass Studios' Acrylic Coating is the most resilient and the most popular of these types of urethanes.

The impact durability of Joel Berman Glass Studios' Acrylic Coating is superior to other types of coatings and is rated 10 in scruff and mar tests. This durability translates to a tough coating that takes constant abuse with a minimum wear.

##### **High Gloss**

A distinct advantage of a high cross linking aliphatic urethane, like Joel Berman Glass Studios' Acrylic Coating, is the rich wear layer that forms at the surface during the curing cycle. This layer provides long term protection for the pigment particles, improves color and gloss retention and gives that deep, rich gloss associated with high quality urethanes.

##### **Chemical and Solvent Resistance**

In addition to providing aesthetic qualities, this rich wear layer also provides a versatile barrier to all forms of punishment from caustic acids, abrasives, solvents in cosmetics, dyes, etc.

##### **UV Screening Agents**

Joel Berman Glass Studios' Acrylic Coating has ultra violet light screening agents U.V.R and ULTRABLOCK protecting the surface against harmful light radiation which will turn many coatings, particularly epoxies, prematurely yellow.

## Performance Data Guide

### Standard Performance Tests

**The following tests were performed on BONDERITE 1000 Treated, Cold Rolled Steel Panels**

Weight/Gallon	11.4 – 11.6
Viscosity – Initial	1900 cp. @ 77 degrees F
Viscosity – Catalyzed	30—35 seconds #2 Zahn
Viscosity – Reduced	20---24 seconds #2 Zahn
% Solids by Weight	69% +/- 1.0
% Solids by Volume	55% +/- 1.0
Volume Solids at Spray Visc.	41%
Theoretical Coverage @ 1mil	960 sq. ft. per gallon
Pencil Hardness	4 H sit. Mar—No film break
Gloss	95 +/-
Flexibility	¼ In.Mand. Passes-No Cracks
Direct Impact	Pass 80 In. Lbs at 1 mil dry film
Reverse Impact	Pass 80 In. Lbs at 1 mil dry film

### Immersion Tests

5% Detergent 7 Hrs. at 10000	No Effect
Ethylene Glycol Rt.	16 hrs. sit. Softening of film

Spot Tests 24 Hours—Substrate Bonderite 1000

#2 Diesel Fuel	No effect
30 SAE HD Motor Oil	No effect
Mineral Spirits	No effect
Xylol	Slit. Ring Mark
Cellosolve Acetate	Slit. Ring Mark-No softening
Cyclohexanone	Mod. Ring Mark-Slit. softening
5% Sulfuric Acids	No Effect
30% Sulfuric Acids	Film slightly dulled
50% Sulfuric Acids	Film dulled
10% Hydrochloric Acid	No effect
Lipstick	No effect
Mustard	Very slit. Stain
Catsup	No effect
Hair Color	Mod. Stain
Bitters	Mod. Stain
1% Iodine	Mod. Stain
5% Potassium Permanganate	Mod. Stain
Marker Pen	No effect

### Accelerated Weathering Tests

Q.U.V. 60% Gloss	Initial Gloss 88 537 Hrs. Final Gloss 87
Q.U.V. 20% Gloss	Initial Gloss 81 537 Hrs. Final Gloss 72

### Falling Sand Abrasion

108 Liters per mil dry film

# Joel **Berman** Glass Studios

## Isocyanate Acrylic Urethane vs. Non- Isocyanate Urethane

**Acrylic Urethanes** which employ an isocyanate based catalyst system, particularly Joel Berman Glass Studios' high density cross-linked system, have developed a reputation as the best overall coating system for performance in areas such as; initial gloss, gloss retention, stain and solvent resistance, color retention and impact resistance.

Our topcoat system was compared against an isocyanate-free acrylic urethane topcoat system in a performance test against a variety of surface contaminants.

The following results were found:

### 24 Hours Exposure

Agents	Acrylic Urethane	Non-Isocyanate Urethane
Mustard	Very slight stain	Slight stain
Catsup	No effect	No effect
Hair Color	Bad stain	Bad stain
Iodine	Bad stain	Bad stain
Marking Pen	No effect	Very slight mark
Ammonia	No effect	No effect
5-10% Sulfuric Acid	No effect	Very slight mark

### Water Soak – Tap water and 5% Detergent Solution

Panels were immersed in tap water and a 5% solution of household detergent for 120 hours at 72 degrees F. Both systems passed, no effect.

### Abrasive Cleaners

Panels of both systems were wiped with abrasive household cleaners and allowed to stand for 24 hours after which, the cleanser was removed. Both systems passed, no effect.

### Gloss

Gloss was measured on both systems:

Acrylic Urethane—91%

Non-Isocyanate Urethane--- 80%

# Joel **Berman** Glass Studios

## Isocyanate Acrylic Urethane vs. Non-Isocyanate Urethane

### Hardness

Pencil hardness was run on both systems applied and cured to ceramic panels

Acrylic Urethane—Between H & 2H

Non-isocyanate Urethane—H

### Solvent Resistance

Panels of each system were given rub tests using common solvents. A cotton rag was soaked in each solvent then the wet rag was applied to the surface with moderate pressure and rubbed forward and backward. A movement forward and a return to the starting position was one rub cycle. The test was for 20 cycles or failure, whichever came first.

Solvent	Acrylic Urethane	Non-Isocyanate Urethane
Mineral spirits	No Effect	No Effect
Isopropyl Alcohol	No Effect	No Effect
Xylol	No Effect	Failed
Methyl Ethyl Ketone	No Effect	Failed

### Adhesion

All panels were cross hatched, then tape pulls were performed using cellophane package tape. Both systems passed, no failures.

### Appearance

The Acrylic Urethane system had a slightly smoother, more uniform appearance. It was also glossier.

### Conclusion:

Joel Berman Glass Studios' Isocyanate Acrylic coating system provides a harder, more chemical resistant, glossier finish than the non-isocyanate coating system. While the test results were fairly close in some instances, the distinct edge appears to be in gloss and resistance to harsh solvents. This edge can translate into a significant edge in everyday practical reliability, where real-world finish wear and tear occurs.

## Acid and Solvent Resistance

Reagent	Conc.	Immersion Test
<b><u>ACIDS</u></b>		
Sulphuric	5%	No effect—3 ½ years
Sulphuric	10%	Slight loss of gloss—3 ½ years
Sulphuric	20%	Slight loss of gloss—3 ½ years
Sulphuric	30%	Slight loss of gloss—3 ½ years
Sulphuric	50%	Slight loss of gloss—3 ½ years
Nitric	10%	Slight loss of gloss—1000 hours
Nitric	20%	Failed after 36 days
Phosphoric	50%	No effect—3 ½ years
Phosphoric	75%	Failed after 14 days
Hydrochloric	5%	Slight loss of gloss—3 ½ years
Hydrochloric	10%	Slight loss of gloss—3 ½ years
Hydrochloric	15%	Slight loss of gloss—3 ½ years
Hydrochloric	28%	Failed after 48 hours
Acetic	5%	Failed after 40 days
Acetic	10%	Failed after 14 days

<b><u>Chemicals</u></b>		
Tri-cresyl Phosphate Sodium Tri-		No effect—3 ½ years
Polyphosphate 25% Polychlorinated		No effect—3 ½ years
Polyphenyls		No effect—3 ½ years
Di-Butyl Phthalate		No effect—3 ½ years
Di-Octyl Phthalate		No effect—3 ½ years
Di-Butyl Fumerate		No effect—3 ½ years
Methyl Salicylate		Slight loss of gloss—3 ½ years

<b><u>Solvents</u></b>		
Mineral Spirits		No effect—3 ½ years
Xylol		No effect—3 ½ years
MIBK		No effect—3 ½ years
Ethyl Acetate		Slight loss of gloss, softening—3 ½ years
Gasoline		No effect—3 ½ years