

**EPOTUF® 37-685**

(United States Patent Number: 5204385)

Product Code: 37685-00

**Waterborne Epoxy Curing Agent**

**DESCRIPTION**

EPOTUF® 37-685 is a patented amine functional dispersion that is used to formulate two component waterborne epoxy coatings with properties comparable to conventional solvent based two component epoxy coatings.

**APPLICATIONS**

- Medium-Heavy industrial maintenance primers (non-immersion)
- Light duty direct-to-metal coatings
- Rail and transportation coatings
- Light duty steel shop and holding primers
- Concrete sealers, primers and topcoats
- Architectural coatings

**FEATURES**

- Corrosion resistance on steel
- Low VOC capability (<100 g/l)
- Fast dry times
- Stable performance over a 4 hour pot life
- High hardness
- Excellent chemical resistance
- Low odor and easy clean-up
- Good in-can coating stability
- Wide recoat window
- Non-HAPs

**TYPICAL PROPERTIES**

Percent Solids, by weight	50
Percent Solids, by volume	46
Appearance	Milky white emulsion
Viscosity, cps, 25° C	50
Weight per Gallon, pounds	8.9
Amine Hydrogen Equivalent Weight, as supplied	320
Volatiles, by weight	7% propylene glycol monomethyl ether 43% water

**STORAGE**

To ensure maximum shelf life, store product preferably between 40°F and 80°F in the original sealed containers.

**SAFETY**

**READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET BEFORE WORKING WITH THIS PRODUCT**

The information herein is general information designed to assist customers in determining whether our products are suitable for their applications. Our products are intended for sale to industrial and commercial customers. We require customers to inspect and test our products before use and to satisfy themselves as to contents and suitability for their specific applications. We warrant that our products will meet our written specifications. **Nothing herein shall constitute any other warranty express or implied, including any warranty of merchantability or fitness for a particular purpose,** nor is any protection from any law or patent to be inferred. All patent rights are reserved. The exclusive remedy for all proven claims is limited to replacement of our materials and in no event shall we be liable for special, incidental or consequential damages.

**FORMULA #1: RED IRON OXIDE PRIMER  
USING EPOTUF® 37-143 and EPOTUF® 37-685**

**COMPONENT A**

<u>Lbs.</u>	<u>Gals.</u>	<u>Material</u>	
250.40	28.13	EPOTUF® 37-685	
11.02	1.39	EPOTUF® 37-620	
1.73	0.23	Patcote 841	(1)
27.83	3.71	2-Butoxy Ethanol	
86.93	10.44	Deionized Water	
<b>Mix until uniform, then add:</b>			
59.77	1.43	Red Iron Oxide R5098D	(2)
501.72	20.73	Wollastocoat 10 AS	(3)
<b>High speed disperse to 5 Hegman, then add:</b>			
13.40	1.75	Propylene Glycol Monomethyl Ether	
2.41	0.28	BYK-345	(4)
<b>955.21</b>	<b>68.10</b>	<b>Total, Component A</b>	

**COMPONENT B**

<u>299.90</u>	<u>31.90</u>	EPOTUF® 37-143
<b>299.90</b>	<b>31.90</b>	<b>Total, Component B</b>

**1255.12    100.00    COMPONENT A AND B TOTAL**

*Thin as needed with deionized water to application viscosity*

**ANALYSIS:**

74.6	Percent Solids, Weight
61.0	Percent Solids, Volume
12.55	Weight/Gallon, Pounds
1.52/1	Pigment to Binder, Weight Ratio
36.7	Pigment Volume Concentration, %
0.86	VOC, Lbs/Gal
102.46	VOC, Grams/Liter
1.3/1	Epoxy:Amine Ratio

**SUPPLIERS:**

	<b>Raw Material</b>	<b>Supplier</b>	<b>Purpose</b>
(1)	Patcote 841	Hydrite	Defoamer
(2)	Red Iron Oxide	Elementis	Primer Pigment
(3)	Wollastocoat 10 AS	Nyco Mineral, Inc.	Filler
(4)	BYK-345	BYK-Chemie	Surface Additive

Formula 4493-24E

**FILM PROPERTIES:**

*Typical primer properties based on 7 day ambient cure 2 mil films on polished CRS (unless otherwise noted).*

Pot Life, Hours	4
Gardner Dry Time, hours	
Set-to-Touch	0.75
Through Dry	6.0
Hard Dry	8.5

Pencil Hardness	2H
König Hardness, seconds	106
MEK double rubs	100+
Crosshatch adhesion	5B

Chemical Resistance, 24 hour spot tests:  
(5 = no effect, 1 = destroyed)

10% Acetic Acid	1.0
10% Hydrochloric Acid	1.0
10% Sulfuric Acid	1.0
10% Sodium Hydroxide	4.5
2% Nitric Acid	3.5
Acetone	4.5
Xylene	3.0
Methanol	4.5
Ethanol	4.5
Isopropanol	4.5
Gasoline	4.0
Water	4.0
<u>Skydrol LD-4</u>	<u>5.0</u>
<b>Average:</b>	<b>3.5</b>

Corrosion Resistance, 1000 Hour Salt Fog, polished CRS:

<b>Salt Fog: 1000 Hours</b>	<b>2.0 mils</b>	<b>5.5 mils</b>
Scribe Blisters	6MD/8D 3mm	4F/5MD/6D 3.5mm
Scribe Corrosion Creep	1.5mm	1.5mm
Field Blisters	6-7F	none
Field Rust	none	none
Field Adhesion, Crosshatch	1B	5B

**Substrate Recommendations:**

<b>Substrate</b>	<b>Usage</b>
Concrete	Recommended
Cold Rolled Steel	Recommended
Blasted Steel	Recommended
Untreated Aluminum	Recommended
Chromate Pretreated Aluminum	Recommended
Bonderite B37 Treated Steel	Not Recommended
Galvanized Steel	Not Recommended
Hot Dipped Galvanized Steel	Not Recommended
Tinplate Steel	Not Recommended

**FORMULA #2: RED IRON OXIDE PRIMER  
WITH IMPROVED CURE SPEED**

**COMPONENT A**

<u>Lbs.</u>	<u>Gals.</u>	<u>Material</u>	
229.73	25.81	EPOTUF® 37-685	
10.11	1.28	EPOTUF® 37-620	
1.58	0.21	Patcote 841	(1)
25.53	3.40	2-Butoxy Ethanol	
79.77	9.58	Deionized Water	
<b>Mix until uniform, then add:</b>			
54.84	1.31	Red Iron Oxide R5098D	(2)
460.33	19.02	Wollastocoat 10 AS	(3)

**High speed disperse to 5 Hegman, then add:**

12.30	1.60	Propylene Glycol Monomethyl Ether	
12.15	1.50	ANCAMINE K54	(4)
2.20	0.25	BYK-345	(5)
<b>888.54</b>	<b>63.97</b>	<b>Total, Component A</b>	

**COMPONENT B**

338.64	36.03	EPOTUF® 37-143	
<b>Mix under moderate agitation for 15 minutes</b>			
338.64	36.03	<b>Total, Component B</b>	

**1227.17 100.00 COMPONENT A AND B TOTAL**

*Thin as needed with deionized water to application viscosity*

**Gardner Circular Dry Times, hrs**  
Set / Through / Hard

Without ANCAMINE K54:	0.45 / 7.10 / 12.75
With ANCAMINE K54:	0.45 / 3.05 / 3.50

**ANALYSIS:**

75.0	Percent Solids, Weight
62.5	Percent Solids, Volume
12.27	Weight/Gallon, Pounds
1.32/1	Pigment to Binder, Weight Ratio
33.6	Pigment Volume Concentration, %
0.78	VOC, Lbs/Gal
93.41	VOC, Grams/Liter
1.6/1	Epoxy:Amine Ratio

**SUPPLIERS:**

	<b>Raw Material</b>	<b>Supplier</b>	<b>Purpose</b>
(1)	Patcote 841	Hydrite	Defoamer
(2)	Red Iron Oxide	Elementis	Primer Pigment
(3)	Wollastocoat 10 AS	Nyco Mineral, Inc.	Filler
(4)	Ancamine K54	Air Products	Accelerator
(5)	BYK-345	BYK-Chemie	Surface Additive

**FORMULA #3: RED IRON OXIDE PRIMER  
WITH ULTIMATE SALT SPRAY PERFORMANCE\*  
USING EPOTUF® 37-143 AND EPOTUF® 37-685**

**COMPONENT A**

<u>Lbs.</u>	<u>Gals.</u>	<u>Material</u>	
233.23	26.21	EPOTUF® 37-685	
10.26	1.30	EPOTUF® 37-620	
1.61	0.22	Patcote 841	(1)
25.92	3.45	2-Butoxy Ethanol	
80.99	9.72	Deionized Water	

**Mix until uniform, then add:**

55.67	1.33	Red Iron Oxide R5098D	(2)
467.33	19.31	Wollastocoat 10 AS	(3)

**High speed disperse to 5 Hegman, then add:**

12.48	1.63	Propylene Glycol Monomethyl Ether	
2.23	0.26	BYK-345	(4)
<b>889.72</b>	<b>63.43</b>	<b>Total, Component A</b>	

**COMPONENT B**

343.80	36.57	EPOTUF® 37-143	
343.80	36.57	<b>Total, Component B</b>	

**1233.52 100.00 COMPONENT A AND B TOTAL**

*Thin as needed with deionized water to application viscosity*  
*\* For salt spray data, see table on page 7.*

**ANALYSIS:**

74.7	Percent Solids, Weight
62.0	Percent Solids, Volume
12.34	Weight/Gallon, Pounds
1.32/1	Pigment to Binder, Weight Ratio
33.6	Pigment Volume Concentration, %
0.79	VOC, Lbs/Gal
94.82	VOC, Grams/Liter
1.6/1	Epoxy:Amine Ratio

**SUPPLIERS:**

	<b>Raw Material</b>	<b>Supplier</b>	<b>Purpose</b>
(1)	Patcote 841	Hydrite	Defoamer
(2)	Red Iron Oxide	Elementis	Primer Pigment
(3)	Wollastocoat 10 AS	Nyco Mineral, Inc.	Filler
(4)	BYK-345	BYK-Chemie	Surface Additive

**FORMULA #4: WHITE PRIMER (OPTIONAL GREY TINTED FORMULA)  
USING EPOTUF® 37-143 and EPOTUF® 37-685**

**COMPONENT A**

<u>Lbs.</u>	<u>Gals.</u>	<u>Material</u>	
262.12	29.45	EPOTUF® 37-685	
11.52	1.46	EPOTUF® 37-620	
1.82	0.25	Patcote 841	(1)
29.12	3.88	2-Butoxy Ethanol	
67.83	8.14	Deionized Water	
<b>Mix until uniform, then add:</b>			
60.85	1.83	TiPure R902 TiO <sub>2</sub>	(2)
510.57	21.10	Wollastocoat 10 AS	(3)

**High speed disperse to 5 Hegman, then add:**

<u>3.87</u>	<u>0.50</u>	Propylene Glycol Monomethyl Ether
<b>947.70</b>	<b>66.61</b>	<b>Total, Component A</b>

**COMPONENT B**

<u>313.90</u>	<u>33.39</u>	EPOTUF® 37-143
<b>313.90</b>	<b>33.39</b>	<b>Total, Component B</b>

**1261.60    100.00    COMPONENT A AND B TOTAL**

**Thin as needed with deionized water to application viscosity**

**ANALYSIS:**

76.1	Percent Solids, Weight
63.3	Percent Solids, Volume
12.62	Weight/Gallon, Pounds
1.47/1	Pigment to Binder, Weight Ratio
36.4	Pigment Volume Concentration, %
0.73	VOC, Lbs/Gal
87.83	VOC, Grams/Liter
1.3/1	Epoxy:Amine Ratio

**SUPPLIERS:**

	<b>Raw Material</b>	<b>Supplier</b>	<b>Purpose</b>
(1)	Patcote 841	Hydrite	Defoamer
(2)	TiPure R960	DuPont	Titanium Dioxide
(3)	Wollastocoat 10 AS	Nyco Mineral, Inc.	Filler

**Component B (EPOTUF® 37-143) can be successfully tinted using some of the following universal colorants:**

<b>Black Colorant</b>	<b>Compatibility</b>	<b>Color Acceptance</b>
Degussa Chroma-Chem 844	compatible	poor
Degussa Aqua-Chem 895	compatible	fair
Degussa Aqua-Chem 896	compatible	good
Degussa Color Trend 888	compatible	good
Penn Color 36B17	compatible	good
Penn Color 37B497	compatible	good
Eagle WB197T	compatible	good
Eagle K97	compatible	good
Elementis Tint-Ayd NV-7317	compatible	good

<b>Black Colorant</b>	<b>Stability: 6 weeks @ 120°F</b>	<b>Recommended?</b>
Degussa Chroma-Chem 844	slight flocculation	no
Degussa Aqua-Chem 895	no noticeable change	yes
Degussa Aqua-Chem 896	very thick	no
Degussa Color Trend 888	slight flocculation	no
Penn Color 36B17	no noticeable change	yes
Penn Color 37B497	clear syneresis	yes
Eagle WB197T	no noticeable change	yes
Eagle K97	no noticeable change	yes
Elementis Tint-Ayd NV-7317	cloudy syneresis	yes

**Colorant loading level: 14.74 lbs per 304.85 lbs EPOTUF 37-143**

**FORMULA #5: FILM FORMING CLEAR CONCRETE SEALER  
USING EPOTUF® 37-143 and EPOTUF® 37-685**

**COMPONENT A**

<u>Lbs.</u>	<u>Gals.</u>	<u>Material</u>
417.46	47.12	EPOTUF® 37-685
<u>20.87</u>	<u>2.78</u>	2-Butoxy Ethanol
<b>438.33</b>	<b>49.89</b>	<b>Total, Component A</b>

**COMPONENT B**

417.46	47.33	EPOTUF® 37-143
<u>20.87</u>	<u>2.78</u>	2-Butoxy Ethanol
<b>438.33</b>	<b>50.11</b>	<b>Total, Component B</b>

**876.66    100.00    COMPONENT A AND B TOTAL**

**ANALYSIS:**

60.8	Percent Solids, Weight
58.0	Percent Solids, Volume
8.8	Weight/Gallon, Pounds
0.86	VOC, Lbs/Gal
103.6	VOC, Grams/Liter
50:44	Mix Ratio, Stoichiometry by Weight

**FILM PROPERTIES:**

Gardner Dry Time on Glass, 2.3 mwft, hours	
Set-to-Touch	1.5
Through Dry	9.0
Hard Dry	11.0

*Typical sealer properties based on 7 day ambient cure 2 mil films on polished CRS (unless otherwise noted).*

**pH & Viscosity, Each Component & Mixed**

Component A	pH: 10.76	Viscosity: 60 cps
Component B	pH: 5.00	Viscosity: 222 cps
Mixed, Initial	pH: 10.55	Viscosity: 325 cps
Mixed, 2 hours	pH: 10.00	Viscosity: >1000 cps

Patti Pull Test Adhesion	>700psi on concrete
MEK double rubs	>250 on glass
Concrete Penetration	good
Wet Look	good, darkening & moderate gloss
Hot Tire Pickup Resistance	slight staining, washed off
Water immersion (Aluminum)	5/24 hour: no blush, whitening, softening or adhesion loss
24hour Water Spot	soaked into concrete (good water vapor transmission)

Chemical Resistance, 24 hour spot tests, 4 mil film over B1000 & Concrete: (5 = no effect, 1 = destroyed)

Brake Fluid	1.0	Transmission Fluid	2.0
Bleach	4.0	Skydrol LD-4	4.0
Gasoline	5.0	Water	3.0
10% HCl**	1.0	Windex	4.0
Motor Oil	5.0	WD-40	5.0

\*\*HCl exhibited efflorescence & whitening

**FORMULA #6: PENETRATING CLEAR CONCRETE SEALER  
USING EPOTUF® 37-143 and EPOTUF® 37-685**

**COMPONENT A**

<u>Lbs.</u>	<u>Gals.</u>	<u>Material</u>
98.92	11.16	EPOTUF® 37-685
4.95	0.66	2-Butoxy Ethanol
<u>225.84</u>	<u>27.08</u>	Deionized Water
<b>329.71</b>	<b>38.90</b>	<b>Total, Component A</b>

**COMPONENT B**

98.92	11.22	EPOTUF® 37-143
4.95	0.66	2-Butoxy Ethanol
<u>410.53</u>	<u>49.22</u>	Deionized Water
<b>514.40</b>	<b>61.10</b>	<b>Total, Component B</b>

**844.11   100.00   COMPONENT A AND B TOTAL**

**ANALYSIS:**

15.0	Percent Solids, Weight
13.8	Percent Solids, Volume
8.4	Weight/Gallon, Pounds
0.87	VOC, Lbs/Gal
103.7	VOC, Grams/Liter
50:25.6	Mix Ratio, Stoichiometry by Weight

**FILM PROPERTIES:**

Gardner Dry Time on Glass, 2.3 mwft, hours	
Set-to-Touch	1.5
Through Dry	6.0
Hard Dry	8.0

*Typical sealer properties based on 7 day ambient cure 2 mil films on polished CRS (unless otherwise noted).*

**pH & Viscosity, Each Component & Mixed**

Component A	pH: 10.79	Viscosity: 40 cps
Component B	pH: 4.10	Viscosity: 20 cps *
Mixed, Initial	pH: 10.80	Viscosity: 20 cps
Mixed, 2 hours	pH: 10.70	Viscosity: 25 cps

\*Slight soft settling of Component B

Patti Pull Test Adhesion	n/a (penetrated concrete)
MEK double rubs	7 on glass
Concrete Penetration	good
Wet Look	good, darkening & moderate gloss
Hot Tire Pickup Resistance	slight staining, washed off
Water immersion (Aluminum)	5/24 hour: no blush, whitening, softening or adhesion loss
24hour Water Spot	soaked into concrete (good water vapor transmission)

Chemical Resistance, 24 hour spot tests, 4 mil film over B1000 & Concrete: (5 = no effect, 1 = destroyed)

Brake Fluid	2.0	Transmission Fluid	4.0
Bleach	4.0	Skydrol LD-4	3.0
Gasoline	3.0	Water	4.0
10% HCl**	2.0	Windex	4.0
Motor Oil	3.0	WD-40	4.0

\*\*HCl exhibited efflorescence & whitening

**FORMULATING INFORMATION**

Addition of a polyamide such as EPOTUF® 37-620 or 37-640 can aid in pigment suspension and result in longer paint stability before settling occurs. This type of addition imparts a thixotropic character to the paint by swelling of the polyamide in water. Incorporating Chartwell's C-515.71/1.5H amino functional metal organic adhesion promoter along with a polyamide gives optimum in-can coating stability (see Formula 2 & 3).

Soft settling of either Part A or Part B is normal and can be easily redispersed with agitation.

Some solvent is needed for film coalescence. The choice and level of co-solvent can affect gloss, corrosion resistance, and dry times. Glycol ethers tend to give moderate to heavy viscosity increase but these types of water soluble solvents are preferred.

It is not recommended to use aliphatic solvents such as mineral spirits or aromatics such as xylene, as these are incompatible with water systems.

Water is the thinner of choice. Solvents will thicken the paint. Water and/or a water/MEK mix provides easy clean up.

For optimum performance in corrosion protection, an excess of epoxy to amine hydrogen equivalents is recommended. An epoxy to amine H equivalent ratio of 1.3 – 1.6 has been found to provide excellent performance in salt spray, prohesion, and humidity tests (see data in table below).

Sodium nitrate, a flash rust inhibitor, has not been tested in EPOTUF® 37-685. However, formulations based on 37-685 have not exhibited flash rusting in the laboratory.

Modified zinc phosphate salts (anticorrosive pigments) can have an adverse effect on adhesion when the film is exposed to humid conditions.

PVC at near critical (CPVC) has shown maximum performance in humid and corrosive environments.

Silanes can be added for maximum adhesion in heavy duty environments.

Stainless steel processing equipment is recommended to minimize metal ion contamination. Temperature should not exceed 120° F. It is recommended to use lower speeds (lower tip speeds) with high speed dispersers.

Pre-dispersed pigment concentrates are more compatible with EPOTUF® 37-143 than EPOTUF® 37-685 and therefore should be added to 37-143 side of the system for optimum stability (see Formula 4 for more details).

**Effect of Epoxy to Amine Ratio on Exposure Testing \***

Epoxy : Amine Ratio		1.1 : 1.0	1.3 : 1.0	1.6 : 1.0
Adhesion	<b>1000 Hours: Film Thickness = 5.5 mils</b>			
	Salt Spray, Scribe - Tape Pull	poor / 100% removal	fair / 70% removal	very good / 50% removal
	Salt Spray, Field - Crosshatch	poor / 0B / 100% removal	excellent / 5B / no removal	very good / 4B / 5% removal
	Prohesion, Scribe - Tape Pull	poor / 65% removal	excellent / no removal	excellent / no removal
	Prohesion, Field - Crosshatch	good / 2B / 35% removal	very good / 3B / 10% removal	very good / 4B / 5% removal
	<b>336 Hours: Film Thickness = 2.0 mils</b>			
	Humidity, Scribed After Exposure	poor	excellent	excellent
DI H <sub>2</sub> O Immersion, Scribed After Exposure	poor	excellent	excellent	
Blistering	<b>1000 Hours: Film Thickness = 5.5 mils</b>			
	Salt Spray, Scribe	3MD/4-6D 5mm	4F/5MD/6D 3.5mm	2-3F 3.5mm/6-7MD 3mm
	Salt Spray, Field	3F/4-6D	none	none
	Prohesion, Scribe	>2-6D/mil scale 9mm	3-7D/mil scale 5.5mm	3-7D/mil scale 4.5mm
	Prohesion, Field	8VF near scribe	8VF	none
	<b>336 Hours: Film Thickness = 2.0 mils</b>			
	Humidity	7-8D	none	none
DI H <sub>2</sub> O Immersion	7-8D	none	none	

\* 7 day ambient cure films on polished CRS