

SSPC: The Society for Protective Coatings

PAINT SPECIFICATION NO. 22

Epoxy Polyamide Paints (Primer, Intermediate, and Topcoat)

1. Scope

1.1 This specification covers three types of two-component epoxy polyamide coatings—primer, intermediate, and topcoat—for use on steel surfaces. The information described herein shall be used as a control for evaluation of proposed coating systems. See SSPC-PS 13.01, "Epoxy Polyamide Painting System," for specifications covering system requirements, including surface preparation, application, and thickness.

1.2 These coatings, when applied over properly prepared steel surfaces, are suitable for exposures in environmental zones 2A (frequently wet by fresh water), 2B (frequently wet by salt water), 3A (chemical, acidic), 3B (chemical, neutral), 3C (chemical, alkaline), 3D (chemical, solvents); but not for potable water tanks. They are intended for brush or spray application over steel prepared in accordance with SSPC-SP 6, "Commercial Blast Cleaning," or SSPC-SP 8, "Pickling." The performance will be improved by a better degree of surface preparation. They are suitable for shop, field, or maintenance coatings and are to be applied in accordance with SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel." If the primed part of the structure is to be exposed to the weather, it should be topcoated as soon as practical.

2. Description

2.1 The coatings supplied under this specification are two-part products composed of a base component and a curing agent component. When the two components are mixed in the proper proportions the coatings are capable of curing at temperatures as low as 50°F (10°C) and fully curing in seven days.

2.2 The primer contains approximately 65% by volume of nonvolatile film-forming solids (pigment and binder). The theoretical spreading rate for a 2.5 mil (63 micrometers) dry film thickness is 420 square feet/U.S. gallon (10.2 square meters/liter).

2.3 The intermediate contains approximately 65% by volume of nonvolatile film-forming solids (pigment and binder). The theoretical spreading rate for a 2.5 mil (64 micrometers) dry film thickness is 420 square feet/U.S. gallon (10.2 square meters/liter).

2.4 The topcoat contains approximately 60% by volume of nonvolatile film-forming solids (pigment and binder). The theoretical spreading rate for 2.5 mil (63 micrometers) dry film thickness is 380 square feet/U.S. gallon (9.5 square meters/liter).

3. Reference Standards

3.1 The standards referenced in this specification are listed in Sections 3.4 through 3.7 and form a part of this specification.

3.2 The latest issue, revision, or amendment of the referenced standards in effect on the date of invitation to bid shall govern unless otherwise specified.

3.3 If there is a conflict between the requirements of any of the cited reference standards and this specification, the requirements of this specification shall prevail.

3.4 SSPC STANDARDS AND JOINT STANDARDS:

PA 1	Shop, Field, and Maintenance Painting of Steel
PA 2	Measurement of Dry Coating Thickness With Magnetic Gages
SP 6/NACE No. 3	Commercial Blast Cleaning
SP 8	Pickling
SP 10/NACE No. 2	Near-White Blast Cleaning
PS 13.01	Epoxy Polyamide Painting System
VIS 2	Standard Method of Evaluating Degree of Rusting on Painted Steel Surfaces

3.5 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS:

B 117	Method of Salt Spray (Fog) Testing
D 209	Specification for Lampblack Pigment
D 263	Specification for Chrome Oxide Green Pigment
D 331	Specification for 2-Ethoxyethyl Acetate (95% Grade)
D 476	Specification for Titanium Dioxide Pigments
D 522	Test Methods for Mandrel Bend Test of Attached Organic Coatings

- D 562 Test Method for Consistency of Paints Using the Stormer Viscometer
- D 605 Specification for Magnesium Silicate Pigment (Talc)
- D 607 Specification for Wet Ground Mica Pigments
- D 610 Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
- D 714 Test Method for Evaluating Degree of Blistering of Paints
- D 1153 Specification for Methyl Isobutyl Ketone
- D 1210 Test Methods for Fineness of Dispersion of Pigment-Vehicle Systems
- D 1310 Test Method for Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
- D 1475 Test Method for Density of Paint, Varnish, Lacquer, and Related Products
- D 1544 Test Method for Color of Transparent Liquids by Bubble Time Method
- D 1640 Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
- D 1648 Specification for Basic Lead Silicochromate Pigment
- D 1652 Test Methods for Epoxy Content of Epoxy Resins
- D 1654 Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
- D 2369 Test Method for Volatile Content of Coatings
- D 3722 Specification for Natural Red and Brown Iron Oxide Pigments

3.6 FEDERAL STANDARDS:

- MIL-DTL-24441 Paint, Epoxy Polyamide, General Specification for

3.7 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARD:

- Z129.1 Hazardous Industrial Chemicals – Precautionary Labeling

4. Composition

4.1 Ingredients and proportions of the reference formulations shall be as specified in Table 1.

4.2 Each component of these paints based on the specified ingredients shall be uniform, stable in storage, and free from grit and coarse particles.

4.3 The base component of each coating shall contain an epoxy resin together with anti-corrosion pigments, color pigments, mineral fillers, gellant, leveling agent, and volatile solvents. The epoxy resin shall be a di-epoxide condensation product of biphenol A and epichlorohydrin with terminal epoxide group.

4.4 The curing agent component of each coating shall contain a liquid type polyamide resin and volatile solvent. The polyamide resin shall be a condensation product of dimerized fatty acids and polyamines.

4.5 Each coating shall conform to the composition (analysis) requirements of Table 2.

5. Properties

5.1 The epoxy resin shall meet the requirements of Table 3.

5.2 The undiluted polyamide resin shall meet the requirements of Table 4.

5.3 Coatings supplied under this specification shall be comparable in performance to the reference formulations of Table 1. They need not be composed of the quantities and types of ingredients given in Table 1. However, if substitutions of other ingredients are made, the coatings shall meet the performance requirements of this specification; and, when incorporated into a painting system, the performance requirements of SSPC-PS 13.01, "Epoxy Polyamide Painting System."

5.4 After combining the base and curing agent components, the primer, intermediate, and topcoat shall conform to the requirements of Table 5 and Sections 5.5 through 5.9.

5.5 **POT LIFE:** Determine pot life of the individual coatings as follows. Thoroughly mix a one-pint sample of the finished coating and let stand at 77 + 3°F (25 + 2°C) for eight hours. At the end of this time there shall be no evidence of gelation. The coatings shall be in a free-flowing condition and brushable without thinning. NOTE: When mixing larger volumes, more heat will develop with a resultant shortening of the pot life.

5.6 **SOLVENT RESISTANCE:** The development of solvent (methyl ethyl ketone) resistance is required as an indication of satisfactory cure and subsequent chemical resistance. Apply the individual coating (primer, intermediate, topcoat) by spray or brush to a clean test panel so that a dry film thickness of two to three mils (51-76 micrometers) per coat is obtained. Air dry the panel for five days at 77 ± 3°F (25 ± 2°C) and relative humidity of 40%- 50%. Following the curing period, saturate a small cottonball with methyl ethyl ketone and place on the test panel under a

TABLE 1
COMPOSITION OF REFERENCE FORMULATIONS

INGREDIENTS	PRIMER				INTERMEDIATE				TOPCOAT				STANDARDS ASTM
	Lb.	(kg)	Gals.	(L)	Lb.	(kg)	Gals.	(L)	Lb.	(kg)	Gals.	(L)	
BASE COMPONENT:													
Red Iron Oxide	17	(7.7)	0.46	(1.7)	68	(30.9)	1.83	(6.9)	—	—	—	(12.5)	D 3722
Rutile Titanium Dioxide	—	—	—	—	—	—	—	—	115	(52.2)	3.29	(5.5)	D 476
Magnesium Silicate	85	(38.6)	3.58	(13.6)	68	(30.9)	2.86	(10.8)	55	(25.0)	2.32	(8.8)	D 263
Mica	28	(12.7)	1.19	(4.5)	23	(10.4)	0.98	(3.7)	18	(8.2)	0.77	(2.9)	D 605
Lampblack	—	—	—	—	—	—	—	—	2	(0.9)	0.13	(0.5)	D 607
Organo Montmorillonite ¹	8	(3.6)	0.56	(2.1)	8	(3.6)	0.56	(2.1)	8	(3.6)	0.56	(2.1)	D 209
95/5 Methanol/Water	3	(1.4)	0.40	(1.5)	3	(1.4)	0.40	(1.5)	3	(1.4)	0.40	(1.5)	—
Epoxy Resin ²	199	(90.3)	20.10	(76.1)	201	(91.3)	20.30	(76.9)	212	(96.2)	21.41	(81.1)	—
Leveling Agent ³	10	(4.5)	1.18	(4.5)	10	(4.5)	1.18	(4.5)	11	(5.0)	1.29	(4.9)	—
Methyl Isobutyl Ketone	43	(19.5)	6.44	(24.4)	44	(20.0)	6.59	(25.0)	46	(20.9)	6.89	(26.1)	—
Xylene	125	(57.2)	17.36	(65.7)	150	(68.1)	20.64	(78.1)	111	(50.4)	15.28	(57.8)	D 1153
2-Ethoxy Ethanol	67	(30.4)	8.66	(32.8)	65	(29.5)	8.40	(31.8)	69	(31.3)	8.91	(33.7)	D 364
TOTALS (Base Component)	588	(266)	59.93	(226.9)	640	(290.6)	63.70	(241.3)	713	(324.7)	62.70	(237.4)	D 331
CURING AGENT COMPONENT:													
Polyamide Resin ⁴	107	(48.6)	13.20	(50.0)	108	(49.0)	13.33	(50.5)	114	(51.0)	14.07	(53.3)	—
Xylene	104	(47.2)	14.32	(54.2)	109	(49.5)	15.02	(56.7)	142	(64.5)	19.56	(74.0)	—
TOTALS (Curing Agent Comp.)	211	(95.8)	27.52	(104.2)	217	(98.5)	28.35	(107.2)	256	(116.3)	33.63	(127.3)	—
TOTALS (Formulation)	797	(361.7)	87.45	(331.0)	857	(389.1)	92.09	(348.5)	969	(440.0)	96.30	(364.7)	—

¹NL Industries Bentone 27 or equivalent

²Epon Resin 1001, Shell Chemical Company or equivalent

³Beetle 216-8, American Cyanamid Company or equivalent

⁴Versamid 115 (Henkel), Uni-Rez 2115 (Union Camp) or equivalent

TABLE 2
ANALYSIS

CHARACTERISTICS	PRIMER		INTERMEDIATE		TOPCOAT		STANDARDS ASTM
	Min.	Max.	Min.	Max.	Min.	Max.	
Nonvolatiles, % by weight	65	—	65	—	60	—	D 2369

TABLE 3
EPOXY RESIN ANALYSIS

CHARACTERISTICS	REQUIREMENTS		ASTM
	Min.	Max.	
Epoxide Equivalent	450	550	D 1652
Color, Gardner (40% in Butyl Carbitol)	—	4	D 1544

TABLE 4
POLYAMIDE RESIN ANALYSIS

CHARACTERISTICS	REQUIREMENTS		ASTM
	Min.	Max.	
Amine Value ¹	230	250	—
Color, Gardner	—	8	D 1544
Specific Gravity	0.96	0.98	D 1475
Viscosity, Brookfield, at 75°C, poises	31	37	—

¹Perchloric acid titration

watch glass for 30 minutes. After a ten-minute recovery period, determine the pencil hardness of the coating. The minimum allowable rating is "7B."

Determine pencil hardness as follows: Using a series of drawing leads (either wood clinched or secured in a mechanical holder), expose approximately 1/4" (6 mm) of lead. With a rotary motion square the point of the lead against No. 400 grit paper. Hold the lead at approximately 45° and push forward against the film using a pressure just short of breaking the lead. If penetration is not made, repeat using the next harder lead until penetration is made. Rate the film by indicating the hardest lead that does not penetrate.

5.7 TEST PANELS: Test panels shall be carbon steel—minimum size 4" x 8" x 1/8" (10.2 x 20.3 x 0.31 cm)—unless otherwise specified. They shall be blast cleaned in accordance with SSPC-SP 10, "Near-White Blast Cleaning." Air drying and test conditions shall be at 77 ± 3°F (25 ± 2°C), and 40%-50% relative humidity.

5.8 ELCOMETER ADHESION TEST: Prepare test panels as in Section 5.7 using 1/4" (6 mm) thick steel plate. Apply coatings at 2.0-3.0 mils (51-76 micrometers) dry film thickness per coat in accordance with the following schedule.

COATING	SUBSTRATE	DRYING TIMES
Primer	Steel	Five days
Intermediate	Primer	72 hours for primer 72 hours for intermediate
Topcoat	Primer and Intermediate	72 hours for primer 72 hours for intermediate 5 days for topcoat

The adhesion of the prime coat to the substrate, intercoat adhesion, or cohesion of any coat of the painting system shall be determined by the adhesion tester (1,000 pounds, 156 kg). Prepare test panels as described above. Lightly sand the coating surface and aluminum dolly, and apply a quick set adhesive containing alpha cyanoacrylate. Allow the adhesive to cure overnight. Scribe the coating and adhesive around the dolly prior to testing. Make a minimum of three trials and report the average. An average of 400 pounds per square inch (280,000 kg/square meter) is considered acceptable.

5.9 SALT SPRAY RESISTANCE (PRIMER ONLY): Prepare at least two test panels as in Section 5.7 and apply one prime coat at 2.5-3.0 mils (64 to 76 micrometers) dry film thickness. Air dry five days. Protect the backs and edges. Scribe the panels as per ASTM D 1654 to base metal and exposure for 500 hours at five percent salt spray in accordance with ASTM B 117. During the test, the panels shall be inclined at an angle of 15 degrees off the vertical.

At the end of the test period, the primer shall have a minimum rust grade rating of "8." Blistering shall be no more than Blister Size No. 4, few. Photographic standards SSPC-VIS 2, "Standard Method of Evaluating Degree of Rusting on Painted Steel Surfaces," or ASTM D 610 may be used for rusting, and ASTM D 714 may be used for blistering.

6. Labeling

6.1 Refer to ANSI Z129.1, "Hazardous Industrial Chemicals — Precautionary Labeling." Other guidelines can be found in the National Paint and Coating Association (NPCA) "Paint Industry Labeling Guide."

6.2 MARKING OF CONTAINERS: Each container of each component shall be legibly marked with the following information:

Name: Epoxy Polyamide Coating (Specify Which:
Primer, Intermediate, or Topcoat)
Specification: SSPC-Paint 22
Component:
Color:
Lot Number:
Stock Number:
Date of Manufacture:
Quantity of Paint in Container:
Information and Warnings as may be required by
Federal and State Laws:
Manufacturer's Name and Address:

6.3 DIRECTIONS FOR USE: The manufacturer shall supply complete instructions covering uses, surface preparation, mixing, thinning, application method, application conditions, pot life, wet and dry film thicknesses, temperature and humidity limitations, drying time, etc., with each container of paint.

6.4 The following are guidelines for the instructions required:

Mixing and Thinning: Each coating component should be stirred to a smooth homogenous mixture. Then the proper amount of base and curing agent components, as recommended by the manufacturer, should be added together and mixed thoroughly. After allowing to stand for 30 minutes at 77 ± 3 °F (25 ± 2°C), the coating may be thinned up to 12% by volume of the total coating for spraying. The coating should be applied within the manufacturer's pot life limitations.

Coating Thickness: The coatings are usually applied by spray to a dry film thickness of two to three mils (51-76 micrometers) per coat with total dry thickness seven to nine mils (178-229 micrometers), as measured in accordance with SSPC-PA 2, "Measurement of Dry Coating Thickness with Magnetic Gages."

**TABLE 5
 PROPERTIES**

CHARACTERISTICS	PRIMER		INTERMEDIATE		TOPCOAT		STANDARDS ASTM
	Min.	Max.	Min.	Max.	Min.	Max.	
Viscosity shear rate 200 rpm Kreb Units	65	85	60	80	60	80	D 562
Weight per U.S. Gallon, pounds (kg/L)	11.7 (1.4)	12.7 (1.5)	11.0 (1.3)	12.0 (1.4)	9.7 (1.2)	10.7 (1.3)	D 1475
Fineness of grind, Hegman units	3.0	—	3.0	—	3.0	—	D 1210
Drying time (75°F [25°C], 45% R.H.):							
Tack-free, hours	—	2	—	2	—	2	
Dry Hard, hours	—	5	—	5	—	5	
Dry Through, hours	—	8	—	8	—	8	
Flash Point, °F	81	—	81	—	81	—	D 1310

Cure Time Between Coats: Under normal conditions, each coat should be air dried a minimum of four hours, but no more than 72 hours between application coats. In very hot weather with surfaces exposed to direct sunlight, it may be necessary to limit the intercoat drying period to 24 hours or less. Long drying time between coats may cause poor intercoat adhesion. These coatings shall not be applied at temperatures below 50°F(10°C).

7. Inspection

7.1 All materials (coatings) supplied under this specification are subject to timely inspection by the purchaser or his authorized representative. The purchaser shall have the right to reject any materials supplied which are found to be defective under this specification. (See Note 9.1.) In case of dispute, unless otherwise specified, the arbitration or settlement procedure established in the procurement documents shall be followed. If no arbitration procedure is established, the procedure specified by the American Arbitration Association shall be used.

7.2 Samples of paints may be requested by the purchaser and shall be supplied upon request along with the manufacturer's name and identification for the materials. Samples may be requested at the time the purchase order is placed or may be taken from unopened containers at the job site.

7.3 Unless otherwise specified, the sampling shall be in accordance with ASTM D 3925.

8. Disclaimer

8.1 While every precaution is taken to ensure that all information furnished in SSPC standards and specifications is as accurate, complete, and useful as possible, SSPC cannot assume responsibility nor incur any obligation resulting from the use of any materials, coatings, or methods specified herein, or of the specification or standard itself.

8.2 This specification does not attempt to address problems concerning safety associated with its use. The user of this specification, as well as the user of all products or practices described herein, is responsible for instituting appropriate health and safety practices and for insuring compliance with all governmental regulations.

9. Notes

Notes are not requirements of this specification.

9.1 The procurement documents should establish the responsibility for samples, testing, and any required affidavit certifying full compliance with the specification.