

MATERIAL AND EQUIPMENT STANDARD
FOR
EPOXY POLYAMIDE PAINT
AS
TOP COAT (FINISH)

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1. SCOPE

This Standard Specification which is derived from SSPC Paint No. 22 covers the minimum requirements for the composition, analysis, properties, storage life and packaging, inspection and labeling of Epoxy Polyamide paint as top coat (finish).

2. SOURCES AND REFERENCES

2.1 Sources

In preparation of this Standard, in addition to the Referenced Codes and Standards mentioned in 2.2, the following standards and publications have also been considered:

BSI (BRITISH STANDARDS INSTITUTION)

BS381 C "Colors for Identification Coding and Special Purposes"

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-TP-100-92 "Paints"

2.2 References

Throughout this Standard the following standards and codes are referred to. The editions of these standards and codes that are in effect at the time of publication of this Standard shall, to the extent specified herein, form a part of this Standard. The applicability of changes in standards and codes that occur after the date of this Standard shall be mutually agreed upon by the Company and the Vendor.

SSPC (STEEL STRUCTURES PAINTING COUNCIL) Volume 2

SSPC No. 22 "Epoxy-Polyamide Paint (Primer-Intermediate, and Top coat"

SSPC-PA Guide 3 "A Guide to Safety in Paint Application"

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

Specification for Ingredients

D209	Lampblack
D263	Chrome Oxide Green
D331	2-Ethoxy Ethanol
D364	Industrial Grade Xylene
D476	Titanium Dioxide Pigments
D605	Magnesium Silicate Pigments
D607	Wet Ground Mica Pigment
D1153	Methyl Isobutyl Ketone
D1648	Basic Lead Silico Chromate

Specification for Packaging

D3951-88	Standard Practice for Commercial Packaging
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Test Methods For Properties

B117	Salt Spray (Fog) Testing
D522	Elongation of Attached Organic Coatings with Conical Mandrel Apparatus
D562	Consistency of Paints Using the Stormer Viscometer
D610	Evaluating Degree of Rusting on Painting Steel Surfaces
D714	Evaluating Degree of Blistering of Paints
D1210	Fineness of Dispersion of Pigment Vehicle Systems
D1310	Flash Point of Liquids by Tag Open Cup Apparatus
D1475	Density of Paint, Varnish, Lacquer, and Related Products
D1544	Color of Transparent Liquids (Gardner Color Scale)
D1640	Drying, Curing , or Film Formation of organic Coatings at Room Temperature
D1652	Epoxy Content of Epoxy Resins
D1654	Evaluating Painted or Coated Specimens Subjected to Corrosive Environments
D2369	Volatile Content of Paints

US FEDERAL STANDARDS

MIL-P-24441	Paint, Epoxy Polyamide, General Specification for
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ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE)

ANSI Z129.1	"Precautionary Labeling of Hazardous Industrial Chemicals"
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3. UNITS

International System of Units (SI) in accordance with IPS-E-GN-100 shall be used.

4. COMPOSITION**4.1 Ingredients and Proportions**

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

4.2 Percentage

4.2.1 This paint contains approximately 60% by volume of nonvolatile film forming solids (pigment and binder).

4.2.2 The curing agent component of the paint shall contain a liquid type polyamide resin and volatile solvent. The polyamide resin shall be a condensation product of dimerized fatty acids and polyamines.

4.2.3 The base component of the paint 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.

TABLE 1 - COMPOSITION OF REFERENCE FORMULATIONS

INGREDIENT		REQUIRED		STANDARDS ASTM
		Kg	Lit.	
BASE COMPONENT :				
BASIC LEAD SILICO CHROMATE		59	14.5	D1648
RUTILE TITANIUM DIOXIDE		52	12.5	D476
CHROMIUM OXIDE		29	5.5	D263
MAGNESIUM SILICATE		25	9	D605
MICA		8	3	D607
LAMPBLACK	1	0.5		D209
ORGANO MONTMORILLONITE		4	2	-
95/5 METHANOL / WATER	1.5	1.5		-
EPOXY RESIN		96	81	-
LEVELING AGENT		5	5	-
METHYL ISOBUTYL KETONE		21	26	D1153
XYLENE		50	58	D364
2-ETHOXY ETHANOL		31	34	D331
TOTALS (BASE COMPONENT)		382.5	252.5	
CURING AGENT COMPONENT :				
POLYAMIDE RESIN		52	53	-
XYLENE		62	74	-
TOTALS (CORING AGENT COMPONENT)		114	127	-
TOTALS (FORMULATION)	496.5	379.5		-

5. ANALYSIS

The paint shall conform to the composition (analysis) requirements of Table 2.

TABLE 2 - ANALYSIS

CHARACTERISTICS	REQUIREMENTS		STANDARDS ASTM METHOD
	Min.	Max.	
NONVOLATILES, % BY WEIGHT	60	-	D2369

TABLE 3 - PROPERTIES EPOXY RESIN

CHARACTERISTICS	REQUIREMENTS		ASTM METHOD
	Min.	Max.	
EPOXIDE EQUIVALENT	450	550	D1652
COLOR, GARDNER (40% in BUTYL CARBITOL	-	4	D1544

TABLE 4 - PROPERTIES POLYAMIDE RESIN

CHARACTERISTICS	REQUIREMENTS		ASTM
	Min.	Max.	
AMINE VALUE ¹	230	250	-
COLOR, GARDNER	-	8	D1544
SPECIFIC GRAVITY	0.96	0.98	D1475
VISCOSITY, BROOKFIELD, at 75°C, POISES	31	37	-
1 PERCHLORIC ACID TITRATION			

6. PROPERTIES

6.1 Requirements

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

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

6.1.3 The paint supplied under this specification shall be comparable in performance to the reference formulation of Table 1. It need not be composed of the quantities and type of ingredients given in Table 1. However, if substitutions of other ingredients are made, the paint shall meet the performance requirements of this specification, and when incorporated into a painting system.

6.1.4 Each component of this paint based on the specified ingredients shall be uniform, stable in storage, and free from grit and coarse particles.

6.1.5 After combining the base and curing agent components, the paint shall conform to the requirements of Table 5 and Section 5.2 through 5.6.

6.2 Color

The color shall be as specified in procurement documents with reference to Table 6.

6.3 Solvent Resistance

The development of solvent (methyl ethyl ketone) resistance is required as an indication of satisfactory cure and subsequent chemical resistance. Apply the paint by spray or brush to a clean test panel so that a dry film thickness of 50-75 microns per coat is obtained. Air dry the panel for five days at 25±2°C and relative humidity of 40%-50%. Following the curing period, saturate a small cotton ball with methyl ethyl ketone and place on the test panel under a 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 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.

6.4 Test Panels

Test panels shall be carbon steel minimum size 10.2 cm × 20.3 cm × 0.3 cm unless otherwise specified . They shall be blast cleaned to grade Sa2½ . Air drying and test conditions shall be at 25±2°C and 40%-50% relative humidity.

6.5 Elcometer Adhesion Test

Prepare test panels as in Section 6.4 using 6 mm thick steel plate . Apply the paint at 50-75 microns dry film thickness per coat in accordance with the following schedule.

COATING	SUBSTRATE	DRYING TIMES
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 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 28 kg/square centimeter is considered acceptable.

6.6 Pot Life

Determine pot life of the paint as follows. Thoroughly mix half a kilo sample of the finished coating and let stand at 25±2°C for eight hours. At the end of this time there shall be no evidence of gelation. The paint shall be in a free flowing condition and brushable without thinning.

TABLE 5 - PROPERTIES COMBINED PAINT

CHARACTERISTICS	TOPCOAT		STANDARD ASTM
	Min.	Max.	
PAINT CONSISTENCY VISCOSITY SHEAR RATE 200 rpm			
GRAMS	95	190	
KREB UNIT	60	80	D562
DENSITY kg/Lit	1.2	1.3	D1475
FINENESS OF GRIND, MICRON	65	-	D1210
" " HEGMAN UNITS	3.0	-	D1475
DRYING TIME (24°C, 45% R.H.)			D1640
TACK FREE, HOURS	-	2	
DRY HEAD, HOURS	-	5	
DRY THROUGH, HOURS	-	8	
FLASH POINT, °C	27	-	D1310

TABLE 6 - REFERENCE COLORS

PAINT COLOR	COLOR No. to BS 381 C	
ARCTIC BLUE		112
SEA GREEN		217
BRILLIANT GREEN		221
CANARY YELLOW		309
LIGHT STRAW		384
MIDDLE BROWN		411
SIGNAL RED	537	
LIGHT ORANGE		557
LIGHT GREY	631	

7. STORAGE LIFE AND PACKAGING

7.1 Condition in Container

The paint (both base component and curing agent) shall show no thickening, curding, gelling, or hard caking when tested as specified in US Federal Standard No. 141, method 3011 after storage for 24 months from date of delivery, in a full, tightly covered container, at a temperature of 10 - 43°C .

7.2 Packaging

The packaging shall meet the relevant requirement of ASTM D3951-88.

8. INSPECTION

8.1 All materials supplied under this specification shall be subject to timely inspection by the purchaser or his authorized representative. The purchaser shall have the right to reject any material(s) supplied which is (are) found to be defective under this specification. In case of dispute, the arbitration or settlement procedure established in the procurement documents shall be followed:

8.2 Samples of any or all ingredients used in the manufacture of this paint may be requested by the purchaser and shall be supplied upon request, along with the supplier's name and identification for the material.

8.3 Unless otherwise specified, the methods of sampling and testing should be in accordance with US Federal Test Method Standard No. 141, or applicable methods of the American Society for Testing and Materials (ASTM).

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

9. LABELING

9.1 Refer to ANSI Standard Z129.1 "Precautionary Labeling of Hazardous Industrial Chemicals".

9.2 Marking of Containers

Each container of each component shall be legibly marked with the following information:

Name: Epoxy-Polyamide Paint (Topcoat)

Specification: IPS-M-TP-225-92

MESC No. :

No of components

Maximum temperature resistance

Type of spray

Kind and size of spray nozzletip

Cleaning material

Flash point °C

Pot life (hours)

Drying time for overcoating

Kind of thinner

Color: (As specified in procurement documents according to Table 6 of this standard)

Lot Number:

Stock Number:

Date of Manufacture:
Quantity of Paint in Container:
Information and Warnings, if needed,
Manufacturer's Name and Address:
Design Guide: For guidance on the usage of this paint for various application/environment and temperature range reference shall be made to IPS-E-TP-100

9.3 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.

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 $25\pm 2^{\circ}\text{C}$ the paint may be thinned up to 12% by volume of the total paint for spraying. The paint should be applied within the manufacturer's pot life limitations.

- Coating Thickness

The paint is usually applied by spray to a dry film thickness of 50-75 microns per coat.

- 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 10°C .

9.4 Directions for Safety

The following directions for safety shall be supplied with each container of paint:

Paints are hazardous because of their flammability and potential toxicity. Proper safety precautions shall be observed to protect against these recognized hazards. Safe handling practices are required and should include, but not be limited to, the provisions of SSPC-PA Guide 3, "A Guide to Safety in paint Application" and to the following:

- Keep paints away from heat, sparks, and open flame during storage, mixing, and application. Provide sufficient ventilation to maintain vapor concentration at less than 25% of the lower explosive limit.
- Avoid prolonged or repeated breathing of vapors or spray mists, and prevent contact of the paint with the eyes or skin.
- Clean hands thoroughly after handling paints and before eating or smoking.
- Provide sufficient ventilation to insure that vapor concentrations do not exceed the published permissible exposure limits. When necessary, supply appropriate personal protective equipment and enforce its use.

- This paint may not comply with some air pollution regulations because of its hydrocarbon solvent content.
- Ingredients in this paint, which may pose a hazard include lead and chromate containing pigments, hydrocarbon solvents, and plasticizers. Applicable regulations governing safe handling practices shall apply to the use of this paint.
- During surface preparation that involves the removal of an old film of this paint, care shall be taken to minimize dusting, to protect workers from the dust, and to properly dispose of coating residues.