

**MATERIAL AND EQUIPMENT STANDARD**  
**FOR**  
**COAL TAR EPOXY POLYAMIDE PAINT**  
**AS**  
**PRIMER, INTERMEDIATE AND TOP COAT (FINISH)**

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## 1. SCOPE

This Standard specification which is generated from SSPC Paint No. 16 covers the minimum requirements for the composition, analysis, properties, storage life and packaging, inspection and labeling of coal tar epoxy-polyamide paint as primer, intermediate and top coat(finish).

## 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. 16	"Coal Tar Epoxy Polyamide Black (or Dark red) Paint"
SSPC-PA. Guide 3	"A Guide to Safety in Piant Application".
SSPC PA2	"Measurement of Dry Paint Thickness with Magnetic Gages"

### **ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)**

#### **(Specifications for Ingredients)**

D364	"Industrial Grade Xylene"
D605	"Magnesium Silicate Pigment"
D3721	"Synthetic Red Iron Oxide Pigment"

#### **(Specifications for Packaging)**

D3951(88)	"Standard Practice For Commercial Packaging"
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#### **(Test Methods for Properties)**

D4	"Bitumen Content"
D5	"Penetration of Bituminous Materials"
D20	"Distillation of Road Tars"
D36	"Softening Point of Bitumen (Ring and Ball Apparatus)"
D139	"Float Test for Bituminous Materials"
D609	"Preparation of Steel Panels for Testing Paint, Varnish, Lacquers, and Related Products"
D1296	"Odors of Volatile Solvents and Diluents"
D1475	"Density of paint, Varnish, Lacquer, and Related Products"
D1544	"Color of Transparent Liquids (Gardner Color Scale)"

D1652 "Epoxy Content of Epoxy Resins"

D2415 "Ash in Coal Tars and Pitches"

#### **UFS (US FEDERAL STANDARDS)**

##### **(Standard Specifications for Ingredients)**

DOD-P-23236 "Paint Coating Systems, Steel Ship Tank, Fuel and Salt Water Ballast"

##### **(Federal Test Method Standard No. 141)**

Method 2161 "Application of Film with Film Applicator (Magnetic Chuck)"

Method 3011 "Condition in Container"

#### **ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE)**

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

#### **IPS (IRANIAN PETROLEUM STANDARDS)**

E-TP-100 "Paints"

### **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 shall be as specified in Table 1 and in sections 4.2 through 4.8.

#### **4.2 Percentage**

This paint contains approximately 71% by volume of nonvolatile film-forming solids (pigment and binder).

**4.3** Coal tar pitch used in this paint is defined as a product obtained from the distillation of high temperature crude coke oven tar, which in itself is a product obtained during the destructive distillation of coal in slot ovens operated at a temperature above 700°C. The coal tar pitch shall be composed primarily of a complex combination of three or more membered condensed ring aromatic hydrocarbons.

**4.4** The epoxy resin shall be a di-epoxide condensation product of bisphenol-A and epichlorohydrin with terminal epoxide groups.

**4.5** The polyamide resin shall be a condensation product of a dimerized fatty acid in polyamines.

**4.6** Acceptable gelling agents are organic derivatives of magnesium montmorillonite and hydrogenated castor oil. Acceptable activators, if used, are methanol, ethanol, or propylene carbonate.

**4.7** The accelerator shall be 2, 4, 6-tri(dimethylaminomethyl) phenol.

#### **4.8 Other Properties**

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

**TABLE 1 - COMPOSITION**

INGREDIENT	TYPICAL COMPOSITION		INGREDIENT STANDARDS
	COMPONENTS A & B Wt. %	Vol. %	
COMPONENT A (82 ± 0.5 wt.%) (80 vol.%)			
COAL TAR PITCH	28.2	29.0	PARAGRAPHS 4.3 & 5.1.1
POLYAMIDE RESIN	9.5	12.4	PARAGRAPHS 4.5 & 5.1.2
MAGNESIUM SILICATE <sup>1</sup>	25.8	11.9	ASTM D 605
XYLENE <sup>2</sup>	15.4	22.9	ASTM D 364
GELLING AGENT AND ACTIVATOR	2.0	2.4	PARAGRAPH 4.6
ACCELERATOR	1.1	1.4	PARAGRAPH 4.7
COMPONENT A TOTALS	82.0	80.0	
COMPONENT B (18 ± 0.5 wt.%) (20 vol.%)			
LIQUID EPOXY RESIN	18.0	20.0	PARAGRAPHS 5.1.2 & 7.1
TOTALS (COMPONENTS A & B)	100	100	

1) When specified in the procurement documents, a dark red colored coating shall be furnished in which 50% or more (by volume) of the magnesium silicate is replaced by synthetic red iron conforming to ASTM Standard D3721. The red coating shall meet all of the black coating, except that the nonvolatile content of component A shall be an amount reflecting the greater specific gravity of the iron oxide pigment.

2) In those cases where the specified volatiles are not permitted, the volatile portion of the coal tar epoxy coating may be replaced with exempt materials to the extent necessary to assure compliance with the applicable regulations. The modified coating shall meet all of the test requirements specified herein except that determination of compliance with the nonvolatile weight content shall reflect any difference in specific gravity between xylene and the substituted solvents.

## 5. ANALYSIS

**5.1** The paint shall conform to the following composition (analysis) requirements:

**5.1.1** The coal tar pitch used shall meet the requirements for one of the types listed in Table 2.

**5.1.2** The epoxy resin shall be clear, free of turbidity, crystals, and particulate matter and shall meet the requirements of Table 3.

**5.1.3** The polyamide resin shall be clear, free of turbidity and particulate matter and shall meet the requirements of Table 4.

TABLE 2 - ANALYSIS OF COAL TAR PITCH

CHARACTERISTICS	REQUIREMENTS						ASTM METHOD
	TYPE 1		TYPE 2		TYPE 3		
	Min.	Max.	Min.	Max.	Min.	Max.	
FLOAT TEST AT 50° 50°C SECONDS	—	—	—	150	220	D 139	
SOFTENING POINT, IN WATER, DEGREES C	70	75	54	62	—	—	D 36
INSOLUBLES IN CARBON DISULFIDE, % BY WEIGHT	—	20	—	20	—	D 4	
ASH, % BY WEIGHT DISTILLATION DRY BASIS, % BY WEIGHT:	—	0.5	—	0.5	—	0.5	D 2415
0 - 170°C	—	—	—	—	—	0	—
0 - 250°C	—	0	—	0	—	—	—
0 - 270°C	—	—	—	—	6	—	—
0 - 300°C	—	5	—	5	—	15	—
SOFTENING POINT OF RESIDUE AT 300°C; IN WATER, °C	—	—	—	—	45	60	D 36

TABLE 3 - ANALYSIS EPOXY RESIN

CHARACTERISTICS	REQUIREMENTS		ASTM METHOD
	Min.	Max.	
EPOXIDE EQUIVALENT	180	200	D 1652
NONVOLATILE CONTENT (1-2 GRAMS AFTER 1 HOUR AT 105 ± 2°C), % BY WEIGHT	99	—	—
COLOR , GARDNER	—	5	D 1544
SPECIFIC GRAVITY	1.15	1.18	D 1475
VISCOSITY, BROOKFIELD, AT 25 °C, POISES	100	160	—

TABLE 4 - ANALYSIS POLYAMIDE RESIN

CHARACTERISTICS	REQUIREMENTS		ASTM METHOD
	Min.	Max.	
AMINE VALUE <sup>1</sup>	330	360	—
NONVOLATILE CONTENT (1-2 GRAMS) AFTER 1 HOUR (105 ± 2°C), % BY WEIGHT	97	—	—
COLOR, GARDNER	—	9	D 1544
SPECIFIC GRAVITY	0.96	0.98	D 1475
VISCOSITY, BROOKFIELD, AT 75°C, POISES	7	9	—

1) The amine value is defined as the milligrams of potassium hydroxide equivalent to the amine alkalinity present in a one gram sample. It is determined by a potentiometric titration with standard perchloric acid according to the following method:

- a) Weigh the approximate amount of well mixed resin to give a titration in the range of 12 to 18 ml into a tared 200 ml berzelius tall form beaker on an analytical balance. Cover the beaker with aluminum foil to minimize contact with air.
- b) From a graduated cylinder, carefully add 90 ml of solvent (Suitable solvents are nitrobenzene, propylene carbonate, or acetonitrile), insert a stirring bar, cover the beaker with aluminum foil, and stir on a magnetic stirrer to dissolve the sample. Add the solvent immediately after weighing the sample. A fume hood should be used for all operations.
- c) From a graduated cylinder, add 20 ml of glacial acetic acid to the sample solution and stir for several minutes.
- d) Immerse the electrodes into the sample solution, stir for two minutes and titrate potentiometrically with 0.1 N per-chloric acid using the millivolt scale. Record the millivolt readings every 0.1 ml Plot a graph showing the millivolts against the titration. The end-point is the midpoint of the inflection on the titration curve.
- e) Conduct a blank determination on 90 ml of the solvent and 20 ml of acetic acid. The blank need only be determined once for each lot of solvent used. On the majority of lots used, the blank has been found to be zero.
- f) Calculate the amine value using the following formula:

$$\text{AMINE VALUE} = \frac{(\text{Sample Titration} - \text{Solvent Blank}) \text{ Normality} \times 56.1}{\text{Weight of Sample}}$$

## 6. PROPERTIES

**6.1** The paint shall meet the requirements of tables 2,3 & 4 and sections 6.2 through 6.13.

**6.2** Component A of this paint (Table 1) shall meet the requirements of sections 6.3 through 6.6.

### 6.3 Odor

The odor shall be normal for the materials permitted (ASTM Standard D 1296).

### 6.4 Color

The color shall be black or dark red, as specified in the procurement documents.



**6.5** The viscosity of component A shall not exceed 160 poises when tested as follows:

Fill a container having a diameter and a height of not less than 7.6 cm and 9.5 cm respectively to a depth of not less than 7.6 cm (3") with a representative sample of component A. Set up a Model RVT or RVF-100 Brookfield Synchro-Electric Viscometer with a No. 7 spindle and with guard removed. Bring the sample to ( and thereafter maintain) a temperature of 25°C and stir vigorously for two minutes with steel spatula. Immediately after stirring, lower the viscometer until 1/2 of the "neck" mark on the spindle is covered. Run the viscometer at 100 rpm for one minute and take a reading of the position of the point on the dial.

If the dial reading is 40 or less, the viscosity shall be considered to be 160 poises or less. If the reading is over 40, immediately start the motor and take additional readings at one-minute intervals. If one or more readings of 40 or less are obtained out of ten readings, taken at one-minute intervals, the viscosity of the material shall be considered to be within specification limits.

**6.6** The nonvolatile content of component A shall not be less than 77% (by weight) when tested as follows:

Place a stirrer made of stiff wire into a small disposable aluminum dish of about 5 cm in diameter and weigh to the nearest 0.1 mg. As rapidly as possible, place between two and three grams of component A into the dish and weigh immediately to the nearest 0.1 mg. After weighing, spread the material over the bottom of the dish. Heat the dish, wire, and contents in a well ventilated convection-type oven maintained at 103-107°C for three hours.

After the material has been in the oven for a few minutes, and periodically thereafter, stir the material. Cool in a desiccator, weigh to the nearest 0.1 mg, and calculate the percentage of residue on a weight basis.

## **6.7 Physical Requirements of the Mixed Paint**

The mixed paint shall meet the requirements of sections 6.8 through 6.15.

### **6.8 Odor**

Shall be normal for the materials permitted (ASTM Standard D1296).

### **6.9 Color**

The color shall be black or dark red as specified in the procurement documents.

### **6.10 Sag**

The paint shall not sag when tested as follows:

Prepare approximately 500 ml of the material by thoroughly mixing 100 ml of component B into 400 ml of component A. Determine its viscosity immediately after mixing, using the same procedure outlined in section 6.7, but employing a No. 5 spindle. If all of five readings taken at one-minute intervals are above 50, reduce the viscosity by adding the thinner in small increments until a reading of not greater than 50 is obtained. Press a strip of 2.5 cm masking tape across the full width of a solvent cleaned 7.6 cm × 15.2 cm cold-rolled steel panel.

The tape shall be parallel to and centered on the shorter axis of the panel. Within five minutes after making the final check of viscosity, apply the material to the panel at a wet film thickness of at least 350 microns. The application may be made with a doctor blade having a gap of approximately 630 microns or by brush. Immediately after applying the material, carefully remove the masking tape and stand the panel in a vertical position (with the bare strip horizontal) in a draft-free, 24-27°C location.

Examine the panel after four hours. Sagging or running of the paint into the base area shall constitute failure of the material to pass the sag test. Save the mixed paint for the penetration and adhesion tests described in sections 6.11 and 6.12 respectively.

### 6.11 Penetration

The Paint shall pass the following test:

Select and solvent spray clean two 7.6 cm × 15.2 cm (3" × 6") coldrolled steel panels in accordance with ASTM Standard D 609. Draw down in accordance with US Federal Test Method No. 141, Method 2161 a coat of the paint mixed (including any thinning) for the sag test. Allow the film to dry 18 to 24 hours in a horizontal position at 60%. Apply a second coat over and at right angles to the first, using freshly mixed paint prepared identically to that used for the first coat. (Save both paints for preparing adhesion test panels). The drawdown applicator(s) shall be such as to provide a total dry film thickness of 510-635 microns, and the coats shall be of approximately equal thickness.

Allow the second coat to dry in a horizontal position at 24-27°C. After 120 hours of curing, clamp the panel onto the table of the penetrometer (ASTM Standard D5) so that the needle is over an area which is within the prescribed thickness range (as measured by SSPCPA 2, "Measurement of Dry Paint Thickness with Magnetic Gages"), and determine the penetration, using a total load of 200 grams applied for five seconds at 25°C. The average of the three lowest out of five penetration readings, all taken within a one centimeter square, shall not exceed 0.03 cm after 120 hours of curing.

### 6.12 Adhesion

The paint shall pass the following test:

Sand blast two steel panels (similar to those used in the penetration test) with a clean, 30 to 50 mesh nonmetallic abrasive until a uniform, gray-white surface, with well-developed anchor pattern is achieved.

Blow off dust with a clean air blast. Brush apply one coat each of the two test batches of paint used for the penetration test panels, allowing the first coat to dry 18 to 24 hours at 24-27°C before applying the second. Each coat shall be applied at a wet film thickness of 250 to 350 microns. After the final coat has cured for 120 hours at 24-27°C, test the adhesion of the paint to the metal with a sharp knife. It shall strongly resist being removed from the metal. Also test the intercoat adhesion by attempting to separate the coats with the knife. Any delamination of the two coats shall constitute failure.

### 6.13 Pot Life

The paint shall pass the following test:

Mix 100 ml of component B into 400 ml of component A, both of which have been brought to a temperature of 24-27°C before mixing. Pour the material at once into a liter tin can, seal tightly, and store at 24-27°C. Examine the material four hours after it was mixed. For its pot life to be considered satisfactorily, the mixed material shall remain in a fluid condition, and, when thinned with no more than 100 ml of xylene (or where required, the recommended thinner), shall be lump free and brushable.

## 7. STORAGE LIFE AND PACKAGING

### 7.1 Condition in Container

The paint (both base component and curing agent) shall show no thickening, crudling, gelling, or hard caking when tested as specified in US Federal Standard No. 141, Method 3011, after storage for 12 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 requirements of ASTM D 3951 (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. When samples are required they shall be requested within seven days of the placement of the order for the paint.

**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.

## 9. LABELING

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

**9.2** Unless otherwise specified in the procurement documents, 15 litres of component A shall be packaged in a standard 18.9 litres container with a lug type removable lid. component B shall be packaged to the full mark in a 3.8 liters can with friction lid.

### 9.3 Marking of Containers

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

**Name: Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint As Primer, Intermediate and ToP Coat (Finish)**

**Specification:IPS-M-TP-190 (0)**

**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: Black (or Dark Red)** .....

**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 (0).

### 9.4 Directions for Use

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

**Directions for Use of Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint**

This paint is intended for use both as a primer, intermediate and finish coat(s) over steel which has been blast cleaned or, blast cleaned and primed with a suitable inhibitive primer.

To Prepare the paint for application, add the entire contents of the epoxy resin (component B) container to the previously stirred contents of the related container of base (component A) and mix vigorously for at least two minutes with a power agitator equipped with a 7.6 cm or longer blade. Some thinning may be desirable for spray application. Use xylene or, where required, the recommended thinner and not more than 1.9 liters (one-half gallon) to 18.9 liters batch should be added. Apply the paint as soon after mixing as practicable since the material will thicken substantially over a two-hour period and may set up in the paint tank within two to four hours during very warm weather unless cooled prior to or after mixing.

This paint is usually applied by spray in two coats to a dry film thickness of 400 microns at its thinnest spots. This requires a spreading rate of 1.5 square meters per liter of unthinned paint. In actual practice, upwards of 300 microns wet paint will probably be required for each 200 micron coat to obtain the desired minimum thickness. The drying time between coats under normal coating conditions shall not exceed 72 hours. Long drying times between coats may cause poor intercoat adhesion, and it is advisable in warm weather to reduce the maximum interval between coats. Under conditions of hot weather or direct sunlight, it may be necessary to limit the intercoat drying period to 24 hours or less.

Abusive handling of precoated steel may cause damage to the coating. This is more noticeable at low temperatures or after extended periods of cure.

This paint may be applied to large surfaces by high pressure airless spray. For application to complex surfaces, use heavy-duty conventional air atomization spray equipment.

If the application is by brush, apply with a stiff brush heavily loaded with paint; apply quickly and smoothly, and avoid excessive brushing.

Do not apply this coating when the receiving surfaces or the ambient temperatures are below 10°C, unless it can reasonably be anticipated that the average ambient temperature will be 10°C or higher for the five-day period subsequent to the application of any coat. At temperatures between 10° and 15°C allow the mixed paint to stand at least 30 minutes prior to application.

Clean all equipment immediately after use with a suitable solvent. Such cleaning solvents as high-flash aromatic naphtha, xylene, or toluene are satisfactory for clean-up, but can be improved by adding 10-20% of methyl isobutyl ketone and 10% isopropyl or normal butyl alcohol.

## 9.5 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 epoxy resin, polyamide resins, hydrocarbon solvent, and coal tars. This paint may contain low concentrations (less than 1% by weight) of materials that are suspected carcinogens. 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.