

**MATERIAL AND EQUIPMENT STANDARD**  
**FOR**  
**ZINC-RICH EPOXY PAINT (ORGANIC ZINC-RICH)**  
**AS**  
**PRIMER, INTERMEDIATE**  
**AND**  
**TOP COAT (FINISH)**

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**1. SCOPE**

This is Standard specification which is generated from SSPC-20 covers the minimum requirements for the composition, analysis, properties, storage life and packaging, inspection and labeling of zinc rich epoxy paint ( organic zinc-rich) to be used as primer, intermediate and top coat. The top coat color should be specified in the procurement documents.

**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) VOL. 2**

- SSPC 20 "Zinc-Rich Primers (Organic Zinc Rich)"
- SSPC-PA Guide 3 "A Guide to Safety in Paint Application"

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

**(Specification for Ingredients)**

- D520 "Zinc Dust (Metallic Zinc Powder)"

**(Test Methods for Properties)**

- A36 "Structural Steel"
- B117 "Salt Spray (Fog) Testing"
- D56 "Flash Point by Tag Closed Tester"
- D185 "Coarse Particles in Pigments, Pastes, and Paints"
- D521 "Chemical Analysis of Zinc Dust (Metallic Zinc Powder)"
- D562 "Consistency of Paints Using the Stormer Viscometer"
- D1200 "Viscosity of Paints, Varnishes, and Lacquers by Ford Viscosity Cup"
- D1308 "Effect of Household Chemicals on Clear and Pigmented Organic Finishes"
- D1475 "Density of Paint, Varnish, Lacquer, and Related Products"
- D1544 "Color of Transparent liquids (Gardner Color Scale)"
- D2369 "Volatile Content of Paints"
- D2371 "Pigment Content of Solvent-Type Paints"
- D3359 "Measuring Adhesion by Tape Test"

**UFS (US FEDERAL STANDARDS)****(Standard Specification)**

PPP-P-1892 "Paint, Varnish, Lacquer And Related Materials, Packaging And Marketing Of"

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

Method 4331 "Spraying Properties"

Method 4541 "Working Properties and Appearance of Dried Film"

**ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE)**

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

**BSI (BRITISH STANDARD INSTITUTION)**

BS381C "Colors for Identification on Coding and Special Purposes"

**IPS (IRANIAN PETROLEUM STANDARDS)**

IPS-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 of paint shall be as specified in Table 1 and Sections 4.2 through 4.6.

**4.2 Percentage**

The paint consists of 70% by weight of nonvolatile film forming solids (pigments and binder).

**4.3** The zinc rich described in this specification consists of zinc dust, an organic vehicle, and selected additives as required.

**4.4 Pigmentation**

The major pigment component in paint is zinc dust of either types described in Table 2.

Other pigment components may include curing aids, tinting colors, suspension and pot life control agents, but should constitute only a minor part of the total pigment portion so as not to detract from the ability of this paint to protect galvanically.

**4.5 Vehicle**

Organic vehicle consist of catalyzed epoxy. The epoxy resin shall be a di-epoxide condensation product of biphenol A and epichlorohydrin with terminal epoxide group with the requirements of Table 3.

**4.6 Curing Agent Component**

The curing agent consist of a liquid type polyamide resin and volatile solvent.

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

**TABLE 1 - COMPOSITION OF PAINT**

INGREDIENTS	COMPOSITION Wt. %	INGREDIENT STANDARDS
PIGMENT ( 83 ±2 Wt. %) 58		ASTM D520
VEHICLE ( 17 ±2 Wt. %) 12		---
SOLVENT 30		---
SELECTED ADDITIVES AS REQUIRED		---

**TABLE 2 - COMPOSITION OF PIGMENT**

	TYPE I	TYPE II
TOTAL ZINC CALCULATED AS Zn, Min. %	97.5	98.0
METALLIC ZINC, Min. %	94.0	94.0
MATERIAL OTHER THAN METALLIC ZINC		
ZnO, AND ADMIXED CaO, WHERE APPLICABLE		
Max. %	0.75	---
CALCIUM, CALCULATED AS CaO, Max. %	0.7	0.7
LEAD, CALCULATED AS Pb, Max. %	---	0.01
IRON, CALCULATED AS Fe, Max. %	---	0.02
CADMIUM, CALCULATED AS Cd, Max. %	---	0.01
CHLORINE, CALCULATED AS Cl, Max. %	---	0.01
SULFUR, CALCULATED AS SO <sub>2</sub> , Max. %	---	0.01
MOISTURE AND OTHER VOLATILE MATTERS, Max. %		
	0.10	0.10
OILY OR FATTY MATTER, OR BOTH, Max. %	---	0.05
ZINC OXIDE (ZnO), Max. %	6.0	remainder
COARSE PARTICLES Max. %:		
TOTAL RESIDUE RETAINED ON 150 µm STANDARD SIEVE OPENING (SIEVE No. 100)		
	NONE	0.1
TOTAL RESIDUE RETAINED ON 75 µm STANDARD SIEVE OPENING (SIEVE No. 200)		
	---	0.8
TOTAL RESIDUE RETAINED ON A 45 µm (SIEVE No. 325) STANDARD SIEVE OPENING		
	4.0	3.0

**TABLE 3 - EPOXY RESINE ANALYSIS**

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

**TABLE 4 - CURING AGENT ANALYSIS**

CHARACTERISTICS	REQUIREMENTS		ASTM METHOD
	Min.	Max.	
AMINE VALUE <sup>1</sup>	230	250	---
COLOR GARDNER	---	8	D1544
SPECIFIC GRAVITY	0.96	0.98	D1475
VISCOSITY, AT 75° C POISES,	31	37	---

1 PERCHLORIC ACID TITRATION

## 5. ANALYSIS

5.1 The paint shall conform to the composition (analysis) requirements of Table 5.

**TABLE 5 - ANALYSIS**

CHARACTERISTICS <sup>1</sup>	MINIMUM REQUIREMENTS	STANDARDS ASTM
TOTAL SOLIDS, % BY WEIGHT OF PAINT	70	D2369
PIGMENT, % BY WEIGHT OF TOTAL SOLIDS	83	D2371
TOTAL ZINC DUST <sup>2</sup> , % BY WEIGHT OF PIGMENT	93	D521
TOTAL ZINC DUST <sup>2</sup> , % BY WEIGHT OF SOLIDS	77	---

1) The minimum composition requirements of zinc-rich paint is controversial. It is recognized that zinc rich primer containing extenders, although having less total zinc dust than specified, may be able to pass all other requirements of this specification. However, these compositional requirements are necessary, as certain non-zinc containing coating may be able to pass all other requirements of this specification.

2) Zinc dust shall meet requirements for composition of pigment (Table 2).

## 6. PROPERTIES

6.1 The paint shall meet the qualitative requirements of Sections 6.2 through 6.9.

## 6.2 Pot Life

The pot life of the zinc-rich paint, when mixed and ready for application in accordance with manufacturer's instructions, shall be a minimum of four hours at 21°C and 50% relative humidity. Although physical properties (viscosity, etc.) may not change, loss of pot life is indicated by lack of adhesion when tested in accordance with Section 6.6.

## 6.3 Working Properties

The mixed paint shall spray easily, and show no streaking, running, sagging, or other objectionable features when tested in accordance with US Federal Standard No. 141, Methods 4331, and 4541.

## 6.4 Test Panel Preparation

Steel test panels (ASTM-A 36 hot rolled steel or equivalent) measuring 10 cm × 15 cm × 1.5 mm, or greater, shall be blast cleaned to Sa3 (white metal) with a nominal anchor profile from 40-90 microns and coated with the zinc-rich paint. The panels shall be blast cleaned and coated on both sides and all edges. The paint shall be spray applied and hardened in accordance with manufacturer's recommendations. The dry film thickness shall be 60-90 microns unless otherwise designated. Prior to any exposure testing, all panels shall be aged for 14 days at 24-26°C and 45-55% relative humidity.

## 6.5 Mudcracking

The paint when applied in accordance with Section 6.4 to a 125-150 microns dry film thickness, shall show no mudcracking when viewed under 10X magnifications.

## 6.6 Adhesion

The paint when applied and hardened in accordance with Section 6.4, shall adhere to the steel substrate when subjected to the "Cross-Cut/Tape Test" (ASTM-D3359, Method B).

There shall be no separation of the paint film, or delamination of an entire square. Spalling loss of adhesion around the perimeter due to cutting of each square is acceptable.

Adhesion rating should be no less than 4B grading when evaluated according to the procedure of ASTM-D 3359, Method B.

## 6.7 Salt Fog Resistance

The paint when applied and hardened in accordance with Section 6.4 and scribed as described below, shall pass, 1,000 hours minimum exposure to salt fog (ASTM-B 117) without any blistering or rusting of the coated portion, with no under cutting from the scribe (Slight rusting in the scribe mark will be permissible and resulting staining should be ignored). Strips 6 mm wide along the edges of the panel may be ignored. Testing shall be done in triplicate.

The scribe mark shall be centrally positioned in the lower half of the panel and shall consist of an "X" comprising the diagonals of a 5 × 5 cm square. To insure proper positioning, cleanliness and depth of scribe mark, a template and scriber or cutting tool having a cutting edge at least 0.8 mm wide shall be used. The operator shall bear down hard and go over each arm of the cut twice to insure a clean scribe of sufficient depth to remove any zinc particles from the scribe and to expose clean steel.

## 6.8 Additional Resistance Tests

Because of the diversity of potential service environments, this specification may require the zinc-rich paint be further exposed and qualified by at least one additional test relating to the intended exposure. For example, if the intended serv-

ices is a petroleum tanker cargo hold which is ballasted with sea water, appropriate test requirements other than those already specified might be:

- Salt Water Immersion (1,000 hours) ASTM-D 1308.
- Oil Immersion (1,000 hours ) ASTM-D 1308 or a cycling combination of both.

Comparative testing of all candidate zinc-rich paints will be more meaningful than individual testing of each primer.

Standard test which may be useful for further qualification are available from a number of organizations, including ASTM, US Government Federal Specifications (TT-P, mil-P, etc.), US Federal Test Method Standards (141), and Canadian Government Specifications Board.

However, it should be emphasized that a well designed non standard test may often provide more meaningful information for a given service condition than one or more standard tests.

## 6.9 Flash Point

The minimum flash point, as determined by the Tag closed cup (ASTM D56) should be 10°C. Specific applications, such as the interior of tanks, holds, and other confined spaces normally require a minimum flash point of 38°C.

## 7. STORAGE LIFE AND PACKAGING

### 7.1 Storage Life

The vehicle of the paint shall show no thickening, curdling, gelling, gassing, or hard caking after being stored for 24 months from the date of delivery in a tightly covered unopened container.

### 7.2 Packaging

The pigment portion of multicomponent zinc-rich paints shall be packaged separately to be mixed with the liquid portion shortly before use. Each container of liquid shall be packaged and labeled in accordance with the requirements of Federal Specification PPP-P-1892 and shall include directions showing correct proportions of liquid to pigment along with necessary mixing instructions. The packaging of single component zinc-rich paints, Types I and II, shall also comply with the above Federal Specification.

## 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 materials.

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

## 9. LABELING

**9.1** Refer to ANSI Standard Z 129.1" Precautionary Labeling of Hazardous Industrial Chemicals".

### 9.2 Marking of Container

Each container shall be legibly marked with the following information:

- Name: Zinc Rich Epoxy Paint (Organic Zinc-Rich) as Primer, Intermediate and Top coat (Finish)**
- Specification: IPS-M-TP-205**
- 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: With reference to BS381C No. (to be specified by specifier)**
- 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 ranges reference shall be made to IPS-E-TP-100 1369(0)**

### 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 times, etc. with each container of paint.

### 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 followings:
- 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, if so formulated, and which may pose a hazard include lead and chromate-containing pigments and hydrocarbon solvents. Applicable regulations governing safe handling practices shall apply to the use of this paint.