MATERIAL AND EQUIPMENT STANDARD

FOR

ZINC SILICATE (INORGANIC ZINC-RICH) PAINT

AS

PRIMER, INTERMEDIATE AND TOP COAT

ORIGINAL EDITION

MAY 1993

This standard specification is reviewed and updated by the relevant technical committee on Nov. 1998. The approved modifications are included in the present issue of IPS.

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1. SCOPE

This Standard Specification which is derived mainly from SSPC Paint 20, covers the minimum requirements for the composition, analysis, properties, storage life, packaging, inspection and labeling of Zinc silicate Paint (Inorganic Zinc-Rich).

Note:

This standard specification is reviewed and updated by the relevant technical committee on Nov. 1998. The approved modifications by T.C. were sent to IPS users as amendment No. 1 by circular No. 54 on Nov. 1998. These modifications are included in the present issue of IPS.

2. REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

SSPC (STEEL STRUCTURES PAINTING COUNCIL VOLUME 2)

SSPC20	"Zinc-Rich Primers (Inorganic Zinc-Rich)"
SSPC-PA Guide 3	"A Guide to Safety in Paint Application"
SSPC To Vision 1	“Guide to visual standard N0.1 “Nov. 1982

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

"Specification for Ingredients"

D520	"Zinc Dust (Metallic Zinc Powder)"

"Test Methods for Properties"

B117	"Salt Spray (Fog) Testing"
D56	"Flash Point by Tag Closed Tester"
D521	"Chemical Analysis of Zinc Dust (Metallic Zinc Powder)"
D1308	"Effect of Household Chemicals on Clear and Pigmented Organic Finishes"
D1475	"Density of Paint, Varnish, Lacquer, and Related Products"
D2369	"Volatile Content of Paints"
D2371	"Pigment Content of Solvent-Type Paints"
D3359	"Measuring Adhesion by Tape Test"

"Specification for Packaging"

D3951	"Standard Practice for Commercial Packaging"

BSI (BRITHISH STANDARDS INSTITUTION)

BS 381 C "Colors for identification, coding and special purposes"

USFS (US FEDERAL STANDARDS)

"Standard Specification"

PPP-P-1892 "Paint, Varnish, Lacquer, and Related Materials, Packaging and Marking Of."

"US 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"

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-GN-100 "Units"

IPS-E-TP-100 "Paints"

SIS (SWEDISH STANDARD)

SIS 05-5900 "Pictorial standards"

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 Sections 4.2 through 4.5.

4.2 Percentage

This paint consists of 78% by weight of non volatile film forming solids (pigment and binder).

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

4.4 The major pigment component in this 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

Inorganic self curing vehicles with reducible, include soluble alkali metal silicates, quarternary ammonium silicates, phosphates and modifications thereof.

TABLE 1 - COMPOSITION

INGREDIENTS	COMPOSITION Wt. %	INGREDIENT STANDARDS
PIGMENT	66	ASTM D520
VEHICLE	12	--
SOLVENT	22	--
SELECTED ADDITIVES	AS REQUIRED	--

TABLE 2 - REQUIREMENTS FOR COMPOSITION OF ZINC DUST

	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
RON, CALCULATED AS Fe, max.%	--	0.02
CADMIUM, CALCULATED AS Cd, max.%	--	0.01
CHLORINE, CALCULATED AS Cl, max.%	--	0.01
SULFUR, CALCULATED AS So_2, max.%	--	0.01
MOISTURE AND OTHER VOLATILE MATTER, 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 0.150 mm STANDARD SIEVE OPENING (No. 100)	NONE	0.1
TOTAL RESIDUE RETAINED ON 0.075 mm STANDARD SIEVE OPENING (No. 200)	--	0.8
TOTAL RESIDUE RETAINED ON 0.075 mm STANDARD SIEVE OPENING (No. 325)	4.0	3.0

5. ANALYSIS

The paint shall conform to the composition (analysis) requirements of Table 3. This table defines the minimum compositional requirements of the zinc rich paint without specifying the vehicle.

TABLE 3 - REQUIREMENTS

CHARACTERISTICS	MINIMUM REQUIREMENTS[1]	STANDARD ASTM
TOTAL SOLID, % BY WEIGHT OF PAINT	78	D2369
PIGMENT, % BY WEIGHT OF TOTAL SOLIDS	85	D2371
TOTAL ZINC DUST [2], % BY WEIGHT OF PIGMENT	87	D521
TOTAL ZINC DUST [2], % BY WEIGHT OF TOTAL SOLIDS	74	--

1) The minimum composition requirements of a zinc rich paint is controversial. It is recognized that zinc rich paints 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 coatings may also be able to pass all other requirements of this specification.

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

6. PROPERTIES

6.1 Requirements

The paint shall meet the qualitative requirements of Section 6.2 through 6.10.

6.2 The ready mixed paint shall be capable of being broken up with a paddle to smooth, uniform consistency and shall not liver, thicken, curdle, gel, or hard settle, nor show any other objectionable properties in a mixed, freshly opened container.

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 white metal blast cleaned (Sa3) 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 recommendation. 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-D 3359, Method B)".

There shall be no separation of the paint film, or delamination of an entire square. Spilling 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 coating, when applied and hardened in accordance with Section 6.4 and scribed as described below, shall pass 1,00 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 Flash Point

The minimum flash point, as determined by the Tag Closed Cup (ASTM D56) should be none.

6.9 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 service 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 paint.

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

6.10 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.

7. STORAGE LIFE AND PACKAGING

7.1 Storage Life

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

7.2 Packaging

The packaging shall meet the requirements 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 Sample 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 stables the responsibility for samples, testing, and any required affidavit certifying full compliance with the specification.

9. LABELING

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

9.2 Marking of Container

Name: Zinc Silicate (Inorganic Zinc-Rich) paint

Specification: IPS-M-TP-210 .....

MESC No. : .....

No. of components .....

Maximum temperature resistance .....

Type of spray .....

Kind and size of spray nozzle tip .....

Cleaning material .....

Flash point °C .....

Pot life (hours) .....

Drying time for overcoating .....

Kind of thinner .....

Color: ..... BS 381C .....

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, applications 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 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 and 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.