MATERIAL AND EQUIPMENT STANDARD

FOR

(ZINC SILICATE) INORGANIC ZINC-RICH PAINT

AS PRIMER

ORIGINAL EDITION

MAY 1993

This standard specification is reviewed and updated by the relevant technical committee on Nov. 1998(1) and Oct. 2014(2). The approved modifications are included in the present issue of IPS.

FOREWORD

The Iranian Petroleum Standards (IPS) reflect the views of the Iranian Ministry of Petroleum and are intended for use in the oil and gas production facilities, oil refineries, chemical and petrochemical plants, gas handling and processing installations and other such facilities.

IPS is based on internationally acceptable standards and includes selections from the items stipulated in the referenced standards. They are also supplemented by additional requirements and/or modifications based on the experience acquired by the Iranian Petroleum Industry and the local market availability. The options which are not specified in the text of the standards are itemized in data sheet/s, so that, the user can select his appropriate preferences therein

The IPS standards are therefore expected to be sufficiently flexible so that the users can adapt these standards to their requirements. However, they may not cover every requirement of each project. For such cases, an addendum to IPS Standard shall be prepared by the user which elaborates the particular requirements of the user. This addendum together with the relevant IPS shall form the job specification for the specific project or work.

The IPS is reviewed and up-dated approximately every five years. Each standards are subject to amendment or withdrawal, if required, thus the latest edition of IPS shall be applicable

The users of IPS are therefore requested to send their views and comments, including any addendum prepared for particular cases to the following address. These comments and recommendations will be reviewed by the relevant technical committee and in case of approval will be incorporated in the next revision of the standard.

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GENERAL DEFINITIONS:

Throughout this Standard the following definitions shall apply.

COMPANY:

Refers to one of the related and/or affiliated companies of the Iranian Ministry of Petroleum such as National Iranian Oil Company, National Iranian Gas Company, National Petrochemical Company and National Iranian Oil Refinery And Distribution Company.

PURCHASER:

Means the “Company” where this standard is a part of direct purchaser order by the “Company”, and the “Contractor” where this Standard is a part of contract documents.

VENDOR AND SUPPLIER:

Refers to firm or person who will supply and/or fabricate the equipment or material.

CONTRACTOR:

Refers to the persons, firm or company whose tender has been accepted by the company.

EXECUTOR:

Executor is the party which carries out all or part of construction and/or commissioning for the project.

INSPECTOR:

The Inspector referred to in this Standard is a person/persons or a body appointed in writing by the company for the inspection of fabrication and installation work.

SHALL:

Is used where a provision is mandatory.

SHOULD:

Is used where a provision is advisory only.

WILL:

Is normally used in connection with the action by the “Company” rather than by a contractor, supplier or vendor.

MAY:

Is used where a provision is completely discretionary.

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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 Inorganic Zinc-Rich (Zinc silicate Paint).

Note 1:

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.

Note 2:

This standard specification is reviewed and updated by the relevant technical committee on Oct. 2014. The approved modifications by T.C. were sent to IPS users as amendment No. 2 by circular No. 440 on Oct. 2014. 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 Pigment"

"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 Liquid Coatings, Inks, and Related Products"
D2369	"Volatile Content of Coatings"
D2371	"Pigment Content of Solvent- Reducible 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 Z400.1 /Z129.1 "Hazard Evaluation and Safety Data Sheet and Precautionary Labeling Preparation"

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-GN-100 "Engineering Standard for Units"

IPS-E-TP-100 "Engineering Standard for Paints"

ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)

8501-1 "Rust Grades and Preparation Grades of Uncoated Steel Substrates and of Steel Substrates after Overall Removal of Previous Coatings"

3. UNITS

This Standard Is Based On International System Of Units (SI), as Per IPS-E-GN-100 Except Where Otherwise Specified.

4. COMPOSITION

4.1 Ingredients and Proportions

Ingredients and proportions shall be as specified in Sections 4.2 through 4.5.

4.2 Components

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

4.3 Zinc Dust Level Classification

The conation shall be classified according to the level of zinc dust by weight present in the dried film as follows:

Level 1 – equal to or greater than 85%

Level 2 – equal to or greater than 77% and less then 85%

Level 3 – equal to or greater than 65% and less then 77%

4.4 The major pigment component in this paint is zinc dust of either types described in Tablet.

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 galvanic ally.

4.5 Vehicle

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

TABLE 1 - REQUIREMENTS FOR COMPOSITION OF ZINC DUST

	TYPE I	TYPE II	TYPE III
Total zinc, calculated as Zn, min.,%	97.5	98.0	99.0
Metallic zinc, min.%	94.0	94.0	96.0
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	0.002
Iron, calculated as Fe, max.%	--	0.02	0.002
Cadmium, calculated as Cd, max.%	--	0.01	0.001
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	0.10
Oily or fatty matter, or both, max.%	--	0.05	--
Zinc oxide (ZnO), max.%	6.0	remainder	remainder
Coarse particles, max.% Total residue retained on 0.150 µm Standard sieve opening (No. 100) sieve	none	0.1	0.1
Total residue retained on 0.075 µm Standard sieve opening (No. 200) sieve	--	0.8	0.8
Total residue retained on 0.075 µm Standard sieve opening (No. 325) sieve	4.0	3.0	0.3

Note: if Type 1 Zinc is used, it is possible to the permissible exposure limit (PEL) For Lead When The products are removed by abrasive blasting.

TABLE 2 - 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] Zinc dust shall be level 1 or 2 According to see 4.3 depended on environment and purchaser requirement.

[2] Zinc dust shall meet the requirements for composition of pigment (Table 1).

5. ANALYSIS

The paint shall conform to the composition (analysis) requirements of Table 3. This table defines the typical compositional requirements of the zinc rich paint.

TABLE 3 - ANALYSIS

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

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 Mud cracking

The paint when applied in accordance with Section 6.4 to a 125-150 microns dry film thickness, shall show no mud cracking 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 3000 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

Neither the vehicle of the multi component coating nor the ready-mixed coating shall show thickening that is detrimental to performance or application properties. The components or coating shall exhibit no curdling, gelling, gassing, or hard caking after being stored unmixed for a minimum of months from date of delivery in tightly sealed, unopened container at a temperature of 10 to 32°C.

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 over coating .....

Kind of thinner .....

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

Lot Number: ……...

Stock Number: .....

Date of Manufacture: .....

Quantity of Paint in Container: .....

MSDS: ……..

INSPECTION DATE: .....

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.