MATERIAL AND EQUIPMENT STANDARD

FOR

EPOXY POLYAMIDE PAINT AS INTERMEDIATE PAINT

ORIGINAL EDITION

MAY 1993

This standard specification is reviewed and updated by the relevant technical committee on Nov. 1998(1) and Aug. 2012(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 are based on internationally acceptable standards and include 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 document.

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 22" covers the minimum requirements for the composition analysis, properties, storage life and packaging, inspection and labeling of two- component epoxy polyamide intermediate paint.

This coating, when applied over properly prepared steel surfaces, are suitable for exposures in environmental zones 2A (frequently wet by fresh water), 2B (frequently wet by salt water), 3A (chemical, acidic), 3B (chemical, neutral), 3C (chemical, alkaline), 3D (chemical, solvents); but not for potable water tanks. They are intended for brush or spray application over steel prepared in accordance with SSPC-SP 6, “Commercial Blast Cleaning,” or SSPC-SP 8, “Pickling.”. They are suitable for shop, field, or maintenance coatings and are to be applied in accordance with SSPC-PA 1, “Shop, Field, and Maintenance Painting of Steel.”

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. 56 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 Aug. 2012. The approved modifications by T.C. were sent to IPS users as amendment No. 2 by circular No. 352 on Aug. 2012. 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)

SSPC 22	“Epoxy-Polyamide Paints (Primer, Intermediate and Topcoat)”
SSPC-PA Guide 3	“A Guide to safety in paint application”.
SSPC to vis. 2	“Guide and Reference Photographs for Evaluating Degree of Rusting on Painted Steel Surfaces”
SSPC-PA 1	“Shop, Field and maintenance Painting of Steel”
SSPC-PA 2	“Measurement of Dry Coating Thickness with Magnetic Gage”
SP6/NACE No. 3	“Commercial Blast Cleaning”
SP8	“Pickling”
SP10/NACE No. 2	“Near- White Blast Cleaning”

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

"Specification for Ingredients"

D331	“2-Ethoxy Ethanol”
D364	“Industrial Grade Xylene”
D605	“Magnesium Silicate Pigments”
D607	“Wet Ground Mica Pigment”
D1153	“Methyl Isobutyl Ketone”
D3722	“Natural Red and Brown Iron Oxides”

"Specification for Packaging "

D3951	“Standard Practice for commercial packaging”

"Test Methods for Properties"

D562	“Standard Test Method for Consistency of Paints Measuring Krebs Unit (UK) Viscosity using a Stormer-Type Viscometer”
D1210	“Standard Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage”
D1310	“Flash Point of Liquids by Tag Open Cup Apparatus”
D1475	“Standard Test Method for Density of Liquid Coating, Inks 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”
D2369	“Volatile Content of Paints”
D4541	“Standard Test Method for Pull-Off Strength of Coating (Adhesion Test)
D3925	“Practice for Sampling Liquid Paints and Related Pigmented Coatings”
D2369	“Standard Test Method for Volatile Content of Coatings”

ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE)

ANSI Z400.1/Z129.1	"Hazard Evaluating and Safety Datasheet and Precautionary Labeling Preparation"

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-GN-100	“Engineering Standard for Units”
IPS-E-TP-100	“Engineering Standard for Paints"

3. UNITS

This Standard is based on International System of Units (SI), as per IPS-E-GN-100 except where otherwise specified.

4. COMPOSITION

The coatings supplied under this specification are two-part products composed of a base component and a curing agent component. When the two components are mixed in the proper proportions the coatings are capable of curing at temperatures as low as 50°F (10°C) and fully curing in seven days.
The intermediate contains approximately 65% by volume of nonvolatile film-forming solids (pigment and binder). The theoretical spreading rate for a 2.5 mil (64 micrometers) dry film thickness is 420 square feet/U.S. gallon (10.2 square meters/liter).

4.1 Ingredients and Proportions

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

4.2 Percentage

The intermediate contains approximately 65% by volume of nonvolatile film forming solids (pigment and binder).

4.3 The curing agent component of each coating shall contain a liquid type polyamide resin and volatile solvent. The polyamide resin shall be a condensation product of dimerized fatty acids and polyamines.

TABLE 1 - COMPOSITION OF REFERENCE FORMULATIONS

INGREDIENTS	INTERMEDIATE Kg	Lit.	STANDARD ASTM
BASE COMPONENT :			
Red Iron Oxide	30.9	6.9	D3722
Rutile Titanium Dioxide	-	-	D476
Magnesium Silicate	30.9	10.8	D263
Mica	10.4	3.7	D605
Lampblack	-	-	D607
Organo Montmorillonite[1]	3.6	2.1	D209
95/5 Methanol / Water	1.4	1.5	-
Epoxy Resin[2]	91.3	76.9	-
Leveling Agent[3]	4.5	4.5	-
Methyl Isobutyl Ketone	20	25	-
Xylene	68.1	78.1	D1153
2-Ethoxy Ethanol	29.5	31.8	D364
TOTALS (Base Component)	290.6	241.3	D331
CURING AGENT COMPONENT:			
Polyamide Resin [4]	49.0	50.5	-
Xylene	49.5	56.7	-
TOTALS (Curing Agent Component)	98.5	107.2	-
TOTALS (Formulation)	389.1	348.5	-

[1] NL Industries Bentone 27 or equivalent
[2] Epon Resin 1001, Shell Chemical Company or equivalent
[3] Beetle 216-8, American Cyanamid Company or equivalent

[4] Versamid 115 (Henkel), Uni-Rez 2115 (Union Camp) or equivalent

5. ANALYSIS

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

TABLE 2 – ANALYSIS

CHARACTERISTICS	REQUIREMENTS Min.	Max.	STANDARD ASTM
Nonvolatiles, % BY Weight	60	-	D2369

TABLE 3 - EPOXY RESIN ANALYSIS

CHARACTERISTICS	REQUIREMENTS Min.	Max.	ASTM METHOD
Epoxide Equivalent	450	550	D1652
Color, Gardner (40% in BUTYL Carbitol)	-	4	D1544

TABLE 4 - POLYAMIDE RESIN ANALYSIS

CHARACTERISTICS	REQUIREMENTS Min.	Max.	ASTM
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 The epoxy resin shall meet the requirements clauses 6.2 through 6.9.

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

6.3 Coatings supplied under this specification shall be comparable in performance to the reference formulations of Table 1. They need not be composed of the quantities and types of ingredients given in Table 1. However, if substitutions of other ingredients are made,the coatings shall meet the performance requirements of this specification

6.4 After combining the base and curing agent components, intermediate, and shall conform to the requirements of Table 5.

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

6.6 Solvent Resistance

The development of solvent (Methyl Ethyl Ketone) resistance is required as an indication of satisfactory cure and subsequent chemical resistance. Apply the individual coating (intermediate) 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.

6.7 Test Panels

Test panels shall be carbon steel minimum size 10 cm × 20 cm × 0.3 cm unless otherwise specified. They shall be blast cleaned in accordance with SSPC-SP10. Air drying and test conditions shall be at 25±2°C and 40%-50% relative humidity.

6.8 Elcometer Adhesion Test

Prepare test panels as in Section 6.7 using 6 mm thick steel plate. Apply coatings at 50-75 microns dry film thickness per coat in accordance with the following schedule and notes.

COATING	SUBSTRATE	DRYING TIMES
*Primer	Steel	5 days
Intermediate	Primer	72 hours for primer
		72 hours for intermediate
**Topcoat	Primer and	72 hours for primer
	Intermediate	72 hours for intermediate
		5 days for topcoat

The adhesion of the prime coat to the substrate, inter coat 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. (refer to ASTM D4541)

6.9 Pot Life

Determine pot life of the intermediate coatings as follows or specified by manufacturer and then approved by end users: Thoroughly mix half a kilogram sample of the finished coating and let stand at 25±2°C for 8 hours. At the end of this time there shall be no evidence of gelation. The coatings shall be in a free flowing condition and brushable without thinning.

TABLE 5 - PROPERTIES

CHARACTERISTICS	INTERMEDIATE Min.	Max.	STANDARD ASTM
Paint Consistency Viscosity			D562
Shear Rate 200 rpm			
Krebs Unit	60	89	
Density kg/Lit	1.3	1.4	D1475
Fineness Of Grind, Micron	65	-	D1210
Drying Time			
(25°C, 45% R.H.)			
Tack Free, Hours	-	2	
Dry Hard, Hours	-	5	
Dry Through, Hours	-	8	
Flash Point, °C	27.2	-	D1310

7. STORAGE LIFE AND PACKAGING

7.1 Packaging

The packaging shall meet relevant requirement of ASTM D 3951.

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 materials(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 shall be in accordance with ASTM D3925.

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 Z400.1/Z129.1 "Hazard Evaluation and Safety Datasheet and Precautionary Labeling Preparation"

9.2 Marking of Containers

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

Name: Epoxy Polyamide, Intermediate

Specification: IPS-M-TP-220

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: .....

Lot Number: .....

Stock Number: .....

Date of Manufacture: .....

Storage Temperature……

Shelf Life……

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

10. 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 followings are guidelines for the instructions required:

- Mixing and Thinning

The paint component should be stirred to a smooth homogeneous 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±2°C,coating the paint may be thinned up to 12% by volume of the total coating for spraying. The paint should be applied within the manufacturer's pot life limitations.

- Paint Thickness

The paint are usually applied by brush or spray to a dry film thickness of 50-75 microns. As measured in accordance with SSPC-PA2, measurement of dry coating with magnetic gage.

- 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 inter coat drying period to 24 hours or less. Long drying time between

coats may cause poor inter coat adhesion. These coatings shall not be applied at temperatures below 10°C

11. 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 breating 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.