MATERIAL AND EQUIPMENT STANDARD

FOR

WASH PRIMER

(BASIC ZINC CHROMATE-VINYL BUTYRAL)

ORIGINAL EDITION

MAY 1993

This standard specification is reviewed and updated by the relevant technical committee on Nov. 1998(1) and June 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.

Standards and Research department

No.17, Street14, North kheradmand

Karimkhan Avenue, Tehran, Iran .

Postal Code- 1585886851

Tel: 88810459-60 & 66153055

Fax: 88810462

Email: Standards@ nioc.ir

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 generated mainly from MIL-P 15328 D and SSPC-Paint No.27 covers the minimum requirements for the composition, analysis, properties, storage life and packaging, inspection and labeling of wash primer (Basic Zinc Chromate-Vinyl Butyral Wash Primer).

This specification covers a two-component basic zinc chromate-vinyl butyral wash primer for structural steel surfaces prior to painting.

It is intended that this coating be used primarily on clean steel free of rust and scale or on clean galvanized metal cleaned according to SSPC-SP1, "Solvent Cleaning"; but it may be used, when specified, on steel with very slight amounts of rust. It is to be applied by brush or spray in accordance with SSPC-PA1, "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. 57 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 June 2012. The approved modifications by T.C. were sent to IPS users as amendment No. 2 by circular No. 344 on June 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 VOLUME 2)

SSPC-Paint No.27	"Basic Zinc Chromate-Vinyl Butyral Wash Primer"
SSPC-PA Guide 3	"A Guide to Safety in Paint Application"
SSPC-PA1	"Shop, Field and Maintenance Painting of Steel"
SSPC-SP1	"Solvent Cleaning"

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

(Specification for Ingredients)

D209	"Standard Specification for Lampblack Pigments"

(Specification for Packaging)

D3951	"Standard Practice for Commercial Packaging"

D3925	"Practice for Sampling Liquid Paints and Related Pigmented Coating"

(Test methods for Properties)

D185	"Standard Test Method for Coarse Particles in Pigments"
D562	"Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer"
D1210	"Fineness of Dispersion of Pigment"
D1296	"Odors of Volatile Solvents and Diluents"
D1475	"Standard Test Method for Density of Liquid Coatings, Inks and Related Products"
D2369	"Standard Test Method for Volatile Contents of Coatings"

UFS (US FEDERAL STANDARD)

(Standard Specifications for Ingredients)

0-0-670	"Orthophosphoric (Phosphoric) Acid, Technical"
TT-B-845	"Butyl Alcohol, Normal (for use in Organic Coatings)"
TT-I-735	"Isopropyl Alcohol"

(US Federal Test Method Standard No. 141)

Method 2011	"Preparation of Steel Panels"
Method 3011	"Condition in Container"
Method 4092	"Course Particles and Skins"
Method 4053	"Nonvolatile Vehicle Content"
Method 4203	"Reducibility and Dilution Stability"
Method 4061	"Drying Time"
Method 6304	"Knife Test"

(Military Specifications)

MIL-P-15173	"Pigment, Magnesium Silicate, Dry (Paint Pigment)"

(US Federal Standard DOD-P-15328)

MIL-P-15328 D	"Primer (Wash) Pretreatment (Formula No.117 for Metals) (Metric)"

ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE)

ANSI Z400.1/Z 129.1	"Hazer Evaluation and Safety data sheet and Precautionary Labeling Preparation"

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-TP-100	"Engineering Standards for Paints"
IPS-E-GN-100	"Engineering Standards for Units"

3. UNITS

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

4. DESCRIPTION

Basic Zinc chromate-vinyl butyral wash primer is a pretreatment for metals which reacts with the metal and at the same time forms a protective vinyl film which coating is supplied as two components which are mixed together just prior to use. The base contains an alcohol solution of polyvinyl butyral resin pigmented with basic zinc chromate. The diluent contains an alcohol solution of phosphoric acid which reacts with the vinyl resin, the pigment, and the steel. Details of the composition are given in Federal Specification DOD-P-15328.

This primer contains approximately 10% by volume of nonvolatile film-forming solids (pigment and binder). The theoretical spreading rate for a 0.5 mil (13 micrometers) dry film thickness is 320 square feet/U.S. gallon (7.9 square meters/liter). Actual spreading rates can be significantly lower.

5. COMPOSITION

5.1 Ingredients and Proportions

Ingredients and proportions shall be as specified in Table 1.

5.2 Percentage

This primer contains approximately 10% by volume of nonvolatile film forming solids (pigment and binder).

TABLE 1 – COMPOSITION

INGREDIENTS PER 378.5 Lit. PAINT	TYPICAL COMPOSITION Kg	Lit.	INGREDIENT STANDARDS ASTM	US FEDERAL	MILITARY SPEC.
INGREDIENTS OF RESIN COMPONENT (303 LIT.)[1]					
POLYVINYL-BUTYRAL RESIN[2]	25.455	23.089			
ZINC CHROMATE (INSOLUBLE TYPE)[3]	24.545	6.435			
MAGNESIUM SILICATE (TYPE A OR B)	3.636	1.287			MIL-P-15173
LAMPBLACK	0.273	0.151	D209		
BUTYL ALCOHOL, NORMAL	56.818	69.947		TT-B-846	
ISOPROPYL ALCOHOL	160.455	203.633		TT-I-735	
WATER	6.818	6.813			
INGREDIENTS OF ACID COMPONENT 77.5 LIT					
PHOSPHORIC ACID (CLASS 1)	12.727	7.57		0.0-670	
WATER	11.364	11.355			
ISOPROPYL ALCOHOL:	45.0	56.775		TT-I-735	

1 The formula of the base is given slightly in excess of 303 liters to allow for normal manufacturing loss.

2 The resin shall be polyvinyl, partial butyral resin containing only polyvinyl butyral, polyvinyl alcohol, and polyvinyl acetate in the molecule.

The resin shall contain 18.0 to 20.0 percent vinyl alcohol and not more than 1.0 percent of vinyl acetate. A 6 percent solution of the resin in methanol shall have a viscosity of 12 to 18 centipoises at 20°C. The specific gravity (25°/25°C) of the resin shall be 1.05 to 1.15.

3 The zinc chromate shall be of an insoluble type, showing an analysis of 16 to 19 percent Cr_2O_3, 67 to 72 percent ZnO, and not more than 1 percent water soluble salts.

6. ANALYSIS

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

TABLE 2 – ANALYSIS

CHARACTERISTICS	REQUIREMENTS Min.	Max.	ASTM METHOD	US FEDERAL STD. No. 141	MILITARY SPEC.
CHARACTERISTICS OF RESIN COMPONENT: PIGMENT, PERCENT BY WEIGHT OF RESIN COMPONENT:	9.5	11.0			DOD-P15328
VOLATILES, PERCENT BY WEIGHT OF RESIN COMPONENT:	79.0	81.5	D2369		---
NONVOLATILE VEHICLE, PERCENT BY WEIGHT OF RESIN COMPONENT (CALCULATED BY DIFFERENCE)	8.5	10.0		4053	
RATIO OF PIGMENT TO NONVOLATILE VEHICLE BY WEIGHT	1.07	1.15	---	---	DOD-P-15828
COARSE PARTICLES AND SKINS, AS RESIDUE RETAINED ON 0.045 mm SIEVE OPENING (STANDARD No. 325 MESH SCREEN), PERCENT BY WEIGHT OF RESIN COMPONENT:	---	0.2	D185	4092	
CHROMIUM TRIOXIDE (Cr_2O_3), PERCENT BY WEIGHT OF PIGMENT	13.5	---	---		DOD-P-15328
ZINC OXIDE (ZnO) PERCENT BY WEIGHT OF PIGMENT	57.9	---	---		MIL-P 15328 D

(to be continued)

TABLE 2 - ANALYSIS (continued)

CHARACTERISTICS	REQUIREMENTS Min.	Max.	ASTM METHOD	US FEDERAL STD. No. 141	MILITARY SPEC.
DISTILLATION OF 100 g OF THINNER OBTAINED FROM RESIN					MIL-P 15328 D
COMPONENT: INITIAL BOILING POINT, °C	79	82	---	---	MIL-P 15328 D
TEMPERATURE AT 80 cm3. POINT, °C		85			
TEMPERATURE AT 105 cm^3, POINT, °C	116	83			
END POINT, TEMPERATURE °C		120			
VOLUME AT END POINT, cm^3	125	102			
CHARACTERISTICS OF ACID COMPONENT:					MIL-P 15328 D
PHOSPHORIC ACID, PERCENT BY WEIGHT OF ACID COMPONENT:	15.0	16.5	---	---	MIL-P 15328 D
DISTILLATION OF 150 g OF ACID COMPONENT:					
INITIAL BOILING POINT, °C	75	82	---	---	
TEMPERATURE AT 105 cm^3. POINT, °C	---	84			
VOLUME AT END POINT, cm^3. 105	---				
MAXIMUM TEMP. DURING DISTILLATION °C	---	192			

Notes:

The solvent portion of the formulation shall conform to requirements herein specified.

a) Aromatic compounds with eight or more carbon atoms to the molecule, except ethylbenzene (total aromatics less ethylbenzene) shall not exceed 1 percent by volume.

b) The ethylbenzene content of the solvent shall not exceed 1 percent by volume. Compounds with olefinic or cycloolefinic unsaturation shall result in a negative test.

c) Ketones shall not exceed 1 percent by volume.

7. PROPERTIES

The primer shall meet the requirements of Table 3 and Sections 6.1 through 6.8.

7.1 Odor

The odor of the resin component and of the acid component shall be normal for the volatiles permitted when tested in accordance with ASTM D1296.

7.2 Color

The color of primer after drying shall be characteristic of the pigments specified (see table 1). The color of the primer normally approximates color No. 34096 or color No. 34098 of FED-STD-595. On occasion it may be as light as color No. 34151 of FED-STD-595.

7.3 Water in Resin Component

Water shall be added to the resin component during manufacture in the exact amount specified (see Table 1). The finished resin component shall give a negative test for the presence of excess water when tested as specified in 6.3.1.

7.3.1 The presence of excess water in the resin component shall be determined by the following laboratory test on the thinner removed from the resin component by distillation. Upon completing the distillation, mix well and remove 10.0 cm^3 portion to a 100 cm^3 glass-stoppered graduated cylinder. Add 90 cm^3 of chemically pure (c.p) benzene and shake well.

Formation of cloudy solution indicates the presence of excess water. Thinner removed from properly prepared resin component should give a clear solution when tested as specified.

7.4 Butanol

The presence of butanol shall be determined on the fraction of the distillate from the resin component which distills at 117°C to 119°C. This material shall have a refractive index of 1.395 to 1.398 at 25°C. When 5 m L of this material is placed in a 100 m L glass stoppered graduated cylinder with 60 m L of distilled water and shaken, a clear homogeneous solution shall be formed.

7.5 Knife Test

A film of mixed paint, tested as specified in 6.5.1, shall be hard and tough and shall adhere tightly to the metal panel, It shall be difficult to furrow off with the knife and shall not flake, chip, or powder. The knife cut shall show beveled edges.

7.5.1 Mix the coating as specified in 6.7.1. except omit the standing period, Using a 0.0076-cm (0.0152-cm gap clearance) film applicator, draw down 5.08-cm wide film of the mixed coating on aluminum, steel and galvanized steel panels, solvent cleaned as specified in method 2011 of FED-Std-141, using the petroleum naptha ethylene glycol monoethyl ether mixture. Air dry for 1 hour under referee conditions, then perform a knife test as specified in method 6304 of FED-Std-141 and observe for compliance with 6.5.

7.6 Compatibility

There shall be no evidence of incompatibility of any of the ingredient of the mixed coating when tested as specified in 6.6.1.

7.6.1 Compatibility with thinner shall be determined in accordance with method 4203 of FED-Std-141 Fifty cm^3 of mixed primer and 50 cm^3 of isopropyl alcohol conforming to TT-I-735 shall be used. The isopropyl alcohol shall be added slowly to the minutes after mixing.

7.7 Mixing and Application Properties

When tested as specified in 6.7.1 the acid and resin components shall form a smooth and uniform mixture and shall show no signs of thickening of gelatin when examined 24 hours after mixing. The components shall mix readily at any temperature between 4°C and 32°C and shall be suitable for spray application within that temperature range.

7.7.1 Add slowly one part by volume of acid component, with rapid stirring, to four parts by volume of resin component. Store in a closed glass container for 6 hours. Then spray a portion of the mixed material on a solvent cleaned steel panel to a dry film thickness of 0.00076 cm to 0.00127 cm and examine for leveling and evenness of application. Retain the remainder of the mixed material in the closed glass container for 18 additional hours and examine for absence of nonuniformity by appropriate sections of method 3011 of FED-Std-141.

7.8 Surface Appearance and Workmanship

A flow-out film of the mixed primer prepared as in 6.8.1, after drying on glass for 24 hours, shall exhibit a surface smooth in appearance and free of defects such as pinholes, coarse particles, skins or agglomerates of any kind.

7.8.1 Prepare a flow-out film of the primer by pouring approximately 15 cm3 of the mixed primer across a glass panel near the upper edge while the panel is lying flat. Then tilt the panel so as to allow the coating to spread over all but the upper edge next place the panel in an almost vertical position and allow to drain. After 24 hours, examine the film for compliance with 6.8. Coarse particles, skins and agglomerates are characterized by being larger than the dispersed pigment in particle size extending beyond the plane of the film.

TABLE 3 – PROPERTIES

	REQUIREMENTS			
CHARACTERISTICS	**Min.**	**Max.**	**ASTM METHOD**	**US FEDERAL STD. No. 141**
RESIN:				
VISCOSITY SHEAR RATE 200 RPM				
GRAM	110	165		
KREB UNITS	63	75	D562	
DENSITY Kg/LIT.	0.88	0.93	D1475	
FINENESS OF GRIND (MICRONS)	25	---	D1210	
ACID:				
DENSITY	0.90	0.93	D1475	
PRIMER:				
DRY HARD, MINUTES	---	30		4061*

*** Drying time shall be determined by method 4061 of FED-Std-141, except that the primer shall be drawn down on a steel panel using a firm applicator that will deposit a dry film thickness of 7.6 Mic centimeters (cm) to 12.7 Mic. The specified conditions of temperature and humidity shall apply only for referee tests in case of dispute. All other tests shall be conducted under prevailing laboratory conditions.**

8. STORAGE LIFE AND PACKAGING

8.1 Condition in Container

This primer shall supply in two components. The resin component shall be capable of being remixed to a smooth, uniform consistency. It shall not liver, shall not exceed 85 kerbs units in viscosity, and shall not exceed 1-hour dry hard time (for pretreatment primer). It shall not curdle, gel, or show any other objectionable properties for at least 12 months after date of delivery.

8.2 Packaging

The packaging shall meet the relevant requirement of ASTM D3951 (88).

9. INSPECTION

9.1 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.

9.2 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.

9.3 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 D 3925).

10. LABELING

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

10.2 Marking of Containers

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

Name: Wash Primer (Basic Zinc Chromate-Vinyl Butyral)
Specification: IPS-M-TP-180
MESC No.: .....
No. of components: ....
Component: Resin Component or (acid component): .....
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: .....
Lot Number: .....
Stock Number: .....
Date of Manufacture: .....
Storage Temperature: .....
Shelf Life: .....
Quantity of Paint in Container: .....
Information and Warning, (if necessary): .....
Manufacturer's Name and Address: .....
Design Guide: For guidance on the usage of this paint for various applications/environments and temperature range reference shall be made to IPS-E-TP-100.

11. DIRECTIONS FOR USE

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

Directions for Use of Wash Primer (Basic Zinc Chromate -Vinyl Butyral)

This primer is intended to be used primarily on clean steel free of rust and scale or on clean galvanized metal.

Four volumes of resin component shall be mixed with one volume of acid component just prior to use as follows:

First, break up the pigment settled in the resin component with a wooden paddle, mechanical stirrer, or mixer, and mix to distribute the pigment evenly throughout the resin. After the resin component is thoroughly mixed, slowly pour one volume of the diluent into four volumes of the resin component with constant agitation. Do not pour off the liquid which has separated from the pigment and then add the acid component to the settled pigment to aid mixing. Material which is not mixed properly may gel and be unfit for use.

The resin component shall be mixed with the acid component in quantities which will be applied within six to eight hours after mixing. Primer that cannot be used within a maximum of eight hours after mixing with acid component shall be discarded and not used. Screen paint before applying.

Apply the wash primer by spraying or brushing. Spraying is generally the preferred method, but brushing may be desirable over rough or poorly prepared steel. Roller coating may be used only if specified.

Paint brushes should be clean and dry, or wetted with alcoholic solvents. When sprayed, the primer must be deposited on the surface wet; if dusting is encountered, move the gun closer to the surface; if already within 15cm of the surface, decrease atomizing air pressure or increase the liquid pressure, or add thinner.

Where thinning is desired isopropanol (99% grade) or butanol(normal butyl alcohol) or denatured ethanol should be used. At least 25% thinning is usually necessary to get a uniform application. Use denatured ethyl or isoprophy alcohol to clean equipment.

Apply to a dried film thickness of 8 to 13 microns dry or approximately 75 to 125 microns wet. Note that at this thickness, which should not be exceeded, the base metal will show through the coating as evidenced by uneven coloring. This is the normal appearance; do not attempt to hide the base metal completely. When spot treating, cover only spots free of old paint. Slight over lap of existing paints is generally not harmful provided adherence of the wash primer to the old paint is satisfactory and the old paint is not lifted.

The next coat of paint may be applied as soon as the wash primer is dry, usually from one-half hour to four hours later except when otherwise authorized by the inspector.

This wash primer should be applied over clean, dry steel; however, a slightly damp surface may be painted over, provided adequate normal butyl alcohol is used in the thinner. If the surface is excessively wet, the vinyl butyral resin will be thrown out of solution and form a gel, or the dried film will turn white, become brittle, and lack adhesion to the steel.

This wash primer is not intended for use as a shop coat for steel, and it should be recoated with the prime coat of paint before exposure, preferably within 24 hours.

This wash primer is intended for use over clean, dry, descaled steel. It does not work over phosphate treated steel, and should not be used over paint or wetting oils, It must be used on bare metal for best results. If used over mill scale, it may contribute to mill scale lifting.

This wash primer may be used to bond conventional paints to galvanized surfaces or stainless steel. Solvent cleaning of such surfaces, even though apparently clean, is advisable before applying the wash primer. Adhesion to some types of white rust preventatives on galvanized steel is poor.

Almost all paints will adhere well to this wash primer; exceptions are certain types of vinyl paints and some lacquers; these coatings may require an intermediate or bonding coat. Paints containing alcohol or ketone solvents generally show best bonding.

12. 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 applications. 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 solvent content.

Ingredients in this paint which may pose a hazard include zinc chromate, hydrocarbon solvent, and phosphoric acid. Applicable regulations governing safe handling practices shall apply to the use of this paint.