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METRIC
DOD-PRF-24648
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PERFORMANCE SPECIFICATION

PRIMER COATING, ZINC DUST PIGMENTED FOR EXTERIOR STEEL SURFACES (METRIC)

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers zinc containing primers for use on exterior steel surfaces exposed to marine atmosphere, high humidity, sea water, and weathering.

1.2 Classification. The coating shall be of the following types, classes, and compositions as specified (see 6.2.1):

Type I - Aqueous solvent
Type II - Organic (hydrocarbon) solvent
Class 1 - Self curing
Class 2 - Post curing
Composition A - Organic vehicle
Composition B - Inorganic vehicle

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

TT-E-490 - Enamel, Silicone Alkyd Copolymer, Semigloss (for Exterior and Interior Use).
TT-T-548 - Toluene, Technical.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 8010

DISTRIBUTION STATEMENT A Approved for public release; distribution unlimited

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FEDERAL (Continued)

- PPP-P-1892 - Paint, Varnish, Lacquer and Related Materials;
Packaging, Packing and Marking of.
- PPP-T-42 - Tape, Packaging/Masking, Paper.

MILITARY

- DOD-E-699 - Enamel, Exterior, Deck, Gray (Formula No. 20).
(Metric)
- MIL-H-5606 - Hydraulic Fluid, Petroleum Base; Aircraft,
Missile, and Ordnance.
- MIL-P-15930 - Primer Coating, Shipboard, Vinyl-Zinc Chromate
(Formula No. 120).
- MIL-P-24441 - Paint, Epoxy-Polyamide, General Specification for.
- MIL-P-24441/1 - Paint, Epoxy-Polyamide, Green Primer, Formula 150,
Type I.
- MIL-P-24441/2 - Paint, Epoxy-Polyamide, Exterior Topcoat, Haze
Gray, Formula 151, Type I.

STANDARDS

FEDERAL

- FED-STD-141 - Paint, Varnish, Lacquer, and Related Materials;
Methods for Sampling and Testing.
- FED-STD-313 - Material Safety Data Sheets, Preparation and
Submission of.
- FED-STD-595 - Colors.

MILITARY

- MIL-STD-129 - Marking for Shipment and Storage.

(Copies of specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A 366 - Standard Specification for Steel, Sheet, Carbon, Cold-
Rolled, Commercial Quality. (DoD adopted)
- B 117 - Standard Method of Salt Spray (Fog) Testing. (DoD adopted)
- D 93 - Standard Test Methods for Flash Point by Pensky-Martens
Closed Tester. (DoD adopted)
- D 185 - Standard Test Methods for Coarse Particles in Pigments,
Pastes, and Paints. (DoD adopted)
- D 520 - Standard Specification for Zinc Dust Pigment.
- D 521 - Standard Methods for Chemical Analysis of Zinc Dust
(Metallic Zinc Powder). (DoD adopted)
- D 1141 - Standard Specification for Substitute Ocean Water.
(DoD adopted)
- D 1296 - Standard Test Method for Odor of Volatile Solvents and
Diluents. (DoD adopted)

- D 1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes. (DoD adopted)
- D 1748 - Standard Test Method for Rust Protection by Metal Preservatives in the Humidity Cabinet. (DoD adopted)
- D 2197 - Standard Test Methods for Adhesion of Organic Coatings. (DoD adopted)
- D 2698 - Standard Test Method for Determination of the Pigment Content of Solvent-Reducible Paints by High-Speed Centrifuging. (DoD adopted)
- G 23 - Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials. (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Rules and Regulations - Rules 102, 442 and 443

(Application for copies should be addressed to the South Coast Air Quality Management District, 9150 E. Flair Drive, El Monte, CA 91731.)

UNIFORM CLASSIFICATION COMMITTEE AGENT

Uniform Freight Classification Ratings, Rules, and Regulations

(Application for copies should be addressed to the Uniform Classification Committee Agent, Tariff Publication Officer, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC-SP-10 - Surface Preparation Specification No. 10
Near-White Blast Cleaning

(Application for copies should be addressed to the Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburgh, PA 15213.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Qualification. The primer coating furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.3).

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3.2 Materials. The manufacturer is given latitude in the selection of raw materials and processes of manufacture but shall be restricted by the requirements of this specification. The materials used shall be entirely suitable for the purpose intended. The components when mixed for application, shall have a viscosity suitable for spray applications.

3.2.1 Toxic products and formulations. The material shall have no adverse effect on the health of personnel when used according to provided instructions and for its intended purpose. Questions pertinent to this effect shall be referred by the contracting activity to the Chief, Naval Medical Command, Department of the Navy, Washington, DC 20372.

3.2.2 Volatiles. The volatile portion of each component of the primer shall conform to applicable state regulations enacted and in effect on the date of submission for qualification of the material to this specification (see 5.3.2). The solvent content shall conform to the following minimum requirements:

- (a) A combination of hydrocarbons, alcohols, aldehydes, ethers, esters, or ketones having an olefinic or cycloolefinic type of unsaturation except perchloroethylene: 5 percent maximum.
- (b) A combination of aromatic compounds with eight or more carbon atoms to the molecule except ethylbenzene, methyl benzoate, and phenyl acetate: 8 percent maximum.
- (c) A combination of ethylbenzene, ketones having branched hydrocarbon structures, trichloroethylene, or toluene: 20 percent maximum.

3.2.3 Thinners. When the liquid vehicle portion of the primer cannot be thinned with water, butyl cellosolve shall be used as required for thinning. If this solvent is not compatible with a specific primer, the manufacturer of that primer shall specify a suitable solvent (see 4.11).

3.2.4 Zinc dust pigment. The zinc dust pigment shall be in accordance with the requirements of ASTM D 520.

3.3 Components. The zinc rich primer shall be a ready-to-mix, one or more component material. Each component, where indicated, shall be furnished in separate containers as part of a kit, each kit comprising a complete application mix. The manufacturer shall specify the components, mixing instructions, application procedure, and health and safety information necessary to assure optimum performance.

3.4 Service. The coating system shall provide satisfactory service for a minimum of 5 years. Coating failure necessitating removal of more than 5 percent of any application of the coating system prior to 5 years shall be cause for rejection.

3.4.1 Application conditions. The primer and topcoats shall be capable of satisfactory cure and performance when applied under the following conditions:

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- (a) Application and cure at 7.2 to 38 degrees Celsius ($^{\circ}\text{C}$) (45 to 100 degrees Fahrenheit ($^{\circ}\text{F}$) and 20 to 90 percent relative humidity).
- (b) Time lapse of 24 hours minimum to 26 weeks maximum between coats.
- (c) Dry film thickness of 0.2 to 0.254 millimeters (mm) (8 to 10 mils) for each total system.
- (d) Time lapse of 24 hours minimum, from application of last coat of system to initiation of service.
- (e) Primer shall be applied in a single coat in accordance with manufacturers instructions. Topcoats shall be Navy specified coating systems as follows:
 - (1) One mist coat in accordance with formula 150 of MIL-P-24441. One full coat in accordance with either formula 151 or 150 of MIL-P-24441. Two coats in accordance with formula 20 of DOD-E-699.
 - (2) One mist coat in accordance with formula 150 of MIL-P-24441. One full coat in accordance with either formula 151 or 150 of MIL-P-24441. Two coats in accordance with TT-E-490, No. 27 Gray.

Total minimum dry film thickness shall be 10 mils.

3.5 Topcoating properties. The primer shall be capable of being recoated both before and after service exposure with the Navy topcoats specified in 3.4.1(e) and, when tested as specified in 4.8.12, shall show no more than 1 percent primer-topcoat separation.

3.6 Mixing. When tested in accordance with 4.8.2, the zinc dust pigment or pigmented portion shall be easily mixed, by hand, into the remaining multi-component portions to form a smooth, uniform material free from lumps or other objectionable characteristics.

3.7 Odor. When tested in accordance with ASTM D 1296 (see table II), the odor of the wet primer and the dry film shall not be obnoxious.

3.8 Coarse particles and skins. When the mixed primer is tested in accordance with ASTM D 185 (see table II), the percentage of coarse particles and skins retained on the sieve shall not exceed by more than 0.5 percent the total amount of residue retained when the dry zinc pigment is subjected to the sieve test.

3.9 Primer stability. When tested in accordance with 4.8.3, the mixed primer shall not have aged or settled to the extent that it cannot be easily redispersed into a smooth, uniform mixture by hand mixing. At the time of submission of bid, the components, after 1 year storage at a temperature of $27 \pm 5.6^{\circ}\text{C}$ ($80 \pm 10^{\circ}\text{F}$), shall produce a coating which meets all requirements of this specification in the uncured and cured condition.

3.10 Miscibility (ease of reduction) with thinner. When tested in accordance with 4.8.8.4, primers requiring dilution with organic solvents shall be compatible with butyl cellosolve or other solvents specified by manufacturer.

3.11 Flash point. The uncured primer, mixed, thinned if applicable and ready for application, shall not flash at less than 27°C (80°F) when tested in accordance with ASTM D 93 (see table II).

3.12 Film properties. The primer shall be suitable for application by spraying over sandblasted steel. In one cross-coat, applied by spray, not less than 0.076 mm (3 mils) or greater than 0.127 mm (5 mils) in dry film thickness shall be deposited. One hour after application, the coating shall be smooth, even and free of runs, sags, streaks, or other imperfections. The primer shall be thinned in accordance with 3.2.3.

3.13 Drying time.

3.13.1 Class 1. A film of the coating, prepared and tested in accordance with 4.8.4, shall dry dust free in 30 minutes and after 4 hours curing shall not be affected by running tap water. The coating shall be cured ready for service or topcoating 24 hours after application.

3.13.2 Class 2. The coating, prepared and tested in accordance with 4.8.5, shall be dry for application of the recommended curing solution before 2 hours. The cured coating system after 24 hours of curing shall not be affected by running tap water when tested in accordance with 4.8.5. The coating shall be cured ready for service or for topcoating 24 hours after application of the curing solution.

3.14 Flexibility. When tested in accordance with 4.8.6, a film of the primer shall show no cracking or loss of adhesion in the bend area.

3.15 Adhesion. When tested in accordance with 4.8.7, coatings of the primer shall show no lifting, flaking or other signs of loss of adhesion.

3.16 Fluid resistance properties.

3.16.1 Water immersion. When tested in accordance with 4.8.8.1, the primer shall show no wrinkling, blistering, loss of adhesion or other visible defects.

3.16.2 Hydrocarbon immersion. When tested in accordance with 4.8.8.2, a film of the primer shall show no softening, blistering, rusting or other visible defects.

3.16.3 Hydraulic fluid immersion. When tested in accordance with 4.8.8.3, a film of the primer shall show no softening, blistering, rusting or other defects.

3.17 Weathering properties.

3.17.1 Accelerated weathering. When tested in accordance with 4.8.9, the primer film shall show only a slight chalking or fading after 1,000 hours exposure to accelerated weathering.

3.17.2 Humidity resistance. When tested in accordance with 4.8.10, a coating of the primer shall show no corrosion, blistering, wrinkling, or loss of adhesion.

3.17.3 Salt spray resistance. When tested in accordance with 4.8.11, a coating of the primer shall show no blistering, wrinkling, or loss of adhesion. There shall be no general surface corrosion, pitting or other visual evidence of panel corrosion.

3.18 Cathodic protection. When tested in accordance with 4.8.13.1, the coating shall prevent corrosion in the bare metal area during a minimum of 48 hours immersion in synthetic seawater.

3.19 Color. The preferred color of the cured primer is the characteristic metallic color of the zinc pigment which approximates color No. 36231 in accordance with FED-STD-595. However, other colors resulting from the use of additional inhibitive pigments shall not be cause for rejection provided the primer meets all other requirements of this specification.

3.20 Identification characteristics. Nominal values for identification characteristics specified in table I shall be provided by the manufacturer at the time of qualification in addition to application and mixing instructions required. These identification characteristics shall be the criteria by which it is determined that the material offered continues to be the same as that which was qualified. The limits given are absolute; that is, the range is as specified regardless of the nominal value. Values for the complete formulations for each coating of the coating system expressed as percent by mass of each ingredient as specified in table I shall be submitted at the time of qualification. Each ingredient shall be identified by generic type, trade name and source. Request for approval of alternative ingredients or change in formulation shall be directed to the Naval Sea Systems Command (NAVSEA) (see 6.3). Use of alternative ingredients or change in formulation without prior approval is prohibited.

TABLE I. Identification characteristics.

Characteristics	Requirement
Vehicle portion	
Nonvolatiles	$x \frac{1}{1} \pm 2.0$ percent
SiO ₂ of vehicle solids	$x \frac{1}{1} \pm 2.0$ percent
Mass per liter	$x \frac{1}{1} \pm 0.098$ kg/L (0.4 lb/gal)
Ash	$x \frac{1}{1} \pm 1.0$ percent
Powder portion	
Total zinc metal	$x \frac{1}{1} \pm 2.0$ percent
Total lead, if present	$x \frac{1}{1} \pm 1.0$ percent
Carbon pigment ^{2/}	
Coarse particles	4.0 percent maximum
Mass per liter	$x \frac{1}{1} \pm 0.098$ kg/L (0.4 lb/gal)

See footnotes at end of table.

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TABLE I. Identification characteristics. - Continued

Characteristics	Requirement
Mixed component	
Total pigment ^{3/}	x ^{1/} + 2.0 percent
Nonvolatile content ^{3/}	x ^{1/} + 2.0 percent
Volatile content ^{3/}	x ^{1/} + 2.0 percent
Mass per liter	x ^{1/} + 0.098 kg/L (0.4 lb/gal)
Viscosity	(see 3.2)
Stability	(see 3.9)
Flash point	(see 3.11)
Odor	(see 3.7)
Pot life	(see 3.21)
Drying time	(see 3.13)
Coarse particles	4.0 percent maximum
Cathodic protection	(see 3.18)
Color	(see 3.19)

^{1/} "X" specifies manufacturer supplied value.

^{2/} Carbon has been cited as possibly contributing to corrosion. Carbon may be acceptable if (5 years minimum) long service life is shown.

^{3/} May be calculated from analysis of vehicle and dry powder.

3.21 Pot life. The pot life of the coatings of the coating systems, mixed and ready for application, shall be a minimum of 6 hours at 21°C (70°F), and 80 percent relative humidity, when tested in accordance with 4.9.

3.22 Material safety data sheet. The contracting activity shall be provided a material safety data sheet (MSDS) at the time of contract award. The MSDS is DD Form 1813 and is found in FED-STD-313. The MSDS shall be included with each shipment of the material covered by this specification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Inspection system. The contractor shall provide and maintain an inspection system as specified in the contract or order (see 6.2.1).

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) Qualification inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).

4.3 Qualification inspection. Qualification inspection shall consist of all tests specified in table II and shall be conducted at a laboratory satisfactory to NAVSEA. Sufficient material to apply a complete coating system over a minimum area of 50 square meters (m^2) (400 square feet) is required.

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TABLE II. Tests.

Inspection	Requirements paragraph	Qualification tests	Qualification reevaluation tests	Quality conformance tests	Applicable test method FED-STD-141	ASTM test method	Test paragraph
Drying time	3.13	X	X	X	4061	----	4.8.5
Flexibility	3.14	X	X	--	6221	----	4.8.6
Service test	3.4.1	X	--	--	----	----	4.8.14
Coarse particles and skins	3.8	X	X	X	----	D 185	----
Flash point	3.11	X	X	X	----	D 93	----
Miscibility	3.10	X	X	X	----	----	4.8.8.4
Odor	3.7	X	X	X	----	D 1296	----
Mixing	3.6	X	X	X	----	----	4.8.2
Primer stability	3.9	X	X	X	----	----	4.8.3
Film properties	3.12	X	X	X	----	----	4.8.4
Adhesion	3.15	X	X	--	----	----	4.8.7
Water immersion	3.16.1	X	--	--	----	D 1308	4.8.8.1
Hydrocarbon immersion	3.16.2	X	--	--	----	----	4.8.8.2
Hydraulic fluid immersion	3.16.3	X	--	--	----	----	4.8.8.3
Humidity resistance	3.17.3	X	--	--	----	----	4.8.10
Salt spray resistance	3.17.4	X	--	--	----	B 117	4.8.11
Accelerated weathering	3.17.1	X	--	--	----	----	4.8.9
Cathodic protection	3.18	X	--	X	----	----	4.8.13
Color	3.19	X	X	X	----	----	----
Topcoating properties	3.5	X	--	--	----	----	4.8.12
Zinc content	3.20	X	X	X	----	D 2698 and D 521	4.8.1
Zinc dust pigment	3.2.4	X	X	X	----	D 520	----
Pot life	3.21	X	X	X	----	----	4.9

4.3.1 Qualification reevaluation. It shall be the responsibility of the contractor to furnish to the Government, at 5-year intervals, the data necessary to establish the continued conformity of his material to all original qualification requirements and evidence that the materials are identical with the formulation which was qualified. These data shall be complete test results of a sample representing current production, tested against all the requirements designated as qualification reevaluation tests in table II and certification that no change in formulation has been accomplished. Where changes have been approved, table I shall be resubmitted. At the discretion of the qualifying activity, test records from current production may be accepted for the reevaluation to the extent they are available, and samples from current production need be subjected to only the tests for which no production test records are available. The qualifying activity shall be notified of the test results.

4.4 Quality conformance inspection.

4.4.1 Lot. For purposes of quality conformance inspection, a lot shall consist of all primer of the same formula designation from a single uniform batch or uniform blend of batches (for each component where applicable) offered for delivery at one time. Two samples of each component from each lot of primer shall be forwarded to a designated Government laboratory for quality conformance tests.

4.4.2 Quality conformance tests. Quality conformance tests on two samples of each component and two samples of mixed paint for individual lots shall consist of tests as specified in table II.

4.5 Test procedures. Tests shall be run in duplicate unless otherwise specified by NAVSEA.

4.6 Test panels.

4.6.1 Material. Test panels shall be prepared from sheet steel conforming to ASTM A 366, cold-rolled, and may be of any convenient size and thickness subject to the following limitations:

- (a) Unless otherwise specified by the qualifying activity, panels shall be at least 100 mm (4 inches) wide by 150 mm (6 inches) long.
- (b) Panels for the flexibility tests shall be 0.56 ± 0.05 mm (22 ± 2 mils) thick. The panels shall bend smoothly around the mandrel specified in 4.8.6 without deformation such as bulging, buckling, or breaking.
- (c) Other test panels shall be not less than 1.5 mm (60 mils) thick.

4.6.2 Surface preparation. The panels shall be washed in solvent (xylene and isopropanol, 1:1 by volume), rinsed in clean solvent, and dried. The entire panel shall be blasted using any suitable equipment and blasting material. The blasting materials shall be free from oil, grease, dirt, water, or other contaminants that would impair the coatability of the panel surface. The panels

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shall be blast cleaned to a near white metal, in accordance with SSPC-SP-10. After blasting, the panels shall be cleaned by using clean, dry compressed air or a vacuum. Note: Minimum panel size which can be blasted effectively without deformation is 16 gauge.

4.6.3 Application methods. After surface preparation (see 4.6.2), the panels shall be kept clean and free from fingerprints, rust, and so forth. Application of the primer shall be accomplished within a maximum of 1 hour after cleaning, or the cleaned panels may be stored in clean toluene or a desiccator for not more than 72 hours prior to coating. Unless otherwise specified by NAVSEA, the coating shall be mixed and applied in accordance with the contractor's instructions for spray application (dry film thickness of 0.076 to 0.13 mm (3 to 5 mils)), except for the flexibility test which shall be 0.076 ± 0.013 mm (3 ± 0.5 mils). Unless otherwise specified by NAVSEA, 24 hours of drying time at room temperature shall be allowed between coats and between the last coat and immersion testing. Cure times shall be from time of application for type I coatings and from time of application of curing solutions for type II coatings.

4.7 Test conditions. Unless otherwise specified by NAVSEA, all testing, conditioning, curing, and so forth, shall be conducted under standard laboratory conditions of $24 \pm 1^\circ\text{C}$ ($75 \pm 2^\circ\text{F}$) and 50 ± 5 percent relative humidity. Wherever synthetic seawater is specified formula A of ASTM D 1141 shall be used. On panels that are to be used for salt spray, humidity, or other tests where corrosion or rusting is a factor, the edges and associated areas 6.4 mm (1/4 inch) inward on the panels shall be ignored.

4.8 Test methods.

4.8.1 Zinc content. The percentage of zinc dust in the dry film shall be determined as follows: Using one unopened unit of primer (one container of liquid vehicle and the companion container of dry zinc dust), accurately determine the total mass of each component by comparing the mass of the full containers to that of identical, empty, clean containers. Determine the nonvolatile content of the liquid vehicle according to the method specified in table II. Calculate the percent of zinc dust in the dry film as follows:

$$\frac{A \times 100}{A + (B \times C)} = D$$

- A = Mass of zinc dust
- B = Percentage of nonvolatile in the vehicle (as decimal)
- C = Mass of vehicle
- D = Percentage of zinc in the dry film

For ready-mix primers (one component) the vehicle portion of the primer shall be isolated in accordance with ASTM D 2698. The total zinc (Zn) in the remaining solids shall be determined in accordance with the procedure in accordance with ASTM D 521.

4.8.2 Mixing. A 1 liter (L) (1 quart) sample of the primer shall be mixed according to the manufacturer's instructions. The materials shall be briskly stirred, by hand, during the mixing. The complete mixing shall be accomplished in not more than 5 minutes. After the mixture appears uniform or at the end of the 5 minute period, whichever occurs first, the material shall be allowed to stand for 1 minute. It shall then be poured slowly into another container. The primer shall be observed during pouring and the residue remaining in the mixing container observed for any evidence of lumps or pigment that has not been wetted by the liquid vehicle.

4.8.3 Primer stability. A 1-L (1 quart) container shall be filled to within approximately 13 mm (1/2 inch) from the top with well-mixed primer. The container shall be sealed and stored at $24 \pm 1^\circ\text{C}$ ($75 \pm 2^\circ\text{F}$) undisturbed for 4 hours. At the end of this period, the container shall be opened and the primer handmixed for not more than 3 minutes. There shall be no evidence of undispersed lumps of pigment remaining after completion of the stirring. Small amount of pigment clinging to the stirrer shall not be cause for rejection.

4.8.4 Coating. Panels shall be prepared, cleaned, and coated in accordance with 4.6 and 4.7. The coated panels shall be examined for conformance with 3.12.

4.8.5 Drying time. Prepare and coat 100 by 150 mm (4 by 6 inch) panels in accordance with 4.6. Examine for dust free drying and dry hard in accordance with method 4061 of FED-STD-141. Four hours (class 1) or 24 hours (class 2) after the application of the coating or curing solution, if applicable, subject the panel to the running water test. Position the panel at a 45 degree angle 250 to 300 mm (10 to 12 inches) from the point of discharge of a stream of tap water flowing at the rate of 1-L (1 quart) per minute from a standard 20 mm (3/4 inch) faucet, so that the stream strikes the panel 50 mm (2 inches) from the top. After 2 minutes, remove the panel and examine for conformance with 3.13.

4.8.6 Flexibility. Two panels prepared and coated as specified in 4.6.2 and 4.6.3 and cured as applicable shall be bent 180 degrees over a 25 mm (1 inch) mandrel in accordance with method 6221 of FED-STD-141. The panels shall be visually examined immediately to determine conformance with 3.14.

4.8.7 Adhesion. Prepare and coat a panel in accordance with 4.6 and cure for 48 hours. Make two parallel scratches through the coating to metal, 25 mm (1-inch) apart, and not less than 50 mm (2 inches) long, using a stylus. Apply a 25-mm (1-inch) wide strip of masking tape in accordance with PPP-T-42, adhesive side down, perpendicular to the scratches. Press the tape down using two passes of a rubber covered roller. Remove the tape immediately in one abrupt motion, exerting the pull at approximately 90 degrees to the panel. Examine the coating for conformance with 3.15.

4.8.8 Fluid resistance properties.

4.8.8.1 Boiling water immersion test. Prepare and coat panels as specified in 4.6 and 4.7. Cure for 7 days. Immerse one-half of the panel in boiling distilled water for 8 hours. Examine the panel 24 hours after removal from the water for wrinkling, blistering, and adhesion and verify conformance with 3.16.1.

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4.8.8.2 Hydrocarbon immersion. Prepare and coat two 150 by 300 by 3 mm (6 by 12 by 1/8 inch) panels as specified in 4.6. Immerse in toluene in accordance with TT-T-548 at room temperature. Examine after 3, 10, and 30 days for conformance to 3.16.2.

4.8.8.3 Hydraulic fluid immersion test. Prepare and coat two 150 by 300 by 3 mm (6 by 12 by 1/8 inch) panels as specified in 4.6. Immerse in hydraulic fluid in accordance with MIL-H-5606 at room temperature. Examine after 3, 10, and 30 days for conformance to 3.16.3.

4.8.8.4 Miscibility test for pastes-in-oil. Place approximately 100 grams of the paste in a cup or other suitable container, add the specified amount of thinning liquid slowly while thoroughly mixing with a spatula or paddle. Both paste and thinning liquid shall be at 21 to 32°C (70 to 90°F). Note the ability of the paste to break up readily to form a uniform, smooth primer of suitable brushing consistency.

4.8.9 Accelerated weathering. Prepare and coat panels as specified in 4.6 and 4.7. Cure for 7 days, then subject them to accelerated weathering for 1,000 hours in accordance with ASTM G 23, type D. Remove and examine the panels for conformance with 3.17.1.

4.8.10 Humidity resistance. Panels shall be prepared and coated as specified in 4.6 and 4.7; then cured for 7 days. The panels shall be exposed in a humidity cabinet in accordance with ASTM D 1748 and operated at $49 \pm 1^\circ\text{C}$ ($120 \pm 2^\circ\text{F}$) and 100 percent humidity. The primer shall be exposed for 30 days. After exposure, the panels shall be examined for conformance to 3.17.2.

4.8.11 Salt spray resistance. Panels shall be prepared, cleaned, coated with primer and cured as specified in 4.6 and 4.7. They shall then be exposed in accordance with ASTM B 117. Exposure time shall be 30 days.

4.8.12 Topcoating properties. Two panels shall be prepared as specified in 4.6 and 4.7. After curing, the panel shall be coated. The panel shall then be tested in accordance with 4.8.7, 4.8.10, and 4.8.11, and inspected for adhesion of the second coat to the initial coat of primer.

4.8.13 Cathodic protection.

4.8.13.1 30 days. Prepare two 100 by 150 by 3 mm (4 by 6 by 1/8 inch) panels as specified in 4.6 and 4.7. Mask a 40 mm (1-1/2 inch) diameter circle on one face of each panel with tape, then apply 0.076 mm (3 mils) dry film thickness of coating to all exposed surfaces by spraying. Cure for 24 hours and coat the top 25 mm (1 inch) and associated edges of each panel with formula 120 in accordance with MIL-P-15930 or other masking material such as parafin. Cure the panels for 7 days at room temperature, remove the tape from the circle, clean contamination from the surface of the bare metal circle by light sand-blasting as specified in 4.6.2 then immerse in 1200 milliliters of synthetic seawater in a 1500-milliliter pyrex beaker so the water-air interface occurs in the formula 120. Keep the water level constant during the test by the addition of distilled water. Continue the test until corrosion occurs. Examine for compliance with 3.18.1.

4.8.13.2 48 hours. Prepare panels as specified in 4.8.13.1 except mask a 65 mm (2-1/2 inch) diameter circle on the panel. Test as specified in 4.8.13.1, except examine the panels at the end of 48 hours for compliance with 3.18.1.

4.8.14 Service test. The primer, along with approved Navy topcoat (see 3.4.1) shall be applied to a minimum of 50 m² (400 square feet) on exterior steel surfaces in accordance with manufacturer's instructions and 3.4.1. This designated application shall be inspected at 6 months and 1 year by a Navy representative. After 1 year service, qualification shall be recommended if no film failure other than a moderate change in appearance has occurred or spot blast to bare metal of not more than 3 percent of the coated area is required for refurbishment. Coating failure necessitating more extensive rework at 6 months or at 1 year shall be cause for withholding qualification. Rework associated with surface cleaning such as sweep blast shall not be considered as cause for failure. The qualification service testing will be conducted on a Naval ship or, as an alternative, consideration will be given to commercial applications recommended by the contractor and deemed equivalent by NAVSEA.

4.9 Pot life. The coatings of the coating systems shall be mixed from the components, in accordance with the contractor's instructions, in a suitable container so as to result in approximately 1-L (1 quart) of finished material. For routine testing, ambient conditions above 21°C (70°F) and 50 percent relative humidity shall be satisfactory. For referee tests, 21 ± 3°C (70 ± 5°F) and 80 ± 10 percent relative humidity shall prevail. The time between mixing and the loss of adequate brushing and spraying properties shall be determined. Report up to a 48-hour period the actual temperature, humidity and the time of loss of adequate brushing and spraying properties.

4.10 Toxicity. A manufacturer of material shall disclose the formulation of his product to the Chief, Naval Medical Command (NAVMED), Department of the Navy, Washington, DC 20372. The disclosure of proprietary information, which shall be held in confidence by NAVMED shall include the name, formula, and approximate percentage by mass and volume of each ingredient in the product; the results of any toxicological testing of the product; and any such other information as may be needed to permit an accurate appraisal of any toxicity problem associated with the handling, storage, application, use or disposal of the material.

4.11 Certification data/report. The contractor shall certify that each lot of paint is in accordance with this specification (see 6.2.2). In addition to the requirements covered by the data ordering document, the certification data/report shall include the following information:

- (a) Toxicological data and formulations required to evaluate the safety of the material for the intended use (see 3.2.1).
- (b) Certification that volatility requirements are met (see 3.2.2).
- (c) Relative to a lot of paint: results of quality conformance tests and certification of identification characteristics (see 4.3).

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4.12 Inspection of packaging. Sample packages and packs, and the inspection of the preservation-packaging, packing and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition.)

5.1 Packaging. Packaging shall be level A or C as specified (see 6.2.1).

5.1.1 Level A. The primer shall be packaged in accordance with the requirements of PPP-P-1892. For multi-component primers, each component shall be packaged in separate containers. Quantities in each of the containers shall be such that the entire contents of one container shall be mixed with the entire contents of the companion container to provide the correctly proportioned mixed primer. (For liquid vehicle containers larger than 20-L (5 gallons), the appropriate amount of zinc dust may be packaged in two or more containers.) In addition, the companion containers of dry zinc dust and liquid vehicle for units up to and including 4-L (1 gallon) size, shall be packed together in the same package. For multicomponent materials, the specified number components shall be considered as one unit of primer.

5.1.2 Level C. Packaging shall be in accordance with the manufacturer's commercial practice.

5.2 Packing. Packing shall be level A, B or C as specified (see 6.2.1).

5.2.1 Level A. The primer shall be packed in overseas type shipping containers in accordance with the requirements of PPP-P-1892.

5.2.2 Level B. The primer shall be packed in domestic type shipping containers in accordance with the requirements of PPP-P-1892.

5.2.3 Level C. The primer shall be packed in a manner to insure carrier acceptance and safe delivery at destination. Containers shall be in accordance with Uniform Freight Classification Rules or Regulations or other carriers applicable to the mode of transportation.

5.3 Marking. Interior and exterior containers shall be marked in accordance with the requirements of MIL-STD-129. In addition, individual containers shall be marked, either by stencil or durable attached labels, with mixing, thinning, application, and curing instructions, as applicable. Each container shall bear the following information:

"PRIMER COATING, ZINC DUST PIGMENTED, SELF-CURING, FOR STEEL SURFACES
DOD-P-24648
Component ^{1/}
Mix entire contents of this container with 1/ (amount) of component."

1/ Manufacturer shall enter appropriate data.

5.3.1 Precautionary marking. Each container of liquid vehicle shall be marked with the following precautionary marking:

"DO NOT STORE AT TEMPERATURES ABOVE 38°C (100°F) OR BELOW 2°C (35°F)."

5.3.2 Special marking. In addition to other markings required on the containers, there shall be the following statement: "The volatile content of this container is not photochemically reactive as defined by Rules 102, 442, and 443 of the South Coast Air Quality Management District" (see 6.4).

5.3.3 Additional identification. Each component container, shipping container, and palletized load shall be marked with the appropriate hazardous symbol as applicable in accordance with FED-STD-313.

6. NOTES

6.1 Intended use. The zinc-rich primer covered by this specification is for use on surfaces of steel structures that receive severe exposure to adverse weather, condensing moisture, corrosive atmospheres and marine environments. The primer may be applied under conditions of high humidity and condensing moisture.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type, class, and composition required (see 1.2).
- (c) Inspection system in accordance with MIL-I-45208 (see 4.1.1).
- (d) Levels of packaging and packing (see 5.1 and 5.2).
- (e) Required type and size of container (see 5.1.1).
- (f) Special marking required (see 5.3.2).

6.2.2 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of FAR 52.227-7031 are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraph.

<u>Paragraph no.</u>	<u>Data requirement title</u>	<u>Applicable DID no.</u>	<u>Option</u>
4.11	Certification data/ report	UDI-A-23264	10.2.1

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000.19L., Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publication and Forms Center or as directed by the contracting officer.)

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6.2.2.1 The data requirements of 6.2.2 and any task in sections 3, 4, or 5 of this specification required to be formed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 With respect to the products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in Qualified Products List QPL-24648 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 and information pertaining to qualification of products may be obtained from that activity. Application for qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.3.1).

6.3.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

6.4 Volatile content. Although the container marking specifically refers to the Air Pollution District of Los Angeles County, the coating may be used anywhere else a product complying with 3.2.2 is allowed. This includes other air pollution control districts or similar areas controlling the emission of solvents into the atmosphere. Information regarding Los Angeles County Air Pollution Rules 102, 442 and 443 may be obtained from: South Coast Air Quality Management District.

Custodians:

Army - ME
Navy - SH
Air Force - 99

Preparing activity:

Navy - SH
(Project 8010-1068)

Review activities:

Army - MR
Navy - AS, YD

User activities:

Navy - CG, MC

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NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER DOD-P-24648	2. DOCUMENT TITLE Surfaces (METRIC) Primer Coating, Zinc Dust Pigmented For Exterior Steel
3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION (Mark one)
b. ADDRESS (Street, City, State, ZIP Code)	<input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____
5. PROBLEM AREAS	
a. Paragraph Number and Wording:	
b. Recommended Wording:	
c. Reason/Rationale for Recommendation:	
6. REMARKS	
7a. NAME OF SUBMITTER (Last, First, MI) - Optional	b. WORK TELEPHONE NUMBER (Include Area Code) - Optional
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional	8. DATE OF SUBMISSION (YYMMDD)

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