INCH-POUND

MIL-P-28578B(YD)
7 July 1988
SUPERSEDING
MIL-P-28578A(YD)
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MILITARY SPECIFICATION

PAINT, WATER-BORNE, ACRYLIC OR MODIFIED ACRYLIC, SEMIGLOSS, FOR METAL SURFACES

This specification is approved for use by the Naval Facilities Engineering Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers a water-borne, semigloss paint, acrylic or modified acrylic, for use on exterior or interior previously painted metal surfaces or surfaces treated with a primer conforming to MIL-P-28577. It is suitable for use in environments where volatile organic compound (VOC) emissions are controlled by air quality regulations (see 3.3.2, 3.6, 6.1, and 6.3).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer (Code 156), Naval Construction Battalion Center, Port Hueneme, CA 93043-5000, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 8010

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

SPECIFICATIONS

FEDERAL

PPP-P-1892 - Paint, Varnish, Lacquer, and Related Materials; Packaging, Packing, and Marking of

MILITARY

MIL-P-28577 - Primer, Water-Borne, Acrylic or Modified Acrylic, for Metal Surfaces
MIL-P-24441/1 - Paint, Epoxy-Polyamide, Green Primer, Formula 150, Type 1

STANDARD

FEDERAL

FED-STD-313 - Material Safety Data Sheets Preparation and the Submission of

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DODISS shall be the issue of the non-Government documents which is current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B117 - Method of Salt Spray (Fog) Testing
D523 - Test Method for Specular Gloss
D609 - Methods for Preparation of Steel Panels for Testing Paint, Varnish, Lacquer, and Related Products
D714 - Test Method for Evaluating Degree of Blistering of Paints
D1210 - Test Method for Fineness of Dispersion of Pigment-Vehicle Systems
D1640 - Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
D1729 - Practice for Visual Evaluation of Color Differences of Opaque Materials
D1737 - Test Method for Elongation of Attached Organic Coatings with Cylindrical Mandrel Apparatus

D2247 - Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity
D2805 - Test Method for Hiding Power of Paints by Reflectometry
D3273 - Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
D3274 - Method of Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation
D3335 - Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy
D3359 - Test Methods for Measuring Adhesion by Tape Test
D3924 - Specification for Standard Environment for Conditioning and Testing Paint, Varnish, Lacquer, and Related Materials
D3925 - Practice for Sampling Liquid Paints and Related Pigmented Coatings
D3960 - Practice for Determining Volatile Organic Content (VOC) of Paints and Related Coatings
G53 - Practice for Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187).

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC-Paint 104 - White or Tinted Alkyd Paint
SSPC-SP 10 - Near-White Blast Cleaning

(Application for copies should be addressed to the Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburgh, PA 15213-2683).

(Non-Government standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets, or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General. The paint shall consist of pigments and vehicle combined to produce a ready-to-use product meeting all the requirements of this specification. The paint shall be free of materials that would be toxic to personnel under normal conditions of use.

3.2 Composition.

3.2.1 Pigments. All pigments shall be chalk-resistant and alkali-resistant. Tinting pigments shall be used when necessary to provide the color required (see 3.4.2 and 6.2) and shall be lightfast. Suitable extender pigments shall be included when needed.

3.2.2 Vehicle. The vehicle shall consist of an acrylic or modified acrylic copolymer produced by emulsion polymerization. Other necessary additives such as preservatives, antifoam agents, and dispersants may be included.

3.3 Quantitative requirements.

3.3.1 Lead content. The lead metal content of the paint shall be a maximum of 0.06 percent by weight of nonvolatile matter when tested in accordance with 4.3.2.

3.3.2 VOC content. The VOC content shall be a maximum of 250 grams per liter (g/L) (2.1 pounds per gallon (lb/gal)) when tested as specified in 4.3.3.

3.3.3 Drying time. The dry-to-touch time shall be a maximum of one hour and the dry-hard time shall be a maximum of 16 hours when tested as specified in 4.3.4.

3.3.4 Fineness of grind. The fineness of grind shall be a minimum of 6 Hegman units when tested as specified in 4.3.5.

3.3.5 Specular gloss. The 60 degree (°) specular gloss mean reading shall be between a minimum of 30 and a maximum of 60 when tested in accordance with 4.3.6.

3.3.6 Opacity. When tested in accordance with 4.3.7, the contrast ratios shall be as shown for the reflectances indicated below:

Reflectance	Minimum Contrast Ratio
80 and above	0.97
79 - 76	0.98
75 and below	0.99

3.4 Qualitative requirements.

3.4.1 Condition in container. The paint, as received, shall be ready-mixed, and shall show no evidence of biological growth, livering, skinning, putrefaction, rust from corrosion of the container, or hard settling of the pigment. Any settled pigment shall be readily dispersible in the liquid portion by hand stirring to form a smooth, homogenous paint, free from persistent foam.

3.4.2 Color. When tested in accordance with 4.3.8, the color shall be as specified (see 6.2).

3.4.3 Storage stability. When tested in accordance with 4.3.9, the paint shall show no gelation, pigment settling, excessive thickening, coagulation, lumps, or coarse particles, and when applied to a glass panel shall dry to a smooth, uniform finish.

3.4.4 Working properties. When tested as described in 4.3.10, there shall be no runs, sags, streaks, flashes, laps, pinholing, mud-cracking, eyeing, or cratering after application of the first coat; no picking-up or rolling-up of the first coat during application of the second coat; and after 24 hours, the film shall be smooth and uniform.

3.4.5 Microbial growth resistance. When tested as specified in 4.3.11, the degree of microbial growth shall have a maximum disfigurement rating of 8.

3.4.6 Flexibility. When tested in accordance with 4.3.12, there shall be no visible cracking of the paint.

3.4.7 Adhesion to previously painted surfaces. When tested as specified in 4.3.13, the adhesion shall be rated 4B or better.

3.4.8 Humidity resistance. When tested as described in 4.3.14, there shall be no rust bleed-through, no rust creepage greater than 1/8 inch (3 millimeters (mm)) from the scribed mark, and the degree of blistering shall be no greater than size 6 and of medium density as defined in ASTM D714.

3.4.9 Salt spray resistance. When tested as described in 4.3.15, the degree of blistering shall be no greater than size 6 and of medium density as defined in ASTM D714, and there shall be no rust creepage more than 1/8-inch (3 mm) from the scribed mark.

3.4.10 Accelerated weathering resistance. When the coated panel is prepared and tested in accordance with 4.3.16, the 60° specular gloss of the weathered panel be no less than 80 percent of the original value.

3.5 Material Safety Data Sheets (MSDS). MSDS shall be submitted in accordance with FED-STD-313.

3.5.1 Excluded materials. MSDS shall show exclusion of chromium, lead, halogenated solvents, benzene, and 2-ethoxyethanol and 2-methoxyethanol and the corresponding acetates, as intended ingredients.

3.6 Air quality regulations marking. The marking on each unit container and shipping container shall include the maximum VOC in grams per liter and pounds per gallon of coating, less water and less exempt solvents, and shall also state that the material is to be used without thinning under normal environmental and application conditions.

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 Responsibility for compliance. All material must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Material inspection. The contractor is responsible for insuring that supplies and materials are inspected for compliance with all the requirements specified herein and in applicable referenced documents.

4.2 Quality conformance inspection. The quality conformance inspection shall include the tests of 4.3 and the packaging inspection of 4.5.

4.2.1 Sampling. When a certificate of compliance is not acceptable (see 4.4 and 6.2), inspection shall be performed on samples selected from each lot in accordance with ASTM D3925.

4.2.2 Lot. A lot shall consist of material from a single manufacturer's batch, defined as the end product of all raw materials mixed, blended, or processed in a single operation.

4.3 Tests. Samples selected in accordance with 4.2.1 shall be subjected to the tests specified in 4.3.2 to 4.3.16. Failure of any test shall be cause for rejection of the lot from which the sample was taken.

4.3.1 Test conditions. Samples shall be conditioned and tested in a room environment maintained as specified in ASTM D3924 unless otherwise specified in the test method.

4.3.2 Lead content. Determine the lead metal content of the paint in accordance with ASTM D3335.

4.3.3 VOC content. Determine the VOC content in accordance with ASTM D3960, and calculate as grams of VOC per liter of coating less water and less exempt solvents.

4.3.4 Drying time. Determine the dry-to-touch time and dry-hard time in accordance with ASTM D1640.

4.3.5 Fineness of grind. Determine the fineness of grind in accordance with ASTM D1210.

4.3.6 Specular gloss. Measure the 60° specular gloss in accordance with ASTM D523.

4.3.7 Opacity. Measure the contrast ratio in accordance with ASTM D2805 for a spreading rate of 400 square feet per gallon, and determine compliance with 3.3.6.

4.3.8 Color. Apply the paint to a clean, smooth, plate-glass panel with a 0.003 inch (approximately 0.006 inch gap clearance) film applicator. Allow the film to dry for 24 hours. Evaluate the color of the dry film visually in accordance with ASTM D1729.

4.3.9 Storage stability. Fill three resin-lined, friction-top, one-pint cans with the paint, and close the cans tightly. Expose one can and contents three times to the following temperature cycles:

a. Low temperature of 40 ± 3° Fahrenheit (°F) for 16 hours.
b. High temperature of 100 ± 3°F for 8 hours.

Store the second can and contents at 40 ± 3°F for two weeks. Store the third can and contents at 100 ± 3°F for two weeks. Following the exposure periods, examine the contents of the cans for compliance with 3.4.3.

4.3.10 Working properties. Apply the paint to three smooth steel vertical surfaces at 8 mils wet film thickness by spray, and 4 mils wet film thickness by brush or roller. The steel surfaces shall be cold-rolled steel panels conforming to ASTM D609, Type 3, prepared for coating by Method D. Dry the paint in a well-ventilated room or other enclosed space, free from drafts and dust, in diffused light, not in direct sunlight. Maintain the air temperature between 75 ± 5°F and the relative humidity at 50 ± 5 percent during application and drying. After four hours of drying, apply a second coat in the same manner as the first. Examine the applied paint for compliance with 3.4.4.

4.3.11 Microbial growth resistance. Test the paint in accordance with ASTM D3273 and determine the disfigurement rating as specified in ASTM D3274.

4.3.12 Flexibility. Determine flexibility in accordance with ASTM D1737 using a 1/4-inch mandrel. Prepare the test panel by applying the paint to a cold-rolled steel panel conforming to ASTM D609, Type 3, prepared for coating by Method C. The thickness of the panel shall be 0.0375 ± 0.0125 inch. Apply a two-inch-wide film of the paint with a film applicator that will give a dry thickness of 0.09 to 1.1 mils. Air dry the coated panel for 24 hours at a temperature of 70 to 80°F and then place in an oven at 98 to 102°F for four days. After removal from the oven condition the panel for two hours at 70 to 80°F, and then bend over the 1/4-inch mandrel. The bend shall be examined in a strong light for cracking of the paint.

4.3.13 Adhesion to previously painted surfaces.

4.3.13.1 Alkyd adhesion. Coat a panel, having an area of at least 24 square inches, of a suitable non-corroding substrate, with one coat of alkyd enamel conforming to SSPC-Paint 104, Type I. The dry film thickness of the coating shall be a nominal 2 mils. Expose the test panel to 1000 hours of accelerated weathering in accordance with ASTM G53. At the end of the exposure period, wash the panel with water using a soft sponge. Apply one coat of the paint using a 0.003 inch (approximately 0.006 inch gap clearance) film applicator and allow to dry for 72 hours. Determine the adhesion in accordance with ASTM D3359, Method B.

4.3.13.2 Epoxy adhesion. Coat two 3 by 8 inch cold-rolled steel panels, having an area of at least 24 square inches, conforming to ASTM D609, Type 1, prepared for coating by Method D, with an epoxy material conforming to MIL-P-24441/1, Formula 150. The dry film thickness of the coating shall be 2 mils. Allow one coated panel to dry for 24 hours and the second panel for 96 hours. At the end of the drying time, apply one coat of the paint to each panel using a 0.003 inch (approximately 0.006 inch gap clearance) film applicator and allow to dry for 72 hours. Determine the adhesion as specified in 4.3.13.1.

4.3.14 Humidity resistance.

4.3.14.1 Panel preparation. The test panel shall be a hot-rolled steel panel, having an area of at least 24 square inches, prepared for coating by blast cleaning to a nominal 2.0 mil profile in accordance with SSPC-SP 10, using an aluminum oxide grit. Coat the panel with one coat of primer conforming to MIL-P-28577 and two coats of the paint, using a 0.003 inch (approximately 0.006 inch gap clearance) film applicator. Allow the panel to dry 24 hours between coats, and cure the finished panel one week before scribing and exposure. Scribe an "x", two inches wide and two inches high, through the coating to the metal, on the lower half of the panel, before exposure testing. Protect the cut edges of the panel with a suitable material stable under the conditions of the test, such as carnauba wax.

4.3.14.2 Exposure testing. Test the panel, coated side down, in accordance with ASTM D2247 for 1000 hours. Observe the exposed panel for compliance with 3.4.8.

4.3.15 Salt spray resistance. Prepare the test panel as described in 4.3.14.1, and expose the test panel in accordance with ASTM B117 for 1000 hours. Observe the exposed panel for compliance with 3.4.9.

4.3.16 Accelerated weathering resistance. Apply the paint to a smooth 3 by 8 inch aluminum test panel, using a 0.003 inch (approximately 0.006 inch gap clearance) film applicator, and allow the panel to cure for one week. Measure the 60° specular gloss in accordance with ASTM D523. Expose the test panel to 1000 hours of accelerated weathering in accordance with ASTM G53 and then remeasure the 60° specular gloss. Determine compliance with 3.4.10.

4.4 Certificate of compliance. Unless otherwise specified (see 6.2), a certificate of compliance shall be submitted to the procuring activity and shall be acceptable as proof that the products being offered meet all the requirements of this specification, provided the contractor furnishes actual test results, acceptable to the Government, indicating that tests have been performed to substantiate the certification. The certificate shall state that the tests have been performed on products manufactured from the same raw materials as the items being offered. The Government reserves the right to require additional testing and certification when raw materials are changed or when otherwise deemed necessary.

4.5 Packaging inspection. The inspection of the packaging, packing, and marking shall be in accordance with the requirements of section 4 of PPP-P-1892.

5. PACKAGING

5.1 Packaging, packing, and marking. Packaging, packing, and marking shall be in accordance with the requirements of PPP-P-1892, with the level of packaging and the level of packing as specified (see 6.2). The paint shall be furnished in 1-gallon and 5-gallon containers as specified (see 6.2).

5.1.1 Special marking. In addition to markings required by PPP-P-1892, containers shall be marked as specified in 3.6.

6. NOTES

6.1 Intended use. This specification covers a paint intended for use as a topcoat over a water-borne primer conforming to MIL-P-28577 for bare metal surfaces or previously painted metal surfaces in non-marine environments. The paint is also intended for use in all environments directly over suitable previously painted surfaces. The paint can be used on both exterior and interior metal surfaces where air quality regulations limit the VOC content to 250 g/L (2.1 lb/gal). The paint should be applied only at temperatures between 50 and 100°F and a relative humidity no higher than 85 percent.

6.2 Ordering data. Purchasers should exercise any desired options offered herein, and acquisition documents should specify the following:

6.2.1 Acquisition requirements.

a. Title, number, and date of this specification.
b. Color required (see 3.4.2).
c. If a certificate of compliance is not acceptable (see 4.4).
d. Level of packaging and level of packing required (see 5.1).
e. Size of container required (see 5.1).

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 DD Form 1664, Data Item Description (DID), and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DoD Federal Acquisition Regulations Supplement 27.475-1 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 paragraphs:

Paragraph No.	Data requirements title	Applicable DID No.
4.4	Certificate of compliance	DI-E-2121

(DIDs related to this specification, and identified in section 6 will be approved and listed as such in DoD 5010.12L, Acquisition Management Systems and Data Requirements Control List. Copies of DIDs required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.3 Conformance to air quality regulations. Purchasers should determine that the material being procured conforms to the air quality regulations for the applications intended in the jurisdictions where the material will be used.

6.4 Subject term (key word) listing.

Acrylic
Acrylic paint
Acrylic topcoat
Metal paint
Modified acrylic
Paint
Semigloss acrylic
Semigloss paint
VOC controlled paint
Water-borne paint

6.5 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Preparing Activity:
Navy - YD

(Project 8010-1169)