

SSPC: The Society for Protective Coatings

PAINTING SYSTEM GUIDE 4.00

Guide for Selecting Vinyl Painting Systems*

Most needs for vinyl painting systems can be met by the standard SSPC Painting Systems 4.02 and 4.04 in this section. Other combinations of surface preparation, primer, intermediates, and topcoats may be selected for special situations for vinyl painting systems using the following Guide. To do so, select the desired surface preparation, primer, intermediate(s), and topcoat from those listed herein and insert them into the standard SSPC Painting System format. In order to aid in the selection, short comments are given. For additional information consult the "Commentary on Painting Systems" and the referenced standards.

1. Scope

1.1 This guide covers vinyl painting systems for blast cleaned or pickled steel.

1.2 These systems are suitable for use on parts or structures exposed in Environmental Zones 1A (interior, normally dry), 2A (frequently wet by fresh water), 2B (frequently wet by salt water), 2C (fresh water immersion), 2D (salt water immersion), 3A (chemical, acidic), and 3B (chemical neutral).

1.3 The color of the finish paint must be specified.

2. Description

2.1 This guide outlines the components of a complete vinyl painting system. A painting system shall consist of surface preparation by commercial blast cleaning or pickling, one coat of wash primer (when required), one coat of vinyl primer, one or two intermediate coat(s), and one finish coat of vinyl paint.

3. Reference Standards

3.1 The standards referenced in this guide are listed in Section 3.4 through 3.8 and form a part of the specification.

3.2 The latest issue, revision, or amendment of the reference standards in effect on the date of invitation to bid shall govern unless otherwise specified.

3.3 If there is a conflict between the requirements of any of the cited reference standards and the specification, the requirements of the specification shall prevail.

3.4 SSPC STANDARDS AND JOINT STANDARDS:

PA 1	Shop, Field, and Maintenance Painting of Steel
PA 2	Measurement of Dry Coating Thickness With Magnetic Gages
PA Guide 4	Guide to Maintenance Repainting with Oil Base or Alkyd Painting Systems
Paint 8	Aluminum Vinyl Paint
Paint 9	White (or Colored) Vinyl Paint
Paint 27*	Basic Zinc Chromate – Vinyl Butyral Wash Primer
PS 4.02	Four-Coat Vinyl Painting System (For Fresh Water, Chemical, and Corrosive Atmospheres)
PS 4.04	Four-Coat White or Colored Vinyl Painting System (For Fresh Water, Chemical, and Corrosive Atmospheres)
SP 2	Hand Tool Cleaning
SP 3	Power Tool Cleaning
SP 5/NACE No. 1	White Metal Blast Cleaning
SP 6/NACE No. 3	Commercial Blast Cleaning
SP 8	Pickling
SP 10/NACE No. 2	Near-White Blast Cleaning

3.5 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARD:

D 3925	Practice for Sampling Liquid Paints and Related Pigmented Coatings
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3.6 FEDERAL SPECIFICATIONS AND STANDARDS:

MIL-L-2838	(canceled) Lacquer, Vinyl Resin, Gasoline and Water Resistant Primer, Vinyl-Zinc Chromate Type, (for Hot Spray)
MIL-P-15930	(canceled) Enamel, Outside, Gray, Vinyl-Alkyd
MIL-E-15935	(canceled) Enamel, Exterior, Gray, No. 27 Vinyl-Alkyd
MIL-E-15936	(canceled) Enamel, Exterior, Gray, No. 17 (Vinyl-Alkyd)
MIL-E-16188	(canceled) Enamel, Exterior, White, (Vinyl-Alkyd)
MIL-E-16738	(canceled) Enamel, Exterior, White, (Vinyl-Alkyd)

MIL-E-24292	(canceled) Enamel, Exterior, Dark Gray (Vinyl-Alkyd)
MIL-E-24306	(canceled) Enamel, Exterior, Black (Vinyl-Alkyd)
MIL-E-24307	(canceled) Enamel, Exterior, Gray (Vinyl-Alkyd)
MIL-P-28641	(canceled) Primer Coating, Vinyl Chloride Copolymer, High-Build (for Steel and Masonry)
MIL-P-28642	(canceled) Paint (Topcoat), Vinyl Chloride Acetate Copolymer, High Build (for Steel and Masonry)
MIL-E-82401	Enamel, Exterior, Vinyl-Alkyd, Red

3.7 US ARMY CORPS OF ENGINEERS STANDARDS:

CW-09940	Painting Hydraulic Structures and Appurtenant Works
V-106	Vinyl Type Red Oxide (Light or Dark Color) Paint
V-766	Vinyl-Type White (or Gray) Paint
VZ-108	Vinyl-Type Zinc-Rich Paint

3.8 U.S. BUREAU OF RECLAMATION STANDARDS:

VR-3	Vinyl Resin Paint
VR-6	Vinyl Resin Paint
VR-M*	Vinyl Resin Mastic

4. Surface Preparation

4.1 SSPC-SP 6, "Commercial Blast Cleaning," or SSPC-SP 8, "Pickling." If specified in the procurement documents, better degrees of blast cleaning shall be substituted (SSPC-SP 5 or 10).

COMMENT: Blast cleaning or pickling of the steel is the minimum recommended surface preparation for new work. Better degrees of blast cleaning (SSPC-SP 5 or 10) may be substituted. The high degree of cleanliness provided by these cleaning methods may be more economical or may be required for corrosive conditions. In maintenance repainting when only small areas need to be cleaned, hand or power tool cleaning (SSPC-SP 2 or 3) may suffice.

The U.S. Bureau of Reclamation, the Corps of Engineers, and some others require that white metal (SSPC-SP 5) or near-white (SSPC-SP 10) blast cleaning is mandatory for vinyl coatings.

5. Paints

5.1 WASH PRIMER: If specified in the procurement documents, a wash primer complying with SSPC-Paint 27*, "Basic Zinc Chromate - Vinyl Butyral Wash Primer," shall be applied.

COMMENT: Use of a wash primer is recommended for salt water immersion. For fresh water immersion, however, the wash primer is no longer recommended by most manufacturers. The vinyl butyral wash primer should be applied to bare metal only. In spot pretreating care should be taken to minimize overlapping old paint.

5.2 VINYL PRIMERS: After cleaning, the steel shall be primed with one coat of paint conforming with one of the following specifications.

5.2.1 U.S. Bureau of Reclamation Specification, VR-3, "Vinyl Resin Paint."

COMMENT: This high solid vinyl paint is available in white, medium gray, and aluminum colors. The aluminum is recommended as a topcoat only. A three-coat system is used for interior oil service (125 micrometers/5 mils minimum) and four-coat systems are used as interior lining for water service or for exterior service in water and sunlight (150 micrometers/6 mils minimum thickness). The white and medium gray are pigmented with titanium dioxide, extenders, and black tint. They are formulated with vinyl tripolymer and copolymer to meet requirements for overall composition, density, application, dry (three-hour recoat), stability, adhesion and cohesion, flexibility, permeability, resistance to solvent, salt-spray, and abrasion.

5.2.2 U.S. Bureau of Reclamation Specification VR-6, "Vinyl Resin Paint":

COMMENT: This system is similar to VR-3 except that it requires three intermediate coats and two finish coats for a total of 250 micrometers (10.0 mils) minimum dry film thickness. Complete system is intended especially for exterior service in water and sunlight.

5.2.3 Corps of Engineers Specification V-106, "Vinyl Type Red Oxide (Light or Dark Color) Paint":

COMMENT: Corps of Engineers Specification CW-09940, "Painting: Hydraulic Structures and Appurtenant Works," describes four- and five-coat paint systems using this and the following two primers.

5.2.4 Corps of Engineers Specification V-766, "Vinyl-Type White (or Gray) Paint":

COMMENT: See comment under Section 5.2.3.

5.2.5 Corps of Engineers Specification VZ-108, "Vinyl-Type Zinc-Rich Paint":

COMMENT: See comment under Section 5.2.3.

5.2.6 Federal Specification MIL-P-15930*, "Primer, Vinyl-Zinc Chromate Type, (for Hot Spray)":

COMMENT: The zinc chromate vinyl paint is similar to the above, but it is not used as widely on steel. It is not recommended for fresh water use.

5.2.7 Federal Specification MIL-L-2638, "Lacquer, Vinyl Resin, Gasoline and Water Resistant":

COMMENT: This system is intended for coating storage tanks and pipes. Pigments selected must be suitable for potable water service as defined by the Environmental Protection Agency.

5.2.8 SSPC-Paint 9, "White (or Colored) Vinyl Paint":

COMMENT: SSPC-Paint 9 is a white vinyl paint that may also be procured in tints. It can be used as a primer over wash primer or over bare steel and as an intermediate or finish paint over any vinyl paint. It is highly recommended as an inert pigmented vinyl paint for extremely severe chemical exposure that could attack wash primer pigments or other vinyl paint pigments.

5.2.9 Proprietary Primer:

COMMENT: A proprietary primer of proven performance capability may be substituted for any of the above if desired by the specifier. Specify the manufacturer, trade name, and product number of the desired proprietary paint.

5.3 INTERMEDIATE COAT(S) FOR VINYL PAINTING

SYSTEMS: The second coat of paint in a three-coat system may be the same as the first coat, but tinted to contrast with the primer; or when stipulated, it may be the same as the finish coat (third coat), but tinted to contrast with the finish coat. Paints shall be tinted by the manufacturer; otherwise only lampblack dispersed in vinyl chlorideacetate copolymer resin solution or similar black vinyl paint shall be used for tinting.

The primers listed above (particularly those of contrasting color) are suitable for intermediate coats. The primer or finish coat, except aluminum finish coats, may also be used as the third coat of a four-coat system, provided they are tinted to provide contrast with the preceding and following coats. If an aluminum finish coat is used, the next-to-last coat may be the same as the last (finish) coat except that the corresponding non-leafing pigment shall be used in place of leafing aluminum. Alternatively, the intermediate coat(s) of paint shall conform with the following specifications.

5.3.1 U.S. Bureau of Reclamation Specification VR-M*, "Vinyl Resin Mastic":

COMMENT: Used in conjunction with VR-3 and VR-6 vinyl paints, this high build coating is applied at bolts, rivets, and sharp corners.

5.3.2 Proprietary Intermediate:

COMMENT: A proprietary intermediate of proven performance capability may be substituted for any of the above if desired by the specifier. Specify the manufacturer, trade name, and product number of the desired proprietary paint.

5.4 VINYL FINISH COATS: The paint shall conform with one of the following specifications.

5.4.1 SSPC-Paint 8, "Aluminum Vinyl Paint":

COMMENT: SSPC-Paint 8 is an aluminum paint that may be used over any vinyl paint as a finish coat. Aluminum topcoats are preferred for water immersion, but not for use in alkaline or strongly acid exposures. This paint should not be used under other vinyl paints or applied in overly thick films (e.g., 75 micrometers/3 mils per coat) because of the possibility of solvent entrapment by the aluminum flake.

5.4.2 SSPC-Paint 9, "White (or Colored) Vinyl Paint":

COMMENT: An inert pigmented straight vinyl paint suitable for chemical exposures which may be used as a primer or an intermediate finish coat. It may be procured in colors by specifying the color desired and substituting suitable colored pigment for the titanium dioxide.

5.4.3 U.S. Bureau of Reclamation Specification VR-3, "Vinyl Resin Paint":

COMMENT: This vinyl coating is described under primers. Either the white, gray, or aluminum types may be used as finish coats, although the aluminum paint is not recommended for use as a primer or intermediate coat, nor is it recommended for use in alkali or strong acid. Because of its superior impermeability, however, it is the preferred topcoat for other services such as water immersion or exterior sunlight.

5.4.4 U.S. Bureau of Reclamation Specification VR-6, "Vinyl Resin Paint":

COMMENT: Vinyl coating system provides for white, black, color, and an aluminum topcoat as described in VR-3.

5.4.5 Proprietary Finish Paints:

COMMENT: A proprietary finish of proven performance capability may be substituted for any of the above if desired by the specifier. Specify the manufacturer, trade name, color, and product number of the desired proprietary paint.

6. Paint Application

6.1 PAINT APPLICATION: Follow requirements of SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel":

COMMENT: To obtain the required thickness per coat, without pinholing or sagging, airless spray or hot spray with multiple passes are helpful. Single wet coats more than 75 to 125 micrometers (3 to 5 mils) thick, on the other hand, can lead to solvent release problems unless specially formulated highbuild coatings are used.

Sufficient time should be allowed for air drying between coats to assure essentially complete solvent removal. Dry to touch is not a good indication of complete dryness since

retained solvent is very slow to diffuse out, and if not removed, greatly reduces resistance and durability of the paint film. Air dry as much as 24 hours between coats is desirable if feasible.

6.2 FIELD TOUCH-UP PAINTING: In accordance with specification SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel" and in particular with the Section thereof entitled "Field Painting."

6.3 MAINTENANCE PAINTING: For maintenance painting procedures, see SSPC-PA Guide 4, "Guide to Maintenance Repainting with Oil Base or Alkyd Painting Systems."

COMMENT: This guide covers the steps necessary for repainting previously painted steel surfaces.

6.4 NUMBER OF COATS: A minimum of three.

COMMENT: A minimum of three coats of conventional vinyl paint are recommended for the less severe exposures. For very severe exposures, four coats are recommended; and for extremely severe exposures, five or six coats may be required. Complete immersion in corrosive liquids requires thick films and consequently more coats.

Two coats of conventional vinyls on structural steel will result in an uneconomically thin paint film. The thin paint film results in short life of the coating due to inadequate coverage of the blast profile pattern.

6.5 DRY FILM THICKNESS OF PAINT SYSTEM: For conventional vinyl coatings not less than the following as measured in accordance with SSPC-PA 2, "Measurement of Dry Coating Thickness with Magnetic Gages": wash primer, when required, 8 micrometers (0.3 mils); primer 33 micrometers (1.3 mils); for a three-coat painting system 100 micrometers (4.0 mils); for a four-coat painting system 125 micrometers (5.0 mils); for a five-coat painting system 150 micrometers (6.0 mils).

COMMENT: Conventional vinyl coatings contain a high level of solvent and are best applied by air spray in coats of not more than 50 micrometers (2 mils) each. High-build vinyl coatings especially formulated for airless spray can be applied up to 125 micrometers (5 mils) dry film thickness with proper equipment and technique. If done improperly, excessive amounts of solvents can be retained in the dry coating.

7. Inspection

7.1 All work and materials supplied under this specification is subject to timely inspection by the purchaser or his authorized representative. The contractor shall correct such work or replace such material as is found defective under this specification. (See Note 9.1.) In case of dispute, unless otherwise specified, the arbitration or settlement procedure established in the procurement documents shall be fol-

lowed. If no arbitration procedure is established, the procedure specified by the American Arbitration Association shall be used.

7.2 Samples of paints under this painting system may be requested by the purchaser and shall be supplied upon request along with the manufacturer's name and identification for the materials. Samples may be requested at the time the purchase order is placed, or may be taken from unopened containers at the job site.

7.3 Unless otherwise specified, the sampling shall be in accordance with ASTM D 3925.

8. Disclaimer

8.1 While every precaution is taken to ensure that all information furnished in SSPC standards and specifications is as accurate, complete, and useful as possible, SSPC cannot assume responsibility nor incur any obligation resulting from the use of any materials, coatings, or methods specified herein, or of the specification or standard itself.

8.2 This specification does not attempt to address problems concerning safety associated with its use. The user of this specification, as well as the user of all products or practices described herein, is responsible for instituting appropriate health and safety practices and for insuring compliance with all governmental regulations.

9. Notes

Notes are not a requirement of this specification.

9.1 The procurement documents should establish the responsibility for samples, testing, and any required affidavit certifying full compliance with the specification.

9.2 Most vinyl paints listed in this specification are compatible with one another; however, several precautions shall be taken when using vinyl paints. The vinyl paint should be vinyl chloride acetate copolymer, modified by carboxyl or hydroxyl groups if required. Some vinyl primers are satisfactory over wash primer only, some over bare steel only, while some may be used over either. Some vinyl paints will not adhere to wash primers, but must be used over a suitable intermediate coat (many proprietary vinyl paints are of this type).

9.3 Vinyl painting systems are excellent for very severe exposures, including most chemical atmospheres, fresh and salt water immersion, and corrosive environments. Discretion should be exercised when used for immersion in corrosive chemicals such as inorganic acids, alkalis, and salts or in liquids such as aliphatics, alcohols, oils, and

grease. However, they are dissolved by some organic solvents such as aromatics, ketones, ethers, and esters, and attacked by some chemicals such as fuming nitric acid, 98% sulfuric acid, and acetic acid.

* These paints contain lead or chromate. Users are urged to follow all health, safety, and environmental requirements in applying, handling or disposing of these materials.