

SECTION 980 PAINT

980.1 STRUCTURES

Products used in the coating system for structures, including thinners, must be supplied by the same manufacturer. Containers shall clearly show the name of manufacturer, brand name, lot number and date of manufacture.

A. Ethyl Silicate Zinc Rich Primer: Inorganic zinc silicate primer shall be a 2 component self-curing type which cures without the use of a separate curing solution.

1. Composition: Zinc dust shall conform to ASTM D 520, Type I, modified to allow 0.1% retained on the No. 100 (150 μ m) sieve.

The vehicle component shall consist primarily of a partially hydrolyzed ethyl silicate in an appropriate solvent. The mixed paint shall have the following properties:

- a) Zinc portion shall be at least 75% by weight of the total solids of the dried coating.
- b) Total solids shall be at least 72% by weight.
- c) The color shall be distinct contrast with the blast cleaned metal and the finish coat.

2. Resistance: Test panels meeting ASTM D 609, having minimum dimensions of 2"x 5"x1/8" (50 mm by 125 mm by 3 mm), shall be prepared by cleaning all surfaces per SSPC SP 10 with a 1 to 3 mil (0.025 mm to 0.076 mm) profile. A 3 mil (0.076 mm) Dry Film Thickness (DFT) coating shall be applied and curing in accordance with the manufacturer's recommendations. Individual test panels must pass the following tests:

- a) **Fresh Water Resistance:** Panels shall be scribed down to base metal with an X having a least 2" (50 mm) legs and immersed in tap water at 75EF \pm 5EF (24EC \pm 3EC). The panels shall show no rusting, blistering or softening after 30 days. Solution shall be replenished after 7 and 14 days.
- b) **Salt Water Resistance:** Same as Section 980.A.2.a except panels shall be immersed in 5% Sodium Chloride solution.
- c) **Salt Fog Resistance:** Panels shall be scribed down to base metal with an X having at least 2" (50 mm) legs. Panels shall then be tested in accordance with ASTM B 117. After 1000 hours, the coating shall show no loss of adhesion, rusting, blistering or softening.

B. High Build Aliphatic Polyurethane Finish Coat: High build aliphatic polyurethane finish coat shall be a 2 component weather resistant, semi-gloss finish topcoat. The

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finish coat shall be compatible with previously applied coats, when applied to provide a finish coat film of 4 mils (0.10 mm) DFT.

Solids by weight shall be a minimum of 62% in accordance with ASTM D 1644. Solids by volume shall be a minimum of 54%.

The coating shall not run or sag when applied at 10 mils (0.254 mm) WFT, unthinned. The coating must be sprayable to a uniform semi-gloss finish, when thinned to a maximum level resulting in 3.5 lbs./gal. (2 kg/L) volatile organic compound or less.

The coating color shall be as specified in the contract. A set of color chips from the manufacturer shall be submitted to the office of Bridge Design for color selection.

C. Aluminum Filled Epoxy Mastic Primer: The aluminum filled epoxy mastic shall be a 2 component epoxy. The epoxy mastic must have excellent adhesion to rusty steel and most deteriorated coating systems. The epoxy mastic shall contain a rust inhibiting system which effectively controls undercutting of paint film.

1. Composition: The primary pigment shall be aluminum. Lead containing pigments shall not be present. The vehicle shall be of the epoxy-type and shall not contain coal tar. The curing agent shall allow trouble free application during normal humidity conditions.

The epoxy mastic shall contain at least 80% solids by weight in accordance with ASTM D 1644. (Modified to a dry time of 72 hours at 100E F (38E C)., rather than 3 hours at 105E F (41E C).)

2. Flexibility: Apply 5 mils (0.127 mm) of the epoxy mastic on a 1/8"x 30"x 4" (3 mm by 750 mm by 100 mm) steel panel sandblasted in accordance with SSPC SP 5. Cure the coating for 2 weeks at 75EF (24EC). The coating shall show no signs of cracking or loss of adhesion after the panel is uniformly bent around an 8" (200 mm) diameter mandrel.

3. Resistance: The epoxy mastic shall meet or exceed the resistance tests when applied in the following manner. Steel panels 2"x 5"x 1/8" (50 mm by 125 mm by 3 mm) meeting the requirements of ASTM D 609 shall be sandblasted in accordance with SSPC SP 5. Expose the panels to the weather for 30 days so uniform rusting occurs. Hand clean the panels with a wire brush in accordance with SSPC SP-2. Spray apply the epoxy mastic to the panels at 6 mils (0.152 mm) DFT in one coat. Cure the coating as recommended by the manufacturer.

a) Fresh Water Resistance: Panels shall be scribed down to base metal with an X having at least 2" (50 mm) legs and immersed in tap water at 75EF ±5EF (24EC ±3EC). After 30 days, the panel shall be unaffected except for discoloration. There shall be no blistering, softening or visible rusting of the coating beyond 1/16" (1.5 mm) from the center of the scribe.

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- b) **Salt Water Resistance:** Same as Section 980.C.3.a except panels shall be immersed in 5% Sodium Chloride solution. The solution shall be replenished with fresh solution after 7 and 14 days.
- c) **Salt Fog Resistance:** Panels shall be scribed down to base metal with an X having at least 2" (50 mm) legs. Panels shall then be tested in accordance with ASTM B 117. After 1000 hours, the coating shall show no loss of bond, nor shall it show rusting or blistering beyond 1/16" (1.5 mm) from the center of the scribed mark.
- d) **Weathering Resistance:** Panels shall be tested in accordance with ASTM G 23, Type D. Begin testing on the wet cycle. After 1000 hours the coating shall show no rusting, loss of adhesion or blistering.

980.2 TRAFFIC PAINT

- A. **Traffic Paint (Alkyd):** This specification is for fast drying white and yellow alkyd resin ready mixed paint used for pavement marking. The paint shall be used with drop on or spray on glass beads for application to Portland cement concrete and asphalt concrete pavements.

The pavement marking paint (alkyd) shall comply with the requirements of AASHTO M 248-91 "Ready-Mixed White and Yellow Traffic Paints" with the following exceptions:

- 1. AASHTO M-248-91, Section 4.1.2 shall be revised as follows:
ASTM D476 Type I Anatase, or Type II Rutile shall be used.
- 2. AASHTO M-248-91, Section 5.2.1, shall be revised as follows:
The extracted pigment shall meet the requirements of Tables 2-A and 2-B as revised in this specification.

TABLE 2-A
Composition of Pigment White Traffic Paint

Pigment Ingredients (% of Pigment)	Type F
Titanium Dioxide, Min. (Pure)	17.5
Calcium Carbonate	35.0-40.0
Magnesium Silicate	35.0-43.0
Zinc Oxide, Min.	3.0

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TABLE 2-B

Composition of Pigment Yellow Traffic Paint

)		
Pigment Ingredients		Type F
(% of Pigment)		
)		
Lead Chromate, Min. (Pure)		16.7
Magnesium Silicate		35.0-43.0
Calcium Carbonate		35.0-40.0
)		

AASHTO M 248-91, Section 5.3 shall be revised as follows:

Delete contents of Table 3 in AASHTO M 248-91 and replace with the following:

TABLE 3

Composition of Non-Volatile
Vehicle White and Yellow Traffic Paint

)			
Vehicle Ingredients	Acrylic	Chlorinated	
(% by Weight of Vehicle)	Copolymer*	Rubber	
	Type F**	Type F**	
)			
Alkyd resin Solids (+/-0.5%)	41.14	37.6	
Acrylic Copolymer, (BR-201) (+/-0.5%)	47.25		
Chlorinated Rubber (+/-0.5%)		37.0	
Chlorinated Paraffin (+/-0.5%)	11.61	25.4	
)			

* Solvent is 100% MEK except for alkyd resin solution.

** Either Acrylic Copolymer Type F or Chlorinated Rubber Type F may be supplied under this specification.

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AASHTO M 248-91, Section 5.4 shall be revised as follows:

Table 4-A
Quantitative Requirements of White Paint

Characteristics	Type F
Titanium Dioxide (as% of Extr. Pigment) (Min.) (Pure)	17.5
Pigment (%)	49.0-51.0
Total Solids (%) (Min.)	69.0
Vehicle Solids (%) (Min.)	38.0
Weight per Gallon (Lbs.) (Min.) (Kilograms per Liter)	11.1 (1.33)
Viscosity (K.U.)	70-85
Fineness of Grind (Hegman) (Min.)	2.0
Drying Time (Minutes)	10.0 Max.
Directional Reflectance, (%) (Min.)	80.0
Uncombined Water (%) (Max.)	1.0
Particles and Skins Retained on a No. 325 (45 µm) Sieve (%) (Max.)	1.0

TABLE 4-B
Quantitative Requirements of Yellow Paint

Characteristics	Type F
Lead Chromate (as % of Extr. Pigment) (Min.) (Pure)	16.7
Pigment (%)	50.0-52.0
Total Solids (%) (Min.)	69.5
Vehicle Solids (%) (Min.)	38.0
Weight per Gallon (lbs.) (Min.) (kilograms per Liter)	11.3 (1.35)
Viscosity (K.U.)	70-85
Fineness of Grind (Hegman) (Min.)	2.0
Drying Time (Minutes) (Max)	10.0 Max
Color (to pass Fed. Std.)	
Directional Reflectance, (%) (Min.)	50
Uncombined Water (%) (Max.)	1.0
Particles and Skins Retained on a No. 325 (45 µm) Sieve (%) (Max)	1.0

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Acceptance: See subsection 980.3 C. for the acceptance requirements for the alkyd resin paint.

- B. Traffic Paint (Waterborne):** This specification is for fast dry white and yellow acrylic latex traffic marking paint used for pavement marking. The paint shall be used with drop on or spray on glass beads for application to Portland cement concrete and asphalt concrete pavements.

The exact composition of the paint shall be as specified by the manufacturer and conform to the requirements contained in the table below:

The vehicle shall be composed of a 100 percent acrylic polymer such as Rohm and Haas E-2706, or an approved equal.

Weight per gallon @ 77EF pounds, min.	12.0
(kg/cubic Liter @ 25EC),	(1.44)
Viscosity, Krebs Stormer, 77EF (25EC), K.U.	80-100
Grind, Hegman, minimum	3
Total Solids, percent by weight, minimum	73
Non-volatile vehicles, percent by weight, minimum	43
Pigment, percent by weight, white	58-62
Pigment, percent by weight, yellow	57-59
Titanium Dioxide, white paint, lbs./gal., min.	1.0
(kg/Liter)	(0.12)
Dry Time, 12 min. (0.30 mm) wet film, @ 65% RH, minutes, max.	12
Dry Through, @ 90% RH, Daylight Directional Reflectance, white, minimum	83
Daylight Directional Reflectance, yellow, minimum	50
Contrast Ratio, minimum	0.98
Bleeding Ratio, minimum	0.97
Flexibility and Adhesion	No cracking or flaking
Water Resistance	No blistering or loss of adhesion
Settling	Rating of 6 or better
Skinning, 48 hrs.	None
Track Free Time, minutes, maximum	3
pH, minimum	9.6

- 1. Organic Yellow Pigment:** The prime pigment in the organic yellow paint shall be Color Index Pigment Yellow Number 65 or 75.

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2. **Color:** The color of the dry white paint shall be a pure flat white free of tint. The color of the yellow paint shall match Color Number 33538 of Federal Standard 595 and shall conform to the following CIE Chromaticity limits:

x		0.462		0.470		0.479		0.501
y		0.438		0.455		0.428		0.452

3. **Heavy Metals:** The white and organic yellow paints shall be free of lead, chromium, and other toxic heavy metals as defined by the U.S. Environmental Protection Agency.
4. **Testing Requirements:**

Weight Per Gallon (Liter)	ASTM D 1475
Viscosity	ASTM D 562
Fineness Of Grind	ASTM D 1210
Total Solids	ASTM D 2369
Total Pigment	ASTM D 3723
Titanium Dioxide	ASTM D 4563; D 1394
Medium Chrome Yellow	ASTM D 126
Dry Time -12 mils (0.30 mm) wet	ASTM D 711 (modified)
Daylight Directional Reflectance	ASTM D 2805
Contrast Ratio - 15 mils (0.381 mm) wet	ASTM D 2805
Bleeding Ratio	Federal Specification TT-P-85
Color	ASTM D 2805
pH	ASTM E 70

- a. **Flexibility and Adhesion:** Apply 15 mil (0.381 mm) wet film thickness of paint to a 3-inch by 5-inch (75 mm by 125 mm) tin panel. Dry the sample at 77EF (25EC) for 24 hours followed by two hours at 122EF (50EC). When the sample is bent over a 1/2 inch (13 mm) mandrel, the paint shall adhere firmly without cracking or flaking.
- b. **Water Resistance:** Apply 15 mil (0.381 mm) wet film thickness of paint to 4-inch by 8-inch (100 mm by 200 mm) glass plates and dry at 77EF (25EC) for 72 hours. Immerse in distilled water at 77EF (25EC) for 24 hours and then allow the samples to air dry for two hours on a flat surface. The paint shall show no blistering or loss of adhesion.
- c. **Skinning:** After 72 hours in a tightly sealed 3/4 filled container, the paint shall be free of lumps and skins when strained through a No. 100 (150 µm) sieve.
- d. **Settling:** A homogeneous sample of paint in a full one pint (0.5 Liter) friction top can shall be inverted for one hour to insure a complete seal between the cover and body of the can. After one hour the can shall be placed upright in an oven at 120EF (49EC). After five days the can shall be cooled to room temperature for four hours. When tested according to

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ASTM D 869, the degree of settling shall have a rating of 6 or better.

- e. **Track Free Time:** When applied under the following conditions, the paint line shall show no visual tracking when viewed from 50 feet (15 meters) after driving a passenger vehicle over the line at a speed from 25 to 35 miles per hour (40 to 55 kilometers per hour).

15 mils (0.38 mm) wet film thickness.

6 pounds of glass beads per gallon (720 kg/cubic meter) of paint.

Paint temperature at nozzle between 100EF to 120EF (37EC to 49EC).

Pavement temperature from 45EF to 120EF (7EC to 49EC).

- f. **Dry Time:** Test according to ASTM D 711, except wet film thickness shall be 12 ± 1 mils ($0.30 \text{ mm} \pm 0.02 \text{ mm}$). The applied film shall be immediately placed in an humidity chamber controlled at 65 percent ± 3 percent relative humidity and $72.5\text{EF} \pm 2.5\text{EF}$ ($22.5\text{EC} \pm 1\text{EC}$). The air flow across the sample shall be less than one foot (300 mm) per second.

- g. **Dry Through:** The film shall be applied to a nonabsorbent substrate at a wet mil thickness of 12 mils ± 1 mils ($0.30 \text{ mm} \pm 0.02 \text{ mm}$) and placed in a humidity chamber controlled at 90 percent ± 5 percent relative humidity and at $72.5\text{EF} \pm 2.5\text{EF}$ ($22.5\text{EC} \pm 1\text{EC}$). The dry through time shall be determined by ASTM D 1640, except that the pressure exerted shall be the minimum needed to maintain contact with the thumb and film.

The following is applicable to both Sections 980.2 A. and 980.2 B.

ACCEPTANCE BY MANUFACTURER CERTIFICATION

The manufacturer shall submit a "Certificate of Compliance" for each batch of paint produced for use in South Dakota under this specification. The certification shall contain the manufacturer code number and batch number along with the test results of each batch for weight per gallon, viscosity, drying time, percent pigment, percent vehicle, and fineness of grind.

The Certificate of Compliance shall be submitted to the South Dakota Department of Transportation, Chemical Tests Engineer, 700 East Broadway Avenue, Pierre, South Dakota 57501.