SECTION 1080
PAINT AND PAINT MATERIALS

1080-1 GENERAL

All batches or lots of paint products shall be Department approved prior to use. Self-curing inorganic zinc paint shall also be pre-qualified as required in Section 1080-5. Deliver all Department approved paints to the point of application in sealed and original containers clearly marked with the type of paint and batch or lot numbers clearly labeled on the container. At the point of application all paints shall arrive ready to be mixed for use without additional oil or thinner. Mix all paints in accordance with the manufacturer's printed instructions. All paints or paint components that harden or curdle in the container and will not break up with a paddle to form a smooth, uniform consistency will be rejected. Any thinning necessitated by weather conditions shall be approved in writing and use only those thinners approved by the manufacturer. Thinning of any waterborne paints shall be prohibited. Upon receipt at the point of application, store all paint materials in a moisture free environment between 40°F and 110°F or at such temperatures within this range recommended by the manufacturer of which the more stringent shall apply. The storage areas shall be equipped with a device capable of recording daily high and low temperatures.

1080-2 PAINT VEHICLES, THINNERS AND DRIERS

Paint vehicles, thinners and dryers shall meet the requirements for these ingredients that are included in the *Standard Specifications* for the paint being used. Only ingredients recommended by the manufacturer which have a history of compatibility with each other and so recorded on the manufacturer product data sheet may be used.

1080-3 PACKING AND MARKING

Ship paint and paint materials in strong, substantial containers that are properly labeled and plainly marked with the weight, color and volume in gallons of the paint content; a true statement of the percentage composition of the pigment; the proportions of pigment to vehicle; and the name and address of the manufacturer. Any package or container not so marked as described above or exceeding 5 gallons total volume shall require prior approval by the Department. .

1080-4 INSPECTION AND SAMPLING

All paint components shall be sampled and approved by the Department or an approved representative, either at the point of manufacture or at the point of application. Inspection and sampling will be performed at the point of manufacture wherever possible. The Contractor shall not begin painting until the analysis of the paint has been performed, and the paint has been accepted by the Department. When sampling paint products, use the Department sampling procedure. In order for materials to be evaluated and accepted by the Department, coating manufacturers shall submit completed performance test data from the National Transportation Product Evaluation Program (NTPEP) or test results from ISO certified laboratories reporting requirements as required for each paint listed in Section 1080-5 through 1080-9.

1080-5 SELF-CURING INORGANIC ZINC PAINT

Use only Department approved and qualified inorganic zinc paint. These products shall be requalified every five years unless the formulation of the product or manufacturing process is changed in which case, the product shall be requalified before use. Samples for qualification shall be submitted six months in advance. Ensure the paint manufacturer submit the following at the same time to the State Materials Engineer.

(A) A minimum one quart sample of each component of paint including the manufacturer's name, location, product name, mixing instructions, batch number and SDS.

(B) At least three panels prepared as specified in 5.5.10 of AASHTO M 300, Bullet Hole Immersion Test.

(C) At least six panels of 4 inch x 6 inch x 1/4 inch for the MEK Rub test, ASTM D4752 and the Adhesion Pull Test, ASTM D4541.

For new qualifications or where product formulation has changed provide the Department the following.

(A) A certified test report from an approved independent testing laboratory that the product has been tested for slip coefficient and meets AASHTO M 252, Class B.

(B) A certified test report from an approved independent test laboratory for the Salt Fog Resistance Test, Cyclic Weathering Resistance Test, and Bullet Hole Immersion Test as specified in AASHTO M 300.

Use the same batch of paint for all samples and panels. The independent test laboratory report may be for a typical batch of the same product. Submit samples and reports for qualification at least six months in advance of anticipated need. The Materials and Tests Unit will conduct all tests of paints in accordance with the latest ASTMs, Federal Test Method Standard No. 141 and various other methods in use.

Use a self-curing inorganic zinc paint meeting the Type I Inorganic Zinc Primer paint specified in AASHTO M 300 and the following:

(A) Use mixed paint with zinc content of not less than 72% by mass of the total solids.

(B) The slip coefficient meets AASHTO M 253, Class B.

(C) The adhesion shall be no less than 400 psi in accordance with ASTM D4541.

(D) Cure the paint to meet the solvent rub requirements in ASTM D4752.

(E) Formulate the paint to produce a distinct contrast in color with the blast cleaned metal surfaces and with the finish paint.

1080-6 COAL TAR EPOXY PAINT

Use coal tar epoxy paint meeting SSPC-Paint 16.

1080-7 ORGANIC-ZINC REPAIR PAINT

Use organic-zinc repair paint meeting SSPC-Paint 20 Type II or Federal Specification TT-P-641. Organic-zinc repair paint is not tinted and is applied 3 to 4 wet mils of paint per coat. Do not use zinc paint in aerosol spray cans.

1080-8 METALLIZATION SEALERS

Use low-viscosity, clear or colored and pigmented as approved by the Engineer. Sealer products are formulated to flow over and be absorbed into the natural pores of the thermal sprayed coating (TSC). The pigment particle size for colored sealer must be small enough to flow easily into the pore of the TSC, nominally a 5-fineness of grind per ASTM D1210.

1080-9 WATERBORNE PAINTS

Paint manufacturers must have a Department approved and qualified self-curing inorganic zinc product to submit a waterborne paint product for approval.

(A) Composition

Use ingredients and proportions as specified in Tables 1080-7 through 1080-14. Do not use Chrome Green.

Provide raw materials based on the specified ingredients that are uniform, stable in storage, and free from grit and coarse particles. Do not use rosin or rosin derivatives.

Beneficial additives such as anti-skinning agents, suspending agents or wetting aids are allowed.

(B) Properties

(1) General

Use both Type I and II paints that meet Tables 1080-7 through 1080-14.

(2) Odor

Normal for the materials permitted in accordance with ASTM D1296.

(3) Color

The colors before and after weathering when compared with Federal Test Method Standard No. 595B are Brown #30045, Green #24108 and Gray #26622. There are no color requirements for white waterborne paint. The Engineer may approve the use of semi-gloss or gloss products for the above Department colors.

(4) Working Properties

Use a paint that is easily applied by brush, roller or spray when tested in accordance with Federal Test Method Standard No. 141, Methods 4321, 4331 and 4541. Ensure that the paint shows no streaking, running or sagging during application or while drying.

(5) Storage Conditions

Prior to application, ensure that the paint shows no thickening, curdling, gelling or hard caking when tested as specified in Federal Test Method Standard No. 141, Method 3011, after storage for 6 months from the date of delivery, in a full, tightly covered container, at a temperature of 50°F to 110°F.

(6) Skinning

No skinning is allowed in a 3-quarters filled closed container after 48 hours when tested in the standard manner specified in Federal Test Method Standard No. 141, Method 3021.

(7) Salt Contamination

Minimize the content of salt contamination by the incorporation of only high purity materials. Ensure that the specific resistance of the aqueous leachate of the composite of the pigments in required proportions is at least 5,000 ohm-cm when tested in accordance with ASTM D2448.

(8) Early Rust Resistance

Provide each type of paint that meets the early rust requirements specified in Materials and Tests Standards CLS-P-1.0.

(C) Inspection

All materials supplied under this Specification are subject to random inspection by the Department.

Supply samples of any or all ingredients used in the manufacture of this paint, along with the supplier's name and identification for the material when requested.

(D) Volatile Organic Compound (VOC) Content

Ensure that the VOC content after formulation, but before thinning, complies with the VOC limit for the applicable coatings category per Federal regulations. Notify the

coating specifier if State or local regulations reduce the maximum VOC content permitted for coatings applied in a specific locality.

(E) Color Variation

A color variation of 5 Δe units from the specified color will be acceptable. After 3 months weathering, the color shall not vary more than 5 Δe units from the original color value.

Table 1080-1
Composition of Pigments for Waterborne Paints, % By Weight

Property	Brown		White		Gray		Test Method
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	
Pigment Content	20%	25%	35%	40%	13%	17%	ASTM D3723
Major Pigments							
Calcium Carbonate	-	-	30%	-	-	-	ASTM D1159
Magnesium Silicate	-	-	-	12%	-	-	ASTM D605
Titanium Dioxide	-	-	45%	-	70%	-	ASTM D476, Type II
Zinc Phosphate	10%	-	10%	-	10%	-	NCDOT M&T P-10
Iron Oxide	45%	-	-	-	-	-	ASTM D3721
Tinting Pigments							
Lamp Black	-	-	2%	-	-	-	ASTM D209
Phthalocyanine Pigments	-	-	-	2%	-	-	ASTM D1135 & D3256
Acid Soluble Pigments [A]	-	-	-	0	-	0	-
Lead	-	0.005%	-	0.005%	-	0.005%	-
Volatiles	-	2.0 lb/gal	-	2.0 lb/gal	-	2.0 lb/gal	ASTM D2369
Coarse Particles and Skins, as Retained on Std. 325 Mesh Screen	-	0.5%	-	0.5%	-	0.5%	ASTM D185
Rosin or Rosin Derivatives	-	0	-	0	-	0	ASTM D1542

A. Use a 5% acetic acid solution with a pH 4 + 2 to determine solubility.

Table 1080-2
Composition of Vehicle for Waterborne Paints, % By Weight

Property	Brown		White		Gray		Test Method
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	
Total Vehicle	73%	80%	60%	65%	83%	87%	NCDOT M&T P-10
HG-56 [A] Solids	30%	-	30%	-	30%	-	
Water	-	55%	-	55%	-	58%	
Methyl Carbitol	5%	-	5%	-	5%	-	
Texanol	2%	-	2%	-	4%	-	

A. Or approved equivalent

Table 1080-3
Properties of Waterborne Paints, % By Weight

Property	Brown		White		Gray		Test Method
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	
Consistency [A] Sheer Rate 200 rpm, Ounces	255	350	255	350	255	350	ASTM D562
Consistency [A] Sheer Rate 200 rpm, KIrebs units	3.2	3.5	3.2	3.5	90	100	ASTM D562
Density, lb./US gallon	9.7	-	11.0	-	9.35	-	ASTM D1475
Fineness of Grind, Hegman Units	5.0	-	5.0	-	5.0	-	ASTM D1210
Drying Time, Hours, Tack Free	-	3	-	3	-	3	ASTM D1640
Drying Time, Hours, Dry Hard	-	24	-	24	-	24	ASTM D1640
Flash Point, F (degrees)	Report Value	Report Value	Report Value	Report Value	Report Value	Report Value	ASTM D13278
Early Rust	9	-	9	-	9	-	NCDOT M&T CLS-P-1.0
Leneta Sag Test	10+	-	10+	-	10+	-	
Gloss, Specular @ 60 degrees	Report Value	Report Value	Report Value	Report Value	40	-	
pH	8.0	9.0	8.0	9.0	8.0	9.0	ASTM
Adhesion [B]	4B	-	4B	-	4B	-	ASTM D3359
Color, Fed. Std. 595C	30045	-	-	-	26622	-	ASTM D2244

A. Consistency 48 hours or more after manufacture.
B. Prepare the specimen for adhesion by applying 2 dry mils of coating to a 3 inch X 5 inch X 0.25 steel panel cleaned to a minimum SSPC-SP-6 finish with a 1.7 +0.5 mil profile.

1080-10 PAINT FOR VERTICAL MARKERS

For vertical markers, use a waterborne acrylic or alkyd type material meeting Table 1080-15. Apply sufficient paint to completely cover the color of the underlying substrate along with any surface imperfections.

TABLE 1080-4
PROPERTIES OF PAINT FOR VERTICAL MARKERS

Property	Requirement	Test Method
Color	# 27040 Black or # 13538	Federal Color Std. 595
Adhesion to Substrate	3A Min.	ASTM D3359

1080-11 EPOXY RESIN FOR REINFORCING STEEL

Submit prequalified products other than those now approved for use to the State Materials Engineer for approval. Requalify each product every 5 years and any time a change is made in the manufacturing process or chemical composition of the epoxy resin.

Use powdered resin of any color that provides contrast to the corroded or uncorroded surface of the steel. Provide material of the same quality as that used for prequalification tests and as represented by test reports forwarded to the State Materials Engineer.

Ensure the manufacturer of the epoxy resin supplies to the coating applier information on the resin that is essential to the proper use and performance of the resin as a coating. Ensure the manufacturer of the resin furnish the coating applier a written certification signed by a responsible officer of the company that the material furnished for coating the reinforced steel is the same formulation as that for which test reports were previously submitted to the State Materials Engineer.

With each batch of coating material, furnish a written certification by the coating applier to the Engineer which properly identifies the batch number, material, quantity represented, date of manufacture, name and address of manufacturer and includes a statement that the supplied coating material is the same composition as that prequalified.

1080-12 ABRASIVE MATERIALS FOR BLAST CLEANING STEEL

Select the gradation of the abrasive to impart the anchor profile specified.

(A) Mineral and Slag Abrasives

Use blasting abrasives with suitable steel or mineral abrasives containing no more than 100 ppm of any corrosive compound such as sulfate or chloride or 100 ppm of any EPA characteristic waste compound such as lead, chromium or arsenic. Mineral and slag abrasives as defined by SSPC AB-1 are not to be recycled without written permission from the Department. The end user of the abrasive (e.g. shop or contractor), shall provide the Department with the abrasive conformance testing certificate as required in SSPC AB-1 and perform field quality control testing immediately prior to use at the minimum frequency specified in SSPC AB-1.

(B) Ferrous Metallic Abrasives

Ferrous metallic abrasives are new and previously unused material. The end user e.g. shot or contractor) of the abrasive shall provide the Department with the abrasive conformance testing certificate as required by SSPC AB-3 and perform the abrasive cleanliness testing and conductivity testing immediately prior to use when not recorded on the manufacturer's certification. The frequency for this testing is once per 55 gallon barrel of abrasive.

(C) Cleanliness of Recyclable Ferrous Metallic Abrasives

Shop facilities shall annually acquire a composite sample of their recycled abrasive (work mix) in the Department's presence. A composite sample is a mixture of individual samples taken from a minimum of three separate areas of the work mix. The composite sample is to be tested at an accredited laboratory and provide the Department with a TCLP analysis and sulfate and chloride testing. The shop shall provide annually, the Department with a notarized Type 3 certification certifying the plant location has not used their facilities or equipment for the removal of lead based coatings. Prior to starting work, field contractors recycled work mix used shall meet the requirements of SSPC AB-2 prior to first use for each Department project.

Shop and Field Contractors cleaned work mix shall meet the requirements of SSPC AB-2 and maintain the size and shape of the abrasive to impart the specified profile. The quality control inspector shall document and test the cleaned work mix prior to starting work once every 12 hours or once every work shift whichever period is shorter. Abrasive testing shall meet and be performed in accordance with SSPC AB-2, ASTM D4940 (Water Soluble Contaminants), ASTM D7393 (Oil Content), SSPC PA-17 (Particle Size Distribution) and the Contract documents.

Nonconforming work mix shall not be used, shall be removed from equipment and shall be disposed of in accordance with federal, state, and local regulations and project specification requirements. If non-compliant work mix is detected during continuous recycling following three failing testing attempts blasting and handling equipment shall be checked for residual contamination after removal of the contaminated media. Following cleaning, new compliant media should be fed through the equipment and shall be tested for compliance with requirements of SSPC-AB 2 before production work resumes.

1080-13 FIELD PERFORMANCE AND SERVICE

Do not use paint products inspected by the Engineer and found to exhibit poor performance in similar North Carolina environments. Poor performance is defined as any coating failing to meet ASTM D610, Grade 5, or having greater than 3% rusting or disbonding before attaining 5 years of service.

SECTION 1081
EPOXY AND ADHESIVES

1081-1 EPOXY RESIN SYSTEMS

(A) Classification

The types of epoxies and their uses are as shown below:

Type 1 - A low-modulus, non-sag gel adhesive used to bond or repair damp, vertical or overhead surfaces. Typical applications include walls, concrete foundations, concrete pipe, conduit and ceilings.

Type 2 - A low-modulus, general-purpose adhesive used in epoxy mortar repairs. It may be used to patch spalled, cracked or broken concrete where vibration, shock or expansion and contraction are expected. Feather-edged patching is not recommended with this material; instead, the adjacent concrete perimeter should be sawed at least 1/4 inch to 1/2 inch deep and any remaining concrete chipped away to provide a vertical interface between the epoxy mortar and concrete.

Type 3 - A high-modulus general-purpose adhesive used to bond plastic concrete or hardened concrete to hardened concrete or other structural materials. It may be used to produce a high-strength epoxy mortar grout bed for equipment or to patch interior spalls, cracks or broken concrete. It is not recommended for exterior patching because its rate of thermal expansion and contraction differs too greatly from concrete. It may be used for anchoring bolts where a flowable adhesive is required.