

MODIFIED BY EI 84-022 EFFECTIVE 7/19/84 & EI 86-008 EFFECTIVE 2/18/86	<h1>ENGINEERING INSTRUCTION</h1> <p>NEW YORK STATE DEPARTMENT OF TRANSPORTATION</p>	
<b>SUPERSEDED BY EI 88-036</b> <b>EFFECTIVE 10/14/88</b>	SUBJECT: COAL TAR EPOXY PROTECTIVE COATING FOR PAINTING EXISTING BRIDGES Subject Code: 7.27-1-570	
Distribution: 31 Main Office    33 Regions    34 Special		Code: EI 84-8
APPROVED: <i>E. V. Hourigan</i> E. V. Hourigan, Deputy Chief Engineer, Structures Div. <i>J. J. Thomas</i> J. J. Thomas, Director, Highway Maint. Div.		Date: 4/3/84 Supersedes:

I. BACKGROUND

The standard three coat oil-alkyd paint system (prime, intermediate and finish) specified in Section 570 is designed to protect steel bridges in mildly corrosive environments. This exposure condition is common to most areas of the State and the three coat system has proven satisfactory, normally providing corrosion protection without maintenance for periods of 8 to 12 years.

However, on many bridges localized areas on the structure may be exposed to a more severe corrosive environment after being put into use. For example, surfaces adjacent to the roadway on a through truss may be frequently wet by splash and spray from passing vehicles; or a deteriorated bridge joint that leaks can result in the ends of floorbeams being exposed to fresh and chloride (from de-icing salts) contaminated water. When exposed to this type of service condition, the standard three coat paint system will break down in 2 to 3 years. Unless repainted, the unprotected steel will begin to corrode rapidly, resulting in section loss and a corresponding reduction in the structural capacity of the member. In extreme cases, lack of maintenance can result in complete failure of a load-carrying member.

In addition to coating deterioration on painted bridges, structures fabricated from unpainted weathering steel (ASTM A588) are often subject to corrosion on portions of the bridge that are frequently wet, and not allowed to dry out. On these areas of the bridge, serious corrosion of unprotected weathering steel will occur at unacceptable rates.

To correct these problems, steel surfaces on a bridge structure that are frequently wet by water can be painted with a more durable protective coating. Coal tar epoxy paint is a durable coating that has a proven history of providing long term protection in situations involving fresh and salt

PREL.	FINAL
DESIGN	LANDSCAPE
RECEIVED FACILITIES DESIGN DIVISION	
<h2>APR 13 1984</h2>	
CIRC.	FILE

Subject: COAL TAR EPOXY PROTECTIVE COATING FOR PAINTING EXISTING BRIDGES

water exposure. Properly applied, a two-coat application of coal tar epoxy has a minimum estimated service life of 10 years in a highly corrosive environment. The benefits of reduced maintenance and improved corrosion protection make a coal tar epoxy coating system an economical choice for use on bridge surfaces that are frequently wet by water and exposed to corrosive environments. (Note 1)

Note 1. Based on 1981 data from the Steel Structures Painting Council the comparative annual costs for the standard 3-coat oil-alkyd system and the 2-coat coal tar epoxy system in a severe corrosive environment are as follows:

3-COAT OIL-ALKYD SYSTEM

Service Life = 3 Years

Initial Applied Cost = \$1.07/S.F.

Annual Cost = \$0.36/S.F./YR.

2-COAT COAL TAR EPOXY

Service Life = 10 Years

Initial Applied Cost = \$1.11/S.F.

Annual Cost = \$0.11/S.F./YR.

## II. POLICY

A two coat coal tar epoxy paint system shall be used on existing structures to protect the surface of all structural steel members, including weathering steel members beneath the bridge deck that are frequently wet by water. This will normally be the ends of floor beams and other primary and secondary members beneath leaking bridge joints and beneath open steel grates. The surface to be painted with coal tar epoxy paint will be the areas directly affected plus a minimum of two feet in any direction. In addition, any steel beneath the deck (i.e. steel bearings) that is subject to splash, or wetted by other means at an above normal rate, shall be painted with coal tar epoxy.

The application of a finish paint on coal tar epoxy painted surfaces will not significantly improve corrosion protection. However, because the color of the coal tar paint is black (or dark red) it may be desirable to apply a finish paint to improve aesthetics.

This policy is effective for both Contract painting work, and for Maintenance painting work performed by Department forces. Exceptions to this policy are as follows:

1. Coal tar epoxy shall not be specified for new bridge construction. Other paint systems are more appropriate for new construction and if problems with coating performance are anticipated in the design phase, the D.C.E.S. shall be contacted for consideration of an alternate painting system.
2. The entire surfaces of all steel members beneath the deck shall not be painted with coal tar epoxy unless permitted by the D.C.E.S. or Director, Highway Maintenance Division. Other paint systems that

Subject: COAL TAR EPOXY PROTECTIVE COATING FOR PAINTING EXISTING BRIDGES

require less surface preparation work may be more practical for use when repainting extensive surface areas.

3. Bridges that are structurally deteriorated, or scheduled for reconstruction or replacement shall not be painted with coal tar epoxy.

### III. PROJECT INSPECTION

Before the initiation of a painting contract or maintenance painting project, the Regional Structures and Regional Bridge Maintenance Engineers shall inspect the bridge to determine exact areas to be painted with coal tar epoxy. In addition areas to be topcoated with a finish paint to improve aesthetics should also be designated in this survey.

### IV. OPTIONAL SURFACES FOR COAL TAR EPOXY COATING

In addition to those below deck members that are required to be coated by this policy, any steel surface on the superstructure that is wet by splash or spray should be considered for painting with the coal tar epoxy system. In particular, experience has shown that early paint failures often occur on steel curb plates and walks, the roadway side of trusses and painted bridge railing.

The final determination for the use of coal tar epoxy on above deck surfaces should be guided by the following and the attached contract specifications (Appendix A) and maintenance guidelines (Appendix B) that provide additional information regarding the coal tar system:

1. Coal tar epoxy will provide long term corrosion protection. The service life is expected to be 10+ years, after which only minor "touch-up" maintenance should be necessary to repair defects.
2. Coal tar epoxy can only be applied to steel that has been blast cleaned to bare metal (SSPC-SP6). Due to cost or time constraints it may not always be practical to perform this degree of cleaning on small and irregular sections (i.e. steel railing, lattice on trusses, etc.).
3. Coal tar epoxy is only available in black or dark brownish-red color. A finish coat can be painted over the coal tar to improve aesthetics but unless properly applied, adhesion problems that result in peeling of the finish paint may occur.

Any questions or requests for assistance in regard to this material should be directed to the Materials Bureau at 518-457-4285.

APPENDIX A

CONTRACT SPECIFICATIONS

ITEM 18570.73 COAL TAR EPOXY PAINT SYSTEM - CLEANING  
AND PAINTING

ITEM 18570.76 FINISH PAINTING COAL TAR EPOXY

ITEM 18570.73 COAL TAR EPOXY PAINT SYSTEM - CLEANING AND PAINTING

DESCRIPTION: This work shall consist of cleaning designated structural steel surfaces and painting them with two coats of coal tar epoxy paint.

MATERIALS: All materials and equipment for cleaning and painting shall meet the requirements of §740-01, Painting Metal Structures, with the following modifications:

- A. First Coat. The primer or first coat shall be a coal tar epoxy paint conforming to the requirements of SSPC Paint Specification No. 16. The color shall be black (Note 1). Coal tar epoxy paint shall be applied at a minimum wet film thickness of 12 mils, so as to produce a minimum dry film thickness of 8 mils.
- B. Second Coat. The intermediate or second coat shall be a coal tar epoxy paint identical to the prime coat, except the color shall be dark red (Note 1). The second coat shall be applied at a minimum dry film thickness of 8 mils.

Note 1: The first and second coats of coal tar epoxy paint are interchangeable. If directed by the Engineer the color of the first coat shall be red and the color of the second coat shall be black.

CONSTRUCTION DETAILS:

- A. Cleaning: All designated surfaces shall be cleaned to bare steel in accordance with §740-01, Surface Preparation, F. Commercial Blast Cleaning. The surface after cleaning shall be defined by SSPC-Vis 1, Pictorial Standards BSA2, CSA2, or DSA2, as applicable.
- B. Painting: The requirements of §740-01 shall apply together with the following:
  1. All designated steel surfaces shall be painted with a prime and intermediate coat of coal tar epoxy paint.
  2. Cleaned bare metal surfaces shall have all blasting products removed and shall be painted one coat of primer within the same working day at the completion of the blasting operations and before the condition known as flash-rusting occurs. Surfaces receiving primer shall be absolutely clean and dry prior to primer application.

3. The second coat shall be applied in accordance with the coating manufacturer's recommendation for re-coating, or in the absence of such instructions applied after the primer has dried to the extent that it cannot be shoved, dented, abraded, or dislodged when struck with a rubber mallet. To minimize intercoat adhesion problems in no case shall more than 72 hours elapse before the application of the second coat, or in conditions of warm weather when the ambient temperature is 80°F or higher, 24 hours. The Engineer shall be the sole determiner of hot weather conditions.
4. No paint shall be applied unless the receiving surface is absolutely dry. No paint shall be applied either to bare steel, or a previously applied coat, if the receiving surface temperature is less than 50°F, or greater than 125°F. No paint shall be applied when the ambient air temperature is below 50°F or greater for a five-day period subsequent to the application of any coat. In no case shall paint be applied if, in the opinion of the Engineer, atmospheric conditions are such, or will change to be such, as to cause unsatisfactory results.
5. All paint shall be proportioned and thoroughly mixed with mechanical mixers in accordance with the manufacturer's recommendations.
6. Thinning of paint to facilitate application may be allowed, if approved by and performed in the presence of the Engineer. The type and quantity of thinner shall be in compliance with the paint manufacturers recommendations.

If thinner is added the applied wet film thickness shall be adjusted to obtain the minimum specified dry film thickness of 8 mils per coat.

Unauthorized use of thinners shall result in repriming the surface in conformance with this specification to the satisfaction of the Engineer at the Contractors expense.

7. The dry film thickness of the two coats of paint shall be determined in accordance with SSPC-PA2, Paint Application Specification No. 2, Measurement of Dry Paint Thickness with Magnetic Gage. A total paint film thickness of 16 mils will be required. Should the verification procedure indicate less than 16 mils the Contractor shall repaint the surface to obtain the specified film thickness. All recoating work done for this purpose shall be performed as directed by the Engineer, and at no additional cost to the State.

METHOD OF MEASUREMENT: Payment will be made at the lump sum price bid.

**BASIS OF PAYMENT:** The lump sum price bid shall include the cost of all labor, materials and equipment necessary to complete the work. Progress payments will be made based upon the percent of designated structural steel cleaned, primed and painted with the intermediate coat. The percentage shall be computed as the ratio of length of designated structural steel cleaned, primed and painted to the total length of structural steel so designated.

and shall include the cost of all labor, materials and equipment necessary to complete the work.

Progress payments will be made based upon the percent of designated structural steel cleaned, primed and painted with the intermediate coat.

The percentage shall be computed as the ratio of length of designated structural steel cleaned, primed and painted to the total length of structural steel so designated.

and shall include the cost of all labor, materials and equipment necessary to complete the work.

Total Bid Price	\$
Less Retention	\$
Net Bid Price	\$

The lump sum price bid shall include the cost of all labor, materials and equipment necessary to complete the work.

Progress payments will be made based upon the percent of designated structural steel cleaned, primed and painted with the intermediate coat.

ITEM 18570.76 FINISH PAINTING COAL TAR EPOXY

DESCRIPTION: This work shall consist of applying a finish paint on structural steel surfaces coated with coal tar epoxy paint.

MATERIALS: All materials and equipment used for painting shall meet the requirements of Section 740, Painting Procedures.

CONSTRUCTION DETAILS:

A. Surface Preparation: To improve adhesion the surface of the dry coal tar epoxy coating shall be roughed up, to the satisfaction of the Engineer, by lightly blasting or abrading by hand or mechanical methods. It is not the intent of this provision to remove a significant amount of the epoxy, only to remove the sheen and dull the surface.

B. Painting: The requirements of g740-01 shall apply together with the following:

1. The finish paint shall be applied no sooner than the following time period after application of the final coat of coal tar epoxy paint:

<u>Average Ambient Temperature</u>	<u>Coal Tar Epoxy Curing Days</u>
70°F or above	5
60° to 70°F	7
Below 50° to 60°F	10

METHOD OF MEASUREMENT: Payment will be made at the lump sum price bid.

BASIS OF PAYMENT: The lump sum price bid shall include the cost of all labor, materials and equipment necessary to complete the work. All work shall be done in a manner satisfactory to the Engineer.

Progress payments will be made. Payment will be based upon the percent of painting completed. The percentage will be computed as the ratio of the area painted to the total area required to be painted under this item.

APPENDIX B

MAINTENANCE GUIDELINE - COAL TAR EPOXY PAINT SYSTEM

Coal tar epoxy coatings may be applied to steel and other metal surfaces. The paint system consists of a coal tar epoxy resin and a hardener. The paint system is applied in two coats. The first coat is applied to the surface and the second coat is applied after the first coat has cured. The paint system is applied to the surface of the steel and other metal surfaces. The paint system is applied to the surface of the steel and other metal surfaces. The paint system is applied to the surface of the steel and other metal surfaces.

PAINTING PROCEDURES

1. Surface Preparation: All surfaces to be painted should be free of oil, dirt, and other contaminants. The surface should be cleaned with a suitable solvent. The surface should be dried thoroughly before painting. The surface should be primed with a suitable primer before painting. The surface should be primed with a suitable primer before painting. The surface should be primed with a suitable primer before painting.

2. Application of Paint System: The paint system should be applied in two coats. The first coat should be applied to the surface and the second coat should be applied after the first coat has cured. The paint system should be applied to the surface of the steel and other metal surfaces. The paint system should be applied to the surface of the steel and other metal surfaces. The paint system should be applied to the surface of the steel and other metal surfaces.

70

## MAINTENANCE GUIDELINE

### COAL TAR EPOXY PAINT SYSTEM

**SCOPE:** This guideline is intended to describe the materials and procedures for the application of coal tar epoxy coatings to steel.

**MATERIAL:** Coal tar epoxy is a two component paint intended to protect structural steel (including weathering type steel) that is frequently wet, or immersed in fresh or salt water. The paint is only available in black or a dark, brownish-red color. A finish coat to improve aesthetics can be applied, providing the surface of the epoxy is roughened to improve adhesion.

Component A of the paint contains a refined coal tar pitch, a liquid-type polyamide resin and a polyamine promoter to accelerate cure rate. Component B is a liquid-type epoxy resin that is mixed into Component A just prior to application.

The mixed paint (A&B) contains approximately 71% of non-volatile film forming solids. The theoretical spreading rate for an 8 mil dry film thickness is 133 sf/gal (12 mils, wet film thickness).

Coal tar epoxy coatings may be toxic and irritating to the skin and eyes. Ingredients in this paint which may pose a hazard include epoxy resin, polyamide resins, hydrocarbon solvent and coal tars. The paint may contain low concentrations (less than 1% by weight) of materials that are suspected carcinogens. Coal tar epoxy should be stored and handled in accordance with the manufacturer's directions. During spray application a respirator to remove the solid air borne particles of overspray together with appropriate personal protective gear should be worn.

#### PAINTING PROCEDURES:

1. Surface Preparation. All surfaces must be blast cleaned to bare metal in accordance with SSPC SP No. 6, Commercial Blast Cleaning, or to a better cleaning degree. All intact paint, rust, mill scale, etc. must be removed. Coal tar epoxy will not adhere to steel surfaces covered with these types of contaminants. After cleaning, dust and blasting residues must be removed by brushing or blowing with compressed air. Cleaned surfaces should be painted with the first coat within the same working day at the completion of the blasting operation or before the condition known as flash-rusting occurs.
2. Number of Coats. Minimum of two.
3. Film Thickness of Paint System. Not less than the following: first coat 12 mils wet (8 mils dry); second coat 12 mils wet (8 mils dry). For the two coat system, 16 mils, dry film thickness.

4. Paint Application. Paint should be applied in accordance with the manufacturer's recommendations and the following:

- a. Mixing. Coal tar epoxy will normally be supplied with four gallons of Component A packaged in a standard five-gallon container. Component B will be packaged to the full mark in a one-gallon can. The mixing ratio will be 4:1 (A:B) by volume.

All mixing should be done with a mechanical agitator.

To prepare the paint add the entire contents of Component B to the previously stirred contents of the related container of Component A. Mix for a minimum of two minutes.

- b. Pot Life. The pot life of the mixed coal tar paint will vary with ambient temperature. Normally the material will thicken substantially over a two-hour period and may set up in the paint tank in two to four hours in conditions of warm weather.
- c. Thinning. Thinning to facilitate spray application may be desirable. Use xylene, or the manufacturer's recommended thinner and not more than one-half gallon to a five-gallon batch.
- d. Application. To obtain the required film thickness coal tar epoxy is normally applied using airless or heavy duty conventional air atomizing spray equipment. If brushes are used, a stiff brush heavily loaded with paint should be used. The paint should be applied quickly and smoothly and excessive brushing should be avoided. Application by roller is not recommended.

Under normal conditions the drying time between the application of the first and second coats should not exceed 72 hours. Long dry times between coats of coal tar epoxy may result in poor intercoat adhesion and in warm weather the maximum 72 hour recoat time should be reduced. In conditions of very hot weather or exposure to direct sunlight the intercoat drying time should be limited to 24 hours, or less.

Coal tar epoxy should not be applied to steel, or a previously applied coat, if the receiving surface temperature is less than 50°F, or greater than 125°F. Additionally, the coating should not be applied when ambient temperatures are below 50°F, unless it can be expected that the average ambient temperature will be 50°F or greater, for a five-day period subsequent to the application of any coat. At temperatures between 50 and 60°F the mixed paint should be allowed to stand for 30 minutes before application.

- 12
- e. Clean-up. Equipment should be cleaned immediately after use, using the manufacturer's recommended solvents. In the absence of instructions, cleaning solvents such as aromatic naphtha, xylene and toluene are satisfactory. The ability of these solvents to clean can be improved by adding 10-20% methyl isobutyl ketone and 10% isopropyl or normal butyl alcohol. Appropriate safety precautions should be followed in performing clean-up work.

TOPCOATING COAL TAR EPOXY: Because the color of the coal tar paint is black (or dark red) it may be desirable to apply a finish coat to improve aesthetics. Any of the Department's standard finish paints may be used for this purpose. However, before painting a finish coat, to prevent bleeding, the coal tar system must be allowed to fully cure, for at least the time period shown below. Additionally, after the coal tar is cured, the surface will have a hard, glossy finish. To minimize peeling, this surface must be abraded by lightly blasting or sanding, before the application of the finish paint. It is not intended to remove a significant amount of the epoxy coating, only to remove the sheen and dull the surface.

FULL CURE TIME FOR COAL TAR EPOXY SYSTEM

<u>Average Ambient Temperature</u>	<u>Curing Time</u>
70°F or higher	5 days
60-70°F	7 days
50-60°F	10 days