

## Item P-629 Thermoplastic Coal Tar Emulsion Surface Treatments

### DESCRIPTION

**629-1.1.** This item shall consist of an application of a thermoplastic resin coal tar emulsion micro-surface applied to an existing, previously prepared asphalt surface, including airport pavements serving small airplanes, roads, and other general applications. Thermoplastic resin coal tar emulsion products provide a fuel-resistant surface where pavements are subjected to fuel spills. Thermoplastic resin coal tar emulsion products assist in pavement preservation through reducing the rate of pavement oxidation. The application of the surface treatment shall be in accordance with these specifications and shall conform to the dimensions shown on the plans or as directed by the Engineer.

### MATERIALS

**629-2.1 Thermoplastic coal tar emulsion.** The emulsion material shall be a thermoplastic coal tar emulsion made up of plastic resin and emulsified coal tar pitch. The thermoplastic coal tar emulsion shall be manufactured as a complete product and tested at the manufacturing plant for material certification. The water content of the emulsion shall not exceed 48%  $\pm$ 1% when tested in accordance with ASTM D244, paragraph 3.

A dried film shall contain a minimum of 89% of a combination of plastic resin and coal tar with the remaining percentage being inorganic filler. The dried emulsion shall have a softening point greater than 212°F (100°C) when tested in accordance with ASTM D36. A film of the dried emulsion material, 8 mils thick, shall stretch to five (5) times its original length at 70°F (21°C) without breaking, and recover 35% of this length in one minute.

**629-2.2 Material certification.** The Contractor shall furnish the manufacturer's certification that each consignment of thermoplastic coal tar emulsion shipped to the project meets the requirements indicated in 629-2.1 and elsewhere in this specification. The Certification shall include actual results of each test and date of when test was performed. The Contractor shall submit a certification that the material proposed has been in field use for a minimum of two (2) years.

**629-2.3 Fuel resistance testing.** The cured thermoplastic coal tar emulsion sample must pass the fuel-resistance test outlined in Appendix A.

**629-2.4 Water.** The water used in mixing shall be potable and free from harmful soluble salts. The temperature of the water added during mixing shall be at least 50°F (10°C). The pH of the water added during mixing shall conform to the requirements of the thermoplastic coal tar emulsion manufacturer.

**629-2.5 Handling and storage.** The mixture shall be continuously agitated from the time it had been mixed until its application on the pavement surface. The distributor or applicator, pumps and all tools shall be maintained in satisfactory working condition. Spray bar nozzles, pumps, or other equipment can be cleaned mechanically or with clean water.

**629-2.6 Health, safety, and environment.** The Contractor must provide a complete Material Safety Data Sheet (MSDS) in accordance with U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Regulations (Standards – 29 CFR), 1910.1200 which establishes the requirement and minimum information for the MSDS for hazardous materials. The MSDS, Section II, shall include the Chemical Abstracts Service (CAS) registry numbers for all applicable hazardous

ingredients in the coal tar emulsion product. The Contractor must provide the manufacturer's certification that the product complies with the Code of Federal Regulation (CFR) Title 40 – Protection of Environment. The manufacturer's certification shall address compliance for Air Programs, Part 59, National Volatile Organic Compound Emission Standards for Consumer and Commercial Products (for the airport location) and Water Programs, Part 116, Designation of Hazardous Substances.

### COMPOSITION AND APPLICATION

#### 629-3.0 Thermoplastic coal tar emulsion micro-surface.

**629-3.1 Quantities of materials per square yard.** Based on the data in this specification, the Contractor shall submit the proportions of water, thermoplastic coal tar emulsion, and aggregate proposed for use to the Engineer for approval prior to the start of operations. A copy of the mix design and test data required by this specification shall be submitted to the Engineer for approval along with the above information. No thermoplastic coal tar emulsion micro-surface shall be produced for payment until a job mix formula has been approved in writing by the Engineer.

The approximate amounts of materials per square yard (square meter) for the micro-surface treatment shall be as provided in the Application Rate table.

**Application Rate**

Aggregate Type	Composition <sup>i</sup> lbs/gal (kg/l)	Application Rate <sup>ii</sup> lb/yd <sup>2</sup> (kg/m <sup>2</sup> )
A	21-23 (2.52-2.75)	8 (4.34)

- i. Aggregate (lbs) shall be mixed homogeneously with the thermoplastic coal tar emulsion (gals).
- ii. Minimum application rate of uncured thermoplastic coal tar emulsion micro-surface.

**629-3.2 Aggregate.** The aggregate shall consist of sound, durable crushed igneous type stone (crushed basalt, granite, trap rock, etc.), be free from films of matter that would prevent thorough coating and bonding with the bituminous material and free from coatings of clay, organic matter, and other deleterious materials. The percentage of wear shall not be greater than 35% when tested in accordance with ASTM C131. The aggregate shall meet the gradation in the table below for Type A when tested in accordance with ASTM C136.

The Contractor shall provide a certification showing particle size analysis and properties of the material delivered for use on the project.

### Aggregate Material Gradation Requirements

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
	Type A
No. 4 (4.75mm)	100
No. 8 (2.38 mm)	75-95
No. 16 (1.19 mm)	50-75
No. 30 (0.60 mm)	30-65
No. 50 (0.30 mm)	20-50
No. 100 (0.15 mm)	15-25
No. 200 (0.07 mm)	5-20

#### 629-3.3 Application

**a. Application of tack coat.** After preparation of the pavement and acceptance by the Engineer, the tack coat shall be applied to the pavement surface only where micro-surface will be applied. Apply a tack coat of thermoplastic coal tar emulsion diluted with 50% water at the rate of 0.10 gallons of mix per square yard (0.45 l/m<sup>2</sup>).

**b. Application of micro-surface.** The surface shall be pre-wet by fogging ahead of the spreader box. Water used in pre-wetting the surface shall be applied at such a rate that the entire surface is damp with no apparent flowing water in front of the spreader box. If temperatures are in the colder acceptable range the rate of fogging may be decreased. The mixture shall be of the desired consistency when deposited on the surface, and no additional elements shall be added. A sufficient amount of mixture shall be carried in the spreader box at all times so that even distribution is obtained. No clumped or unmixed aggregate shall be permitted. No segregation of the emulsion and aggregate fines from the coarse aggregate will be permitted.

Upon completion of the work, the thermoplastic coal tar emulsion micro-surface shall have no bare spots or cracks through which liquids or foreign matter could penetrate to the underlying pavement. The finished surface shall present a uniform texture.

In areas where the spreader box cannot be used, the thermoplastic coal tar emulsion micro-surface shall be applied by a means of a hand squeegee.

### CONSTRUCTION METHODS

**629-4.1 Worker safety.** The thermoplastic coal tar emulsion surface treatment product shall be handled with caution. The Contractor shall obtain a MSDS for both the thermoplastic coal tar emulsion product and sand and require workmen to follow the manufacturer's recommended safety precautions.

**629-4.2 Weather limitations.** The material shall not be applied when the humidity or impending weather conditions will not allow proper drying or when the atmospheric or pavement temperature is below 50°F (10°C), unless otherwise directed by the Engineer.

During application of thermoplastic coal tar emulsion surface treatment, account for wind drift. Cover existing buildings, structures, runway edge lights, taxiway edge lights, informational signs, retro-reflective marking and in-pavement duct markers as necessary to protect against overspray before applying the emulsion. Should thermoplastic coal tar emulsion surface treatment get on any light or marker fixture, promptly clean the fixture. If cleaning is not satisfactory to the Engineer, the Contractor shall replace any light, sign or marker with equivalent equipment at no cost to the Owner.

### 629-4.3 Application equipment

**a. Mobile mixing machine.** The mobile mixing machine shall be a truck-mounted mobile mixing plant with a towed-type spreader box. It shall have a water tank and water pump capable of delivering a constant volume of water.

The mobile mixing machine shall have an agitated storage tank for the thermoplastic coal tar emulsion and a non-shearing peristaltic pump with variable rate of flow for the delivery of this material. The mobile mixing machine shall have a hopper for holding aggregate, supplying this material to the mixing chamber by a conveyor belt. The rate of aggregate delivery shall be volumetrically controlled by an adjustable gate opening. The speed of the conveyor shall be mechanically dependent upon the speed of the peristaltic pump.

The mobile mixing machine shall be a continuous-flow mixing unit capable of delivering predetermined quantities of thermoplastic coal tar emulsion, aggregate, and if necessary water, to the mixing chamber and discharging the thoroughly mixed material on a continuous basis. The mobile mixing machine shall deliver the materials to the mixing chamber in a constant proportion in a manner not dependent on power plant or vehicle speed. The machine shall be equipped with a water spray bar capable of fogging the pavement surface to aid in the application process.

Attached to the mixing machine shall be a mechanical-type squeegee distributor, equipped with flexible material in contact with the surface to prevent loss of material from the distributor. It shall be maintained to prevent loss of micro-surfacing on varying grades and adjusted to assure uniform spread. The spreader box may have an adjustable width.

**b. Batch mixing machine.** The batch-mixing machine shall be either a truck-mounted 500 to 3,000 gallon (1893 to 11356 liter) tank or a self-propelled batch mixing machine 300 to 1000 gallons (1136 to 3785 liters) containing suitably driven mixing blades to combine predetermined quantities of thermoplastic emulsion, aggregate if specified and if necessary, water into a homogeneous mixture. It shall be equipped with a water tank and diaphragm style pump capable of delivering a constant volume of material to a spray wand or spray bar. The device shall have a bottom ball valve of 3 inches (75 mm) diameter capable of delivering material to a squeegee spreader or a drag box.

**c. Auxiliary equipment.** Other tools or equipment such as power brooms, power blowers, air compressors, hand brooms, hand squeegees, etc., shall be provided as required.

**629-4.4 Test areas and test sections.** A qualified manufacturer's representative shall be present in the field to assist the Contractor in applying test areas and/or test sections to determine the optimum application rate. A test area and/or section shall be applied for each differing hot mix asphalt (HMA) pavement surface identified in the project. The test area(s) and/or test section(s) shall be used to determine the material application rate(s) prior to full production. The same equipment and method of operation shall be utilized on the test area(s) and/or test section(s) as will be utilized on the remainder of the work.

**629-4.5 Preparation of asphalt pavement surfaces.** Clean pavement surface immediately prior to placing the seal coat by sweeping, flushing well with water leaving no standing water, or a combination of both, so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film. Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. After cleaning, treat these areas with the oil spot primer. Any additional surface preparation, such as crack repair, shall be in accordance with paragraph 101-3.6.

**629-4.6 Application.** Application shall be in accordance with paragraph 629-3.3.

**629-4.7 Curing.** The mixture shall be permitted to dry for a minimum of 24 hours after the application, before opening to traffic or painting, and shall be sufficiently cured to drive over without damage to the installation. Any damage to the uncured mixture will be the responsibility of the Contractor to repair.

### **QUALITY CONTROL**

**629-5.1 Manufacturer's representation.** The manufacturer's representative shall have knowledge of the material, procedures, and equipment described in the specification and shall be responsible for determining the application rates and shall oversee the preparation and application of the thermoplastic coal tar emulsion surface treatment. Documentation of the manufacturer representative's experience and knowledge for applying the thermoplastic coal tar emulsion surface treatment shall be furnished to the Engineer a minimum of 10 work days prior to placement of the test sections. The cost of the manufacturer's representative shall be included in the bid price.

**629-5.2 Contractor qualifications.** The Contractor shall provide the Engineer contractor qualifications for applicators, personnel and equipment. The Contractor shall also provide, from the thermoplastic coal tar emulsion Manufacturer, documentation that the Contractor is certified to apply the thermoplastic coal tar emulsion surface treatment. Contractor shall provide documentation for at least three (3) applications similar to this project completed in the past two (2) years.

### **METHOD OF MEASUREMENT**

**629-7.1 Measurement.** The Thermoplastic Coal Tar Emulsion Micro-Surface Type A shall be measured by the actual square yardage of the area indicated on the contract drawings or designated by the Engineer.

### **BASIS OF PAYMENT**

**629-8.1 Payment.** Payment shall be made at the contract unit price per square yard (square meter) for the Thermoplastic Coal Tar Emulsion Micro-Surface Type A. This price shall fully compensate the Contractor for furnishing all materials and for all labor, equipment tools and incidentals necessary to complete the thermoplastic coal tar emulsion product installation, including mix design and data sheets stipulated in these specifications.

Payments will be made under:

Item P-629-8.1 Thermoplastic coal tar emulsion Micro-Surface Type A –per square yard.

## TESTING REQUIREMENTS

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in this text by basic designation only.

### 29 CFR Part 1910.1200 Hazard Communication

ASTM C67	Standard Test Method for Sampling and Testing Brick and Structural Clay Tile
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D3699	Standard Specification for Kerosene
ASTM D36	Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)
ASTM D244	Standard Test Methods and Practices for Emulsified Asphalts
ASTM D5340	Standard Test Method for Airport Pavement Condition Index Surveys
AC 150/5320-17	Airfield Pavement Surface Evaluation and Rating (PASER) Manuals

## Appendix A

### FUEL RESISTANCE TEST TEST METHODS CRITERION

#### 1. Scope

This method determines the resistance of the thermoplastic coal tar emulsion surface treatment to kerosene.

#### 2. Apparatus

- 2.1 Two 6" × 6" (150 mm × 150 mm) square 16 gauge sheet metal masks with a 4" × 4" (100 mm × 100 mm) square center removed.
- 2.2 6" × 6" (150 mm × 150 mm) unglazed white ceramic tile with an absorption rate of 10-18% (determined in accordance with ASTM C67).
- 2.3 Brass ring, 2" (50 mm) diameter and 2" (50 mm) high.
- 2.4 Kerosene meeting requirements of ASTM D3699.
- 2.5 Silicone rubber sealant.

#### 3. Procedure

- 3.1 Immerse the ceramic tile in distilled water for a minimum of ten minutes.
- 3.2 Remove excess water from the tile to produce a damp surface before applying the thermoplastic coal tar emulsion surface treatment.
- 3.3 Using the mask described in 2.1 apply thermoplastic coal tar emulsion surface treatment as specified to the tile. Spread even with the top of the mask using a spatula or other straightedge.
- 3.4 Allow the sample to cure for 96 hours at 77 ±2°F. and 50 ±10% relative humidity.
- 3.5 After curing, affix the brass ring to the thermoplastic coal tar emulsion surface treatment on the tile with silicone rubber sealant.
- 3.6 Fill the brass ring with kerosene.
- 3.7 After 24 hours, remove the kerosene from the brass ring, blot dry and immediately examine the film for softness and loss of adhesion. Immediately after the film is examined, break the tile in half, exposing that part of the tile whose film was subjected to the kerosene.
- 3.8 Evaluate for penetration of kerosene through the thermoplastic coal tar emulsion surface treatment and loss of adhesion.

#### 4. Report

- 4.1 Report the results as pass or fail. Visible evidence of leakage or discoloration shall constitute failure of the fuel resistance test.

5. **Criterion:** A "pass" rating in the fuel resistance test is required prior to full production.

END OF ITEM P-629