May 12, 2016

REVISION OF SECTIONS 627 AND 713

MODIFIED EPOXY PAVEMENT MARKING

**NOTICE**

This is a standard special provision that revises or modifies CDOT’s *Standard Specifications for Road and Bridge Construction.* It has gone through a formal review and approval process and has been issued by CDOT’s Project Development Branch with formal instructions for its use on CDOT construction projects. It is to be used as written without change. Do not use modified versions of this special provision on CDOT construction projects, and do not use this special provision on CDOT projects in a manner other than that specified in the instructions unless such use is first approved by CDOT’s Standards and Specifications Unit. The instructions for use on CDOT construction projects appear below.

Other agencies which use the *Standard Specifications for Road and Bridge Construction* to administer construction projects may use this special provision as appropriate and at their own risk.

**Instructions for use on CDOT construction projects:**

Use in projects having modified epoxy pavement marking.

 Sections 627 and 713 of the Standard Specifications are hereby revised for this project as follows:

In subsection 627.05, delete the seventh paragraph and replace with the following:

Modified epoxy pavement marking shall be applied to the road surface according to the modified epoxy manufacturer’s recommended methods at the application rate or coverage shown below. Glass beads shall be applied into the modified epoxy pavement marking by means of a low pressure, gravity drop bead applicator.

In subsection 627.05, delete the last paragraph and replace with the following:

Modified epoxy pavement marking and beads shall be applied within the following limits:

**Application Rate or Coverage
Per Gallon of Modified Epoxy Pavement Marking**

|  |  |  |
| --- | --- | --- |
|  | **Minimum** | **Maximum** |
| 18 mil marking | 85 sq. ft. | 90 sq. ft. |
| Beads | 23 lbs. |  |

Subsection 627.05 shall include the following:

Modified epoxy Pavement Marking shall conform to subsection 713.17.

Subsection 627.13 shall include the following:

**Pay Item Pay Unit**

Modified Epoxy Pavement Marking Gallon

Delete subsection 713.17 and replace with the following:

**713.17 Modified Epoxy Pavement Marking Material.**  Only modified epoxy pavement marking material that is on the Department's Approved Products List may be used. Batches or lots of approved products will be accepted on the project by Certificate of Compliance (COC) in accordance with subsection 106.12. The COC shall confirm that the material meets all CDOT requirements and is the same material that was preapproved in the product evaluation process.

1. *Formulation.*  Modified epoxy pavement marking material shall be a two component, 100 percent solids, material formulated to provide simple volumetric mixing ratio of two volumes of component A and one volume of component B unless otherwise recommended by the material manufacturer.
2. *Composition.*  The component A of both white and yellow shall be within the following limits:

**Resin / Pigment Components (% by Weight)**

|  |  |  |
| --- | --- | --- |
| **Pigment** | **WHITE:** | **YELLOW:** |
| TiO2, ASTM D476, Type II | 18-25 | 10-17 |
| Organic Yellow |  | 6-10 |
| Epoxy Resin | 75-82 | 73-84 |

The pigment for yellow modified epoxy shall contain no lead or other material such that the cured epoxy could be considered a hazardous waste under EPA or CDPHE regulations. The Contractor shall submit to the Engineer a manufacturer's certification of compliance with this requirement.

1. *Epoxide Number.*  The epoxide number of the modified epoxy’s resin shall be the manufacturer’s target value ± 50 as determined by ASTM D 1652 for white and yellow component A on pigment free basis.
2. *Amine Number.* The amine number on the curing agent (component B) shall be the manufacturers target value ± 50 per ASTM D 2071.
3. *Toxicity.*  Upon heating to application temperature, the material shall not produce fumes which are toxic or injurious to persons or property.
4. *Color.* The modified epoxy material, without drop-on beads, shall correspond following requirements:

White – Federal Standard No. 595B-17925. The Yellowness Index (YI) of white shall not exceed 8.0 per ASTM E-313-10 initially.

After 72 QUV exposure per ASTM G-154 with a UVA-340 Lamp at an irradiance of 0.89 W/m2/nm with alternating cycles of 4 hours U.V @ 140º F, and 4 hours humidity @ 122ºF the YI  shall not exceed 15 when measured per ASTM E-313.

The YI, after 500-hour QUV testing as above, shall not exceed 27.

Yellow – Materials for pavement markings shall meet the initial daytime chromaticity that fall within the box created by the following corner points:

Initial Daytime Chromaticity Coordinates (Corner Points)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** |
| x | 0.530 | 0.510 | 0.455 | 0.472 |
| y | 0.456 | 0.485 | 0.444 | 0.400 |

After 72-hour QUV exposure per ASTM G-154 with a UVA-340 Lamp at an irradiance of 0.89 W/m2/nm with alternating cycles of 4 hours U.V @ 140º F, and 4 hours humidity @ 122ºF the Yellow shall fall within the initial chromaticity coordinates stated above.

1. *Drying Time.* The modified epoxy pavement marking material shall have a setting time to a no-tracking condition of not more than 25 minutes at a temperature of 73° F and above.
2. *Curing.*  The modified epoxy material shall be capable of fully curing under the constant surface temperature condition of 35° F and above.
3. *Adhesion to Concrete.* The catalyzed modified epoxy pavement marking material, when tested according to ACI Method 503, shall *have* such a high degree of adhesion to the specified (4000 psi minimum) concrete surface that there shall be a 100 percent concrete failure in the performance of this test
4. *Hardness.*  The modified epoxy pavement marking materials, when tested according to ASTM D 2240, shall have a minimum Shore D Hardness value of 80. Samples shall be allowed to cure at room temperature, 75 ± 2 °F for a minimum of 72 hours and a maximum of 168 hours prior to performing the indicated test.
5. *Abrasion Resistance.*  The abrasion resistance shall be evaluated on Taber Abrader with a 1000 gram load and CS-17 wheels. The duration of the test shall be 1000 cycles. The wear index shall be calculated based on ASTM test method C-501 and the wear index for the catalyzed material shall not be more than 60. The tests shall be run on cured samples of material which have been applied at film thickness of 15 ± ½ mils to code S-16 stainless steel plates. The samples shall be allowed to cure at 75 ± 2 °F for a minimum of 72 hours prior to performing the indicated tests.
6. *Tensile Strength.*  When tested according to ASTM D 638, the modified epoxy pavement marking materials shall have a tensile strength of not less than 6000 psi. The Type IV Specimens shall be cast in a suitable mold and pulled at the rate of ¼ inch per minute by a suitable dynamic testing machine. The samples shall be allowed to cure at room temperature (75 ± 2 °F) for a minimum of 72 hours and a maximum of 168 hours prior to performing the indicated tests.
7. *Compressive Strength.*  When tested according to ASTM D 695, the catalyzed modified epoxy pavement marking materials shall have a compressive strength of not less than 12,000 psi. The cast sample shall be conditioned at room temperature, 75 ± 2 °F, for a minimum of 72 hours and a maximum of 168 hours prior to performing the tests. The rate of compression of these samples shall be no more than ¼ inch per minute.