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| REVIEW OF NEW SPECIFICATION OR SPECIFICATION CHANGE  | **Log No.**  627-9 |
| **Specification Section No.:** 627 and 708  | **Item:** Pavement with Waterborne and Low VOC Paint |
| **Originating Office:** Traffic | **By:** Roybal/Matthews |
| **Date Sent For Review:**  | **Date Comments Due:** January 13, 2010 |
| Please submit response to: STANDARDS AND SPECIFICATIONS UNIT, ROOM 290, HEADQUARTERS, DENVER |
| **Reviewer** | **Concurrent Reviews – Others Commenting** | The attached Draft Specification is submitted for your review and comments. If not returned by Date Comments Due, the draft specification will be considered to be approved unless the Specification Unit of Staff Design [(303) 757-9474, (303) 757-9402] is advised otherwise.**REMARKS:** If these proposed modifications are approved, our unit will issue these in a revised version of this standard special provision. |
|  | **Spec Committee Members:** |  |
|  | Chairman: Wassenaar | X |
|  | Region 1: Cox | **X** |
|  | Region 2: Burch | **X** |
|  | Region 3: Alexander | **X** |
|  | Region 4: Frieler | **X** |
|  | Region 5: Beller | **X** |
|  | Region 6: Koenig | **X** |
|  | Project Development: Lacey | **X** |
|  | Specifications: Brinck | **X** |
|  | Bridge: Hasan | **X** |
|  | Agreements:  | **X** |
|  | Materials: Zufall | **X** |
|  | Traffic Engineering: Matthews | **X** | REVIEWER COMMENTS:( ) Approved ( ) Disapproved ( ) ModifiedIf disapproved or modified, give reason why and show any modifications on the attached draft copy: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ Name/Signature Date |
|  | Maintenance: Mueller | **X** |
|  | FHWA: Urban | **X** |
|  | Attorney General: Spear | **X** |
|  | Attorney General: Morrow | **X** |
|  |  |  |
|  | **Others:** |  |
|  | Colorado Contractors Assoc.: Moody | **X** |
|  |  |  |
|  | **Technical Committees:** |  |
|  | Bridge |  |
|  | Culvert |  |
|  | Joint Co-op, CCA/CDOT |  |

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| **COLORADO DEPARTMENT OF TRANSPORTATION****SUBMITTAL OF NEW SPECIFICATION OR SPECIFICATION CHANGE** | Log No. (Assigned by Standards and Specifications Unit)627-9 |
| TO: Standards and Specifications Unit, Project Development, Suite 290 | FROM:HQ Traffic Engineering Branch(Region, Branch or Technical Committee) |
| SPECIFICATION SECTION NO.627 and 708 | ITEMPavement Marking with Waterborne and Low VOC Paint | Priority Routine[x]  Fast[ ]  |
| Reason for this new or changed specification:The revision entails adding a High Build option for Waterborne and simplifying the table for Waterborne properties.  |
| New or Revised Specification:See Attached. |
| Note: See Procedural Directive 513.1 for a description of appropriate specification development procedures. |

 **CDOT Form 1215 10/01**

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REVISION OF SECTIONS 627 AND 708

PAVEMENT MARKING WITH WATERBORNE PAINT
AND LOW VOC SOLVENT BASE PAINT

**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 on projects having pavement marking paint.

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REVISION OF SECTIONS 627 AND 708

PAVEMENT MARKING WITH WATERBORNE PAINT

AND LOW VOC SOLVENT BASE PAINT

Sections 627 and 708 of the Standard Specifications are hereby revised for this project as follows:

Delete subsection 627.04 and replace with the following:

**627.04 Pavement Marking with Waterborne and Low Volatile Organic Compound (VOC) Solvent Base Paint.**  Striping shall be applied when the air and pavement temperatures are no less than 45 °F for waterborne paint and no less than 40 °F for low VOC solvent base paint on asphalt or portland cement concrete pavements. The pavement surface shall be dry and clean. Surface cleaning shall be required when there is deicing material on the road. Weather conditions shall be conducive to satisfactory results.

The Contractor shall utilize equipment that meets the following requirements, as approved:

1. Equipment shall permit traffic to pass safely within the limits of the roadway surface and shoulder while operating.
2. Equipment shall be designed for placement of both solid and broken line stripes with a reasonably clean-edged stripe of the width and location as shown on the contract and no overspray on the road surface.
3. Equipment shall have a glass bead dispenser directly behind, synchronized with the paint applicator. Each applicator shall have individual control and automatic skip control that will paint a strip with a gap as shown in the contract.
4. The equipment may be equipped with a heat exchanger to heat the paint to reduce drying time.
5. The operation shall include a trailing vehicle equipped with a flashing arrow board.

The Contractor shall prevent traffic from crossing a wet stripe. Stripes which have been marred or picked up by traffic before they have dried shall be repaired at the Contractor’s expense. Removal of paint from vehicles that crossed wet paint shall be at the Contractor’s expense.

The water-based paint and stripes shall fall within the following minimum and maximum ranges:

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| --- | --- | --- |
|  |  | Paint |
|  |  | Water-Based | Low VOC | High Build |
|  | DESCRIPTION | ACCEPTABLE RANGES |
| Alignment  | Lateral Deviation | 2.0 in per 200 ft Max |
| Coverage Rate | Sq. Ft. per Gallon | 100-110 | 100-110 | 70-85 |
| Thickness | Mil | 15-17 | 15-17 | 20-25 |
| Width | Inches | Per Plans +/- 0.25 |
| Dry Time | Minutes | 1.5 | 5 | 5 |
| Beads | Application Rate, lbs/gal | 6-8 | 8-10 |

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REVISION OF SECTIONS 627 AND 708

PAVEMENT MARKING WITH WATERBORNE PAINT

AND LOW VOC SOLVENT BASE PAINT

Subsection 627.13 shall include the following:

#### **Pay Item Pay Unit**

Pavement Marking Paint (Waterborne) Gallon

Pavement Marking Paint (Low VOC Solvent Base) Gallon

Delete subsection 708.01 and replace with the following:

**708.01 General.** This specification covers ready-mixed paints and coatings. Paints and coatings shall be manufactured eight weeks or less prior to delivery to the project. Each paint container shall be labeled with the name and address of the manufacturer, trade name or trademark, type of paint, number of gallons, batch number, and date of manufacture.

Paints shall be free of foreign material that is capable of clogging screens, valves, pumps, and other parts of the application equipment. Paint shall not contain the following:

1. Benzene
2. Chlorinated solvents
3. Ethylene glycol ethers
4. Ethylene glycol acetates
5. Lead
6. Mercury
7. Chromium
8. Cadmium
9. Petroleum products

The Contractor shall obtain certification in writing from the manufacturer showing that the product is free of the materials described above and that it meets or exceeds the requirements of 29 CFR 1910.1200.

Paints shall not form a surface skin within 48 hours in three-quarter filled, tightly closed containers. Paint and coating pigments shall be lead free, and shall not thicken, become granular, or curdle in their containers.

Volatile Organic Compound (VOC) levels for paints and coatings shall comply with the most current EPA regulations. All product compositional proportions are specified by weight. Material Safety Data Sheets and manufacturer’s recommended application instruction sheets representing each paint and coating shall be submitted to the Engineer for the project records prior to use.

Delete subsection 708.05 and replace with the following:

**708.05 Pavement Marking Materials**. Pavement marking materials shall be selected from the Department’s Approved Products List (APL). Prior to start of work, a Certified Test Report (CTR) for all pavement marking materials shall be submitted in accordance with subsection 106.13.

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REVISION OF SECTIONS 627 AND 708

PAVEMENT MARKING WITH WATERBORNE PAINT

AND LOW VOC SOLVENT BASE PAINT

For white paint, the color after drying shall be a flat-white, free from tint, and shall provide the maximum amount of opacity and visibility under both daylight and artificial light. For yellow paint, the Federal Standard 595B shall be used to designate colors and the ASTM E308 shall be used to quantitatively define colors. After drying, the yellow paint shall visually match Federal Standard 595B color chip number 33538, and shall be within 6 percent of central color, PR-1 Chart, where x = 0.5007 and y = 0.4555 (The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 Standard Colorimetric System measured with Standard Illuminant D65.) The Contractor shall submit the exact formulation of the paint for approval by the Engineer. The paint shall not be used until written approval has been received from the Engineer

(a) *Low* *VOC Solvent Base Paint.*Low VOC Paint shall beready mixed, and shall be capable of being applied to Asphalt or Portland Cement Concrete Pavements.

1. *Acrylic Waterborne Paint.* Acrylic waterborne paint shall be a lead-free, 100 percent Acrylic resin polymer waterborne product. The finished product shall maintain its consistency during application at temperatures compatible with conventional equipment.
2. *High Build Acrylic Waterborne Paint.* High build acrylic waterborne paint binder (nonvolatile portion of vehicle) shall be 100 percent acrylic cross linking polymer, by weight, as determined by infrared analysis or other chemical analysis available to the Department.

Waterborne paint shall meet all of the following requirements:

**Performance Requirements:** The paint shall be water resistant and shall show no softening, blistering or loss in gloss.

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REVISION OF SECTIONS 627 AND 708

PAVEMENT MARKING WITH WATERBORNE PAINT
AND LOW VOC SOLVENT BASE PAINT

**ACRYLIC WATERBORNE PAINT**

|  |  |  |  |
| --- | --- | --- | --- |
| **Property** | **White** | **Yellow** | Test Method |
| Nonvolatile portion of vehicle (white and yellow), % | 43.0 | 43.0 | ASTM D 2205 |
| **Pigment Composition**  |  |  |  |
| Percent by weight♦ | 60.0 | 60.0 | ASTM D 4451ASTM D 3723 |
| Paint  |  |  |  |
|  Titanium Dioxide Content, lb/gal | 1.0 | 0.2 | ASTM D 5381 |
|  Total Carbonate,% | 94.0 | 94.0 | ASTM D 1199, Type GC |
| **Properties of the Finished Paint** |  |  |  |
| Total Non-volatiles, (solids) % by weight  | 77.0 | 76.0 | FTMS 141C - Method 4053.1, ASTM D 2369, or ASTM D 4758 |
| Density, lbs/gal **■** | 14.3 | 14.0 | ASTM D 2205 |
| Consistency (Viscosity) White and Yellow, Krebs-Stormer Units | 85-95 | 85-95 | ASTM D 562 |
| Freeze Thaw Stability | Shall complete 5 or more test cycles successfully | ASTM D 2243 |
| Fineness of Grind, Cleanliness Rating B, minimum | 3 | 3 | ASTM D 1210 |
| Hydrogen ion content: pH | 9.6 | 9.6 | ASTM E 70 |
| Directional Reflectance: [5 mil Wet Film] | 85 | 50 | ASTM E 1347 |
| Dry Opacity (Contrast Ratio): [5 mil Wet Film] | 0.95 | 0.92 | ASTM D 2805 |
| ♦Percent by weight shall include percent of organic yellow pigment.**■**Density shall not vary more than 0.3 lbs/gal between batches. |