Oregon

Standard Guidelines for Product Review

Longitudinal Pavement Markings - Standard; Section 00860.00

February 26, 2009

DEPARTMENT OF TRANSPORTATION
Construction Section
800 Airport Road SE
Salem, OR 97301-4798
503/986-3059

00860.00 – Longitudinal Pavement Markings - Standard

General – ODOT uses lead-free, waterborne traffic paint for all long-line projects that don't require a durable product. Products must meet the following specifications and be placed on a test deck for evaluation. The assumption is that the material goes down at 12 – 15 mils wet, with 5-6 pounds of glass beads per gallon, and has a (field) no-track time of less than 90 seconds. All Pavement Markings used on ODOT projects must come from the ODOT Qualified Products List (QPL). Here is the link to the QPL Website: http://www.oregon.gov/ODOT/HWY/CONSTRUCTION/QPL/QPIndex.shtml

Specifications – We allow durable markings to be used in various applications, surface mounted and inlaid. We use spray, extrude, flat, profile, and wet weather markings. Current versions of all of our specifications are on the Internet. You can review the Standard Specifications and modifications to those called Special Provisions by reviewing Section 00850 and 00865 at: http://www.oregon.gov/ODOT/HWY/SPECS/index.shtml

Material Specifications

1. APPLICABLE SPECIFICATIONS: The following specifications, test methods, and standards in effect on the opening date of the Solicitation for Samples form a part of this specification where referenced:

   AASHTO M247; ASTM D93; ASTM D562; ASTM D711; ASTM D713; ASTM D913; ASTM D1210; ASTM D1729; ASTM D2243; ASTM D2486; ASTM D2621; ASTM D2697; ASTM D2805; ASTM D3718; ASTM D3723; ASTM D3960; ASTM E70; ASTM E97; and FTMS 4053

   There may be other test methods and specifications specifically described in this document.

2. GENERAL REQUIREMENTS FOR WATERBORNE TRAFFIC PAINT

   2.1 Silence of Specification. The apparent silence of this specification and supplemental specifications as to any detail, or the apparent omission from it of a detailed description concerning any point, shall be regarded as meaning that only the best commercial practice is to prevail and the only materials and workmanship of first quality are to be used.

   2.2 Cause for Rejection. Any exception to this specification may be cause for rejection.

   2.3 Composition. The manufacturer shall determine the exact composition of the paint. It will be the manufacturer's responsibility to produce a lead free, pigmented, 100% water-borne paint containing all the necessary co-solvents, dispersants, wetting agents, preservatives, and all other additives, so that the paint shall retain its viscosity, stability, and all of the properties as specified herein.

3. CHARACTERISTICS FOR WATERBORNE TRAFFIC PAINT

   3.1 Test Requirements - Lab

Viscosity at 77°F	100 KU max.	ASTM D562
Fineness of Grind, Hegman	3 min.	ASTM D1210

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Laboratory dry to no pickup time @ 15 mils wet film thickness thickness (no beads)@ 50% humidity	10 minutes max.	ASTM D711
Flash Point, °F min	100 min.	ASTM D93
Pigment content, % by weight	68% max.	ASTM D3723
Non volatile vehicle, % by weight	36% min.	FTMS 4053
Total solids by volume	60% min.	ASTM D2697
Directional Reflectance @ 15 mils wet film thickness White	88% min.	ASTM D2805
Contrast Ratio @ 15 mils wet film thickness		
White	98% min.	ASTM D2805
Yellow	96% min.	STM D2805
Freeze Thaw	5 cycles max.	ASTM D2243
Volatile Organic Compound (VOC)	less than 150 g per liter	ASTM D3960
pH	9.5 min.	ASTM E70
Chromium	shall be negative	ASTM D3718

The binder shall be 100% acrylic when tested in accordance with ASTM D2621.

Color. Paint draw-downs shall be prepared in accordance with ASTM E97. The color of the yellow samples will be compared to the PR-1 chart. They shall closely match 33538 Federal Yellow.

Scrub Resistance. The paint shall pass a minimum of 500 cycles when tested in accordance with ASTM D2486.

Static Heat Stability. Put 450 mL of paint in a 473 mL (one pint) lined container, close the container, seal it with tape, and put in an oven maintained at 135°F ± 1°F for 7 days. Equilibrate the paint at standard conditions and mix thoroughly with gentle stirring. Examine paint for livering and hard settling and determine viscosity. The paint shall show no increase in viscosity greater than 10 KU over the viscosity at 77°F nor any coagulation, lumps, or coarse particles.

Weight Per Gallon. For ODOT purchases, during the term of the bid, the weight per gallon shall be within +/- 0.20 pounds from the bid sample. The procedure described in ASTM D1475 will be used only to calibrate the weight per gallon cup.

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To determine the weight per gallon of the paint, the following water-reduction method shall be used (determine all weight to the nearest 0.01 gram):

Step 1. Tare out the weight of the 83.2 mL weight-per-gallon cup and lid.

Step 2. Weight approximately 40 grams of paint into the cup. Record the weight of the cup, paint, and lid as P.

Step 3. Add a small amount of water and stir thoroughly. Fill the cup to the top with water. Place the lid on the cup and quickly wipe away any excess with one stroke. Record the weight of the cup, lid, water, and paint as M.

Step 4. Clean and dry the cup and lid. Fill with water, replace the lid and wipe away the excess. Record the weight of the cup, lid, and water as S.

Step 5. Calculate the weight per gallon the paint, using the following equation:

$$\frac{1}{(1 - (M-P)/S)} \times \frac{P}{10} = \text{Weight (lbs/gal)}$$

3.2 Test Requirements - Field

No-track time 90 seconds max.

No-Tracking Time. The paint shall dry to a no-tracking condition in no more than 90 seconds when applied at 15 mils wet film thickness at dry pavement temperature of 50°F to 100°F and maximum 85% relative humidity, with 6 pounds of glass beads per gallon of paint. "No-Tracking" shall be the time required for the line to withstand the running of a standard automobile over the line at a speed of approximately 40 mph simulating a passing procedure, without tracking of the reflectorized line when viewed from a distance of 50 feet downstream.

3.3 Road Service Test. On occasion, ODOT will conduct a Road Service Test. Solicitations for samples will be asked for before a Road Service Test is placed. At the Road Service Test, one or more transverse lines of a length, width, and film thickness as designated by the State will be applied at ambient temperature on highway surfaces at locations to be selected by the State for the test. Only those samples meeting all the requirements in this section will be used in the Road Service Test. The State shall apply these lines and shall be the sole judge of methods, equipment, rates of application, and test evaluation.

4. TRAFFIC TEST DECK INSTALLATION AND EVALUATION CRITERIA

4.1 Scope - This procedure covers the methods used to determine the service life index that can be used to determine the cost per day of a traffic paint. This procedure is in accordance with ASTM D 713-90, "Standard Practice for Conducting Road Tests on Fluid Traffic Marking Materials", except as modified herein. A panel organized by ODOT will evaluate each formulation for durability, color, and night visibility performance; then a service life index will be calculated.

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4.2 Type and Location of Pavement for Tests - The products will be applied on portland cement concrete and asphalt cement concrete pavements. The location of the test deck will be announced.

4.3 Installation Procedure

4.3.1 Waterborne Traffic Paint - The paint will be applied transverse to the roadway. Stripes will be 4 inches wide with a wet film thickness of 15 mils plus or minus 1 mil. Standard M247 beads will an AC110 coating be placed at 6 pounds per gallon of paint. Two stripes of each formulation will be applied on bare pavement, on both Portland cement concrete and asphalt cement concrete. The standard ODOT Waterborne paint will be placed on the deck act as "control". All submitted samples will be expected to equal or exceed the performance of the "control". Panels of each formulation will be taken for documentation and for comparison on the appearance evaluation.

4.4 Evaluation Criteria

4.4.1 Durability is a measure of the material remaining on the pavement or substrate. This determination will be made by evaluating an area extending 6 inches each side of the center point of either wheel track. The evaluation will be made in accordance with Test Method D913-88. The rating by each panel member will be averaged. Failure is defined as when there is less than 50% of the material left on the pavement or substrate.

4.4.2 Appearance is the complete impression conveyed when the material surface is viewed at a distance of at least 10 feet, before any detailed inspection has been made. It takes into account changes in the color of the surface under consideration, taking into account changes due to yellowing, bleeding, darkening, fading, dirt collection, mold growth, etc,

4.4.3 Color will be determined by using the PR-1 Chart, 33538 Federal Yellow. The determination will be made without preliminary washing or other modification of the surface of the test lines.

4.4.4 Night visibility will be conducted using a Mirolux 12 retro-reflectometer. Failure is defined as when the measurement is less than 100 millicandellas per lux per square meter. Measurements will be taken in the wheel tracks. The average of readings in both wheel tracks will be used.

4.4.5 The Service Life Index is defined as the number of days between the date the sample was applied and the date any one of the performance measures falls below the specified minimum value.

4.5 Evaluation Procedure – ODOT will monitor the installation.

4.5.1 Waterborne Traffic Paint - Each stripe will be evaluated for 12 months or until a failure occurs. A Service Life index will be determined for each paint sample applied on the road test deck. Any paint sample that fails laboratory testing, field track testing or fails to achieve a service like index greater than the control paint service life will be disqualified from the process. Future paint solicitations may be awarded based on the lowest cost per liter per service day. The "per liter prices" will be divided by the Service life index in days (SLI). This value will be multiplied by the projected usage.

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Process – To have your product reviewed for placement on the QPL, submit the following:

- Preliminary Information for Product Evaluation Form.
- Copies of test reports showing compliance with the above Material Specifications.
- Copies of Brochures, including pictures.
- MSDS (including primers if necessary).
- Limitations of Product or Installations.
- Installation Recommendations.
- Place each product on an ODOT Test Deck for evaluation. Contact Joel Fry in the Office of Maintenance for details (503-986-4485).

Submit to:

Mike Dunning
New Products Coordinator - Oregon DOT
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http://www.oregon.gov/ODOT/HWY/CONSTRUCTION/QPL/QPIndex.shtml