MATERIAL GENERAL SERVICES SPECIAL PROVISIONS
WHITE AND YELLOW ACRYLIC WATERBORNE TRAFFIC MARKING PAINT MGS-91-06N

1.0 DESCRIPTION. These specifications cover waterborne traffic paint for application on bituminous or Portland cement concrete pavements by department-owned spray equipment at application temperatures of 50 to 150°F (10 to 66°C). The paint shall be capable of receiving and holding glass beads for producing reflectorized traffic markings.

1.1 The attention of the bidder is specifically directed to the following requirements: **At the request of the purchaser, any paint furnished under this provision that has been contaminated with any form of material, cannot be satisfactorily applied, or that does not otherwise meet these specifications shall be disposed of by the supplier and immediately replaced with acceptable material entirely at the supplier's expense, including handling and transportation charges. Paint that has been delivered and is subsequently determined to fail to meet these specification requirements may be accepted for use by the purchaser after an appropriate deduction in purchase price as determined by MoDOT. It is to be expressly understood that these requirements are part of the bid.**

2.0 MATERIALS. The paint shall not contain more than 3200 ppm lead and/or more than 800 ppm chromium based on dry weight and shall have limited Volatile Organic Content (VOC), as noted herein.

2.1 Acrylic Emulsion Polymer. The acrylic emulsion polymer used in the manufacture of the paint shall be Rohm & Haas E-2706, Dow DT211, or equal. Later generation acrylic emulsions may be substituted only after concurrence of the Chemical Laboratory Director.

2.2 General. The finished paint shall be formulated and manufactured from first-grade materials and shall be a fast drying, water based, acrylic resin type paint capable of withstanding air and roadway temperatures without bleeding, staining, discoloring, or deforming. The dried paint film shall be capable of maintaining its original dimensions and placement without chipping, spalling, or cracking. In addition, it shall not deteriorate because of contact with sodium chloride, calcium chloride, mild alkalies and acids, or other ice control materials, or oil, gasoline or diesel fuel drippings from vehicles.

2.3 Durability Testing. Determination of conformance to this specification will include, but will not be limited to, the evaluation of test data from AASHTO's National Transportation Product Evaluation Program (NTPEP) or other MoDOT approved facilities. The maintained retroreflectivity and durability shall conform to the following requirements after being installed on at least one NTPEP test deck for at minimum of six (6) months. The six-month data must include the winter months of December, January, and February and the data shall be obtained from evaluation on an NTPEP test deck in a northern, cold climate region.

2.3.1 Maintained retroreflectivity. Photometric quantity to be measured is coefficient of retroreflective luminance (R_L) in accordance with the requirements of ASTM E1347 for 15-meter geometry and ASTM E1710 for 30-meter geometry. The average R_L for concrete and asphalt surfaces shall be expressed in millicandelas per square meter per lux (milicandelas/m^2/lux) and shall be at least 100 for 15 meter geometry or 75 for 30 meter geometry, when measured in the wheel path area.

2.3.2 Durability. Paint shall have a durability rating of at least 4 for both concrete and asphalt

surfaces when tested in the wheel path area of the NTPEP test deck.

2.4 Mixed Paint. The mixed paint shall conform to the following requirements.

2.4.1 The paint shall be strained before filling, using a screen or strainer not coarser than 40 mesh or equivalent.

2.4.2 The volatile content of the finished paint shall contain less than 150 grams of volatile organic matter per liter in accordance with ASTM D3960.

2.4.3 The paint shall have the following properties:

2.4.3.1 Physical Properties.

Weight per Gallon, 77°F (25°C), lbs.	Report
Viscosity, 77°F (25°C), Krebs Units	83-98
Grind (Hegman Gage), min.	3
Laboratory Dry Time, ASTM D 711,minutes, max.	10
Dry Through Time, minutes, max.	150

2.4.3.2 Color. For white, the color shall closely match Color Chip 37925 of Federal Standard 595b and for yellow, the color shall closely match Color Chip 33538 of Federal Standard 595b. Color determination will be made for markings and the diffuse daytime color of the markings shall conform to the below CIE Chromaticity coordinate limits. Color determination for liquid marking materials will be made over the black portion of a 2A or 5C Leneta Chart (or equal) at least twenty-four (24) hours after application of a 15-mil wet film. Color readings will be determined in accordance with the requirements of ASTM E1349 using CIE 1931 2° standard observer and CIE standard illuminant D65.

CIE CHROMATICITY COORDINATE LIMITS (INITIAL)								
	1		2		3		4	
Color	x	y	x	y	x	y	x	y
White	0.334	0.357	0.334	0.317	0.297	0.357	0.297	0.317
Yellow	0.531	0.483	0.531	0.429	0.471	0.483	0.471	0.429

2.4.3.3 Flexibility. The paint shall show no cracking or flaking when tested in accordance with Federal Specification TT-P-1952B.

2.4.3.4 Water Resistance. The paint shall conform to Federal Specification TT-P-1952B. There shall be no blistering or appreciable loss of adhesion, softening, or other deterioration after examination.

2.4.3.5 Freeze-Thaw Stability. The paint shall show no coagulation or change in consistency greater than 10 Kreb Units, when tested in accordance with Federal Specification TT-P-1952B.

2.4.3.6 Heat Stability. The paint shall show no coagulation, discoloration or change in consistency greater than 10 Kreb Units, when tested in accordance with Federal Specification TT-P-1952B.

2.4.3.7 Dilution Test. The paint shall be capable of dilution with water at all levels without

curdling or precipitation such that the wet paint can be readily cleaned up with water only.

2.4.3.8 Storage Stability. After 30 days storage in three-quarters filled, closed container, the paint shall show no caking that cannot be readily remixed to a smooth, homogeneous state, no skinning, livering, curdling, or hard settling. The viscosity shall not change more than 5 Kreb Units from the viscosity of the original sample.

2.4.3.9 Contrast Ratio. The minimum contrast ratio (hiding power) shall be 0.96 when drawn down with a 0.005 bird film applicator on a 2A or 5C Leneta Chart (or equal) and air-dried for 24 hours. Contrast Ratio = Black/White.

2.4.3.10 Reflectance. The daylight directional reflectance of the white paint shall not be less than 84 percent and not less than 50 percent for yellow paint of a 15 mil wet film applied to a 2A or 5C Leneta Chart (or equal). After drying for a minimum of 24 hours measure the reflectance of the paint over the black portion of the chart using colorimeter, ASTM E 1347.

2.3.3.11 Bleeding. The paint shall have a minimum bleeding ratio of 0.97 when tested in accordance with Federal Specification TT-P-1952B. The asphalt saturated felt shall conform to ASTM D 226 for Type I.

2.4.3.12 No-Tracking Time Field Test. The paint shall dry to a no-tracking condition under traffic in three (3) minutes maximum when applied at 15 ± 2 mil wet film thickness at 120-140°F (49-60°C), and from three (3) to ten (10) minutes when applied at ambient temperatures, with 6 pounds (2.72kilograms) of glass beads per gallon (3.8 liters) of paint. "No tracking" shall be the time in minutes required for the line to withstand the running of a standard automobile over the line at a speed of approximately 40 mph (64 kph), simulating a passing procedure without tracking of the reflectorized line when viewed from a distance of 50 feet (15 meters).

2.4.3.13 Dry Through Time. The paint shall be applied to a non-absorbent substrate at a wet film thickness of 15 ± 1 mils and placed in a humidity chamber controlled at 90 ± 5 percent R.H. and 72.5 ± 2.5°F. The dry through time shall be determined according to ASTM D 1640, except that the pressure exerted shall be the minimum needed to maintain contact with the thumb and film.

3.0 PREQUALIFICATION OF BIDDER. No bid will be considered unless the firm submitting the bid can meet the following conditions:

3.1 That it has in operation a plant adequate for, and devoted to manufacture of the pavement marking paint that it proposes to furnish, and is capable of producing batch sizes of at least 3500 gallons (13,250 liters).

3.2 That it maintains a laboratory to scientifically control the product bid upon to assure accuracy and quality of formulation.

3.3 That it has produced fast drying waterborne traffic marking paint over the past year (1) with a successful application record.

3.4 That the product(s) bid upon has successfully completed the durability testing required under Section 2.3 of this specification.

3.5 The Commission must receive proof of the above-listed items prior to the award of the contract.

4.0 PREQUALIFICATION OF PAINT.

4.1 Prior to bid opening, each bidder shall submit three one-quart samples of each paint bid upon. Each paint sample shall be accompanied by one pint can of acrylic emulsion, and certified test results for all of the tests stipulated under Section 2.4 of this specification with the exception of the Storage Stability test stipulated under Section 2.4.3.8. Each sample shall be identified by manufacturer's code number and type of paint to permit easy reference and identification. Samples are to be submitted to the Chemical Laboratory Director, Missouri Department of Transportation, Materials Laboratory, 1617 Missouri Blvd., Jefferson City, MO 65109. MHTC will not award the contract until it receives the results of the paint tests.

4.2 Prior to bid opening, each bidder shall submit documentation indicating the most recent NTPEP report that provides the data required under Section 2.3 of this specification. The bidder shall also submit certification that the paint offered for conformance to this specification is manufactured to the same formulation as the paint applied on the NTPEP test deck. The only deviations from this formulation that are permitted are a slight variation in the amount of thickener used in order to adjust the viscosity to the required level and the addition of sufficient water to replace that lost in processing of the paint. The manufacturer's identification code for the submitted paint shall be the same as that submitted for application to the test decks and that is shown on the appropriate NTPEP report.

4.3 No award of bids will be made until the paint has met all the requirements specified herein, with the exception of the Storage Stability test stipulated under Section 2.4.3.8, when subjected to testing in the MoDOT Central Laboratory. NOTE: Normal testing time is a minimum of 30 calendar days.

5.0 SERVICE. Since proper application is deemed essential to the success of this process, the manufacturer shall have at least one technician available to instruct in the application of this type of paint. The technician shall be familiar with the application equipment and the materials, and shall have successful experience in the placing of fast drying waterborne traffic paint at the film thickness requirements of this specification.

6.0 ACCEPTANCE. The Missouri Department of Transportation reserves the right to make field tests of material after receipt of bids, but prior to award to determine the paint's suitability for application in its equipment and for purposes of determining compliance with drying time requirements of this specification.

6.1 STABILITY IN STORAGE. After storage for periods up to twelve (12) months from the date of manufacture, the paint shall comply with the following requirements:

a) The pigment shall not settle badly or cake in the container, nor shall the paint skin or thicken in storage sufficiently to cause an undesirable change in consistency, nor show spoilage.

b) The paint shall comply with all other provisions of these specifications and be capable of being redispersed with a paddle or mixer to a smooth uniform condition of usable consistency.

7.0 PURCHASING. The ready-mixed paint shall be purchased by volume, one (1) gallon shall mean two hundred thirty-one (231) cubic inches at seventy-seven (77) degrees Fahrenheit.

8.0 INSPECTION. The successful vendor shall notify the Chemical Laboratory Director, Missouri Department of Transportation, P.O. Box 270, Jefferson City, MO 65102 prior to start of manufacture of any paint. Should the vendor's production facility be outside of the State of Missouri, the department reserves the right to take into consideration, in determining the low bidder, the added cost of inspection at such point compared to inspection performed within the state.

8.1 The manufacturer shall provide, at no additional cost, standard friction-seal cans for the shipment of the finished product. The sample cans shall be lined to prevent rusting.

8.1.1 The manufacturer shall arrange for overnight delivery of the samples to MoDOT's Central Laboratory and shall be responsible for the total cost of these shipments.

8.2 Manufacture of the paint may be witnessed in whole or part, at the discretion of the department's inspector. **Production shall not begin prior to the arrival of the department's inspector, unless prior specific approval for the starting has been obtained.** The manufacturer shall provide the inspector free access to those parts of the manufacturing facility where raw materials are stored, products are being manufactured, or finished products are being tested, and in all other ways shall facilitate the inspector in performing his duties. Finished products, when stored, shall be in an orderly fashion to permit proper and correct inventory of these materials at all times.

8.3 Basis for Rejection. Finished products that fail to meet any requirement of these specifications shall be subject to rejection.