

**Office of State Aid Road Construction
Mississippi Department of Transportation**

DATE: December 3, 1998

SUBJECT: HOT SPRAY PAINT PAVEMENT MARKINGS

Section S-619, Painted Traffic Markings, of the 1989 Edition of the Mississippi Standard Specifications for State Aid Road and Bridge Construction is hereby amended as follows:

Delete in toto Subsections S-619.01 thru S-619.03 on page 6-63 and replace with the following:

901-S-619.01--Description. This work shall consist of furnishing materials and applying reflectorized 40 mil thick hot spray paint pavement marking in reasonably close conformity with these specifications and the details shown on the plans or established.

901-S-619.02--Materials:

901-S-619.02.1--Binder. The binder shall consist of a mixture of synthetic resins, at least one of which is solid at room temperature. The total binder content of the paint compound shall be well distributed throughout the compound. The binder shall be free from all foreign objects or ingredients that would cause bleeding, staining or discoloration. The binder shall be 26 percent minimum by weight of the paint compound. The binder shall be characterized by an IR Spectra.

901-S-619.02.2--Pigment. The pigment used for the white paint compound shall be a high-grade pure (minimum 93 percent titanium dioxide TiO₂). The white pigment content shall not be less than 10 percent by weight and shall be uniformly distributed throughout the paint compound.

The pigments used for the yellow paint compound shall be heat resistant, silica encapsulated lead chromate yellow and moly oranges which shall produce a compound meeting the requirements of FED 595 Color No. 33538. The yellow marking material shall contain a minimum of 4 percent by weight of the yellow pigment with a minimum lead chromate content of 50 percent.

901-S-619.02.3--Filler. The filler to be incorporated with the resins as a binder shall be a white calcium carbonate, silica, or an approved substitute. Any filler which is insoluble in 6N hydrochloric acid shall be of such particle size as to pass a No. 100 sieve.

901-S-619.02.4--Glass Beads. Intermix glass beads shall be uniformly mixed throughout the material at the rate of not less than 27 percent by weight (retained on the No. 100 sieve) of paint compound. Drop on beads shall be used with pavement marking material and shall be applied uniformly at a minimum rate of 8 pounds per 100 square feet.

901-S-619.02.4.1--Properties. The drop on glass beads furnished under this specification shall consist essentially of transparent, water-white glass particles of a spherical shape. They shall be manufactured from a glass of a composition designed to be highly resistant to traffic wear and to the effects of weathering. The glass beads shall conform to the following requirements:

- (a) **Sieve Analysis.** The glass beads shall meet the following sieve requirements:

<u>Sieve Size</u>	<u>% Passing</u>
No. 16	99 - 100
No. 20	75 - 95
No. 30	65 - 95
No. 50	15 - 35
No. 100	0 - 5

- (b) **Imperfections.** The surface of the glass beads shall be free of pits and scratches. The sizes beads shall have a roundness of 70% minimum average (ASTM D1155) with the exception of the +20 portion, which shall have a 65% minimum true spheres, tested visually.
- (c) **Index of Refraction.** The index of refraction of the glass beads shall be not less than 1.50 when tested by the immersion method at 77°F.
- (d) **Silica Content.** The glass beads shall contain not less than 65 percent silica (SiO₂).
- (e) **Chemical Stability.** Glass beads which show tendency toward decomposition, including surface etching, when exposed to paint or paint constituents will be rejected. The glass beads shall be tested by Federal Specification T-T-B-1325A, Section 4.3.11 (water resistant soxhlet extraction method) with the following exceptions: Under "Procedure", the size of sample to be tested shall be 25 grams. Under testing, Paragraph (1), the reflux-time shall be 5 hours and upon examination after testing the glass beads shall show no dulling effect. Under Paragraph (2), if more than 4.5 mls of 0.1N hydrochloric acid are used to reach the end point, it shall constitute failure of the test.

- (f) **Flowing Properties.** The glass beads shall flow uniformly through dispensing equipment in atmospheric humidity up to 94%. The drop-on beads shall pass the following test: One hundred grams of glass beads, spread evenly and thinly in a suitable container, shall be conditioned at 77°F for 4 hours over a solution of sulfuric acid (Sp. Gr. 1.10) in a closed desiccator. After 4 hours, the glass beads shall flow readily through a clean glass analytical funnel, 60°, 5 mm. diameter and 105 mm. stem. Inside diameter of the stem shall be a nominal 1/4 inch.
- (g) **Coating:** The glass beads used for intermix shall be uncoated. The glass beads used for the drop on application shall be coated with an adhesion promoting coating. Silicone coated drop on beads shall not be allowed.
- (h) **Packaging.** The Drop on glass beads shall be delivered in approved moisture proof bags consisting of at least five-ply paper construction unless otherwise specified. Each bag shall contain 50 or 55 pounds net, and shall be legibly marked with the manufacturer, specifications and type, lot number, and the month and year the glass beads were packaged.

901-S-619.02.5--Paint: In the plastic state, the material shall not give off fumes that are toxic or otherwise injurious to persons or property. The manufacturer shall provide material safety sheets for the product.

The temperature versus viscosity characteristic of the plastic material shall remain constant and the material shall not deteriorate in any manner during reheating processes.

There shall be no obvious change in color of the material as a result of repeated heatings or from batch to batch. The maximum elapsed time after application after which normal traffic will leave no impression or imprint on the new stripe shall be 30 seconds when the air and road surface temperature is approximately 68°F ± 6°F. After appreciable deformation or discoloration, shall remain free from tack, and shall not lift from the pavement under normal traffic conditions within a road temperature range of -20° to 150°F. The stripe shall maintain its original dimensions and placement. Cold ductility of the material shall be such as to permit normal dimensional distortion as a result of traffic impact within the temperature range specified.

The material shall provide a stripe that has a uniform thickness throughout its cross section and has the density and character to provide a sharp edge of the line.

The paint compound after heating for 4 hours ± 5 min at 375° ± 3°F and cooled at 77°F shall meet the following requirements for daylight reflectance and color, when tested, using a color spectrophotometer with 45° circumferential/0° geometry, illuminant C, and 2° observer angle. The color instrument shall measure the visible spectrum from 380 to 720 nm with a wavelength measurement interval and spectral bandpass of 10 nm.

White: Daylight Reflectance (Y) 75 percent minimum

*Yellow: Daylight Reflectance (Y) 42-59 percent

*Shall match Federal 595 Color No. 33538 and chromaticity limits as follows:

x	.470	.510	.485	.530
y	.455	.485	.425	.456

901-S-619.02.5.1--Specific Gravity. The specific gravity of the paint material shall not exceed 1.87.

901-S-619.02.5.2--Softening Point. After heating the paint material for 4 hours \pm 5 min. at 375° \pm 3°F and testing in accordance with ASTM E28, the material shall have a minimum softening point of 180°F as measured by the ring and ball method.

901-S-619.02.5.3--Tensile Bond Strength. After heating the paint material for 4 hours \pm 5 min. at 375°F, the tensile bond strength to unprimed, sandblasted portland cement concrete block, 0.0625-inch thick film drawdown at 375°F, tested at 75° \pm 2°F shall exceed 180 psi when tested in accordance with ASTM D4796-88.

901-S-619.02.5.4--Impact Resistance. After heating the paint material for 4 hours \pm 5 min at 375° \pm 3°F the impact resistance shall be a minimum of 50 inch pounds with no cracks or bond loss when 0.0625 inch thick film drawdown is made at 375°F on an unprimed sandblasted portland cement concrete block, male indenter 5/8 inch, no female Die, tested at 75° \pm 2°F when tested in accordance with ASTM D2794 minimum.

901-S-619.02.5.5--Yellowness Index. The white paint material shall not exceed a yellowness index of 12 when tested in accordance with ASTM D1925.

- (a) **Identification** - Each package of material shall be stenciled with the manufacturer's name, the type of material and specification number, the month and year the material was packaged and lot number. Lot numbers must begin with the last two digits of the year manufactured and be sequential. The letters and numbers used in the stencils shall be a minimum of 1/2 inch in height.
- (b) **Packaging** - Paint material shall be packaged in suitable containers which will not adhere to the product during shipment and storage. The container of paint material shall weigh approximately 50 lbs. Each container shall designate the color, binder (alkyd or hydrocarbon), spray and user information. The label shall warn the user that the material shall be heated in the range of 350° - 425°F.

- (c) **Storage Life** - The material shall meet the requirements of this specification for a period of one year. The paint must also melt uniformly with no evidence of skins or unmelted particles for this one year period. Any material not meeting the above requirements shall be replaced by the manufacturer.

Delete the first paragraph of Subsection S-619.05 on page 6-64 and replace with the following:

901-S-619.02.6--Installation Requirements:

- (a) Before applying paint, the Contractor shall remove any dirt, glaze, grease, or any other material that would reduce the adhesion of the paint to the pavement
- (b) The paint material shall be readily renewable by placing an overlay of new material directly over old markings of the same material. Such new material shall bond itself to the old markings in such a manner that no splitting or separation takes place. The contractor shall remove all existing material that might cause premature failure of the new material.
- (c) The paint material shall be installed in a molten state by the spray method at a minimum temperature of 350°F and a maximum temperature of 425°F. Scorching or discoloration of material shall be cause for rejection by the Engineer. The machinery shall be constructed so that all mixing and conveying parts, up to and including the spray gun maintain the material in the molten state.
- (d) Paint pavement marking materials shall not be applied by the spray method when air and pavement surface temperatures are below 40°F or when the surface of the pavement contains any evidence of moisture.
- (e) The paint material shall be applied at a thickness of not less than 0.040 inch and in no case shall it exceed a thickness of 0.050-inch.
- (f) The Contractor shall place the paint markings with adequate drop-on glass beads in accordance with the above requirements, uniformly applied to assure adequate nighttime reflectivity. It shall be the Contractor's responsibility to use a compatible combination of paint material and beads to preclude the surface beads from sinking deeply into the paint.

901-S-619.02.7--Equipment Requirements:

- (a) The equipment used to install hot applied paint material shall provide continuous uniform heating to temperatures exceeding 400°F, mixing and agitation of the material. Conveying parts of the equipment between the main material reservoir and the line dispensing device shall prevent accumulation and clogging. All parts of the equipment which come in contact with the material shall be constructed for easy accessibility and exposure for cleaning and maintenance. The equipment shall operate so that all mixing and conveying parts including the line dispensing device, maintains the material at the plastic temperature.
- (b) Glass beads applied to the surface of the completed marking shall be applied by an automatic bead dispenser attached to the marking machine so that the beads are dispensed closely behind the installed marking. The glass bead dispenser shall be equipped with an automatic cut-off control synchronized with the cut-off of the paint material.

901-S-619.03--Acceptance:

- (a) **Paint** - The manufacturer shall furnish the Engineer three (3) copies of certified test report(s) showing results of all required test and certification that the material meets the specifications.
- (b) **Glass Beads** - The manufacturer shall furnish the Engineer three (3) copies of certified test report(s) showing results of all required test and certification that the material meets the specifications. The Engineer shall document acceptance as per S.O.P No. SAD-II-3-5.

901-S-619.04--Method of Measurement: Measurement shall comply with Section S-619.10 of the 1989 Edition of the Standard Specifications.

Delete in toto Subsection S-619.11 on page 6-65 and 6-66 and replace with the following:

901-S-619.05--Basis of Payment. Traffic stripe, will be paid for at the contract unit price per mile or per linear foot as indicated in the proposal.

Detail traffic stripe will be paid for at the contract unit price per linear foot.

Legend will be paid for at the contract unit price per square foot.

The prices thus paid shall be full compensation for completing the work specified.

Payment will be made under:

<u>Pay Item No. 901-S-619-A:</u>	Traffic Stripe (Skip White)	- per mile
<u>Pay Item No. 901-S-619-B:</u>	Traffic Stripe (Skip Yellow)	- per mile
<u>Pay Item No. 901-S-619-C:</u>	Traffic Stripe (Continuous White)	- per mile or lin. ft.
<u>Pay Item No. 901-S-619-D:</u>	Traffic Stripe (Continuous Yellow)	- per mile or lin. ft.
<u>Pay Item No. 901-S-619-G:</u>	Temporary Traffic Stripe	- per lin. ft.
<u>Pay Item No. 901-S-619-H:</u>	Detail Traffic Stripe	- per lin. ft.
<u>Pay Item No. 901-S-619-L:</u>	Legend	- per Sq. ft.