

**SECTION 710**  
**PAINTED PAVEMENT MARKINGS**

**710-1 Description.**

Apply painted pavement markings, in accordance with the Contract Documents.

**710-2 Materials.**

Use only materials listed on the Department's Approved Product List (APL) meeting the following requirements:

Materials for Retroreflective Pavement Markers and Bituminous Adhesive .....	Section 970
Standard Paint .....	971-1 and 971-3
Durable Paint .....	971-1 and 971-4
Glass Spheres .....	971-1 and 971-2

The Engineer will take random samples of all material in accordance with the Department's Sampling, Testing and Reporting Guide schedule.

**710-3 Equipment.**

Use equipment that will produce continuous uniform dimensions of pavement markings of varying widths and meet the following requirements:

1. Capable of traveling at a uniform, predetermined rate of speed, both uphill and downhill, in order to produce a uniform application of paint and capable of following straight lines and making normal curves in a true arc.
2. Capable of applying glass spheres to the surface of the completed line by an automatic sphere dispenser attached to the pavement marking machine such that the glass spheres are dispensed closely behind the installed line. Use a glass spheres dispenser equipped with an automatic cut-off control that is synchronized with the cut-off of the paint and applies the glass spheres in a manner such that the spheres appear uniform on the entire pavement markings surface.
3. Capable of spraying the paint to the required thickness and width without thinning of the paint. Equip the paint tank with nozzles equipped with cut-off valves, which will apply broken or skip lines automatically.

**710-4 Application.**

**710-4.1 General:** Remove existing pavement markings, such that scars or traces of removed markings will not conflict with new pavement markings, by a method approved by the Engineer.

Before applying pavement markings, remove any material that would adversely affect the bond of the pavement markings by a method approved by the Engineer.

Apply standard paint to dry surfaces only, and when the ambient air and surface temperature is at least 40°F and rising.

Apply durable paint to dry surfaces only. Do not apply durable paint when the ambient air and surface temperature is below 50°F, relative humidity is above 80% or when the dew point is within 5°F of the ambient air temperature.

Do not apply painted pavement markings when winds are sufficient to cause spray dust.

Apply painted pavement markings, having well defined edges, over existing pavement markings such that not more than 2 inches on either end and not more than 1 inch on either side is visible. When stencils are used to apply symbols and messages, the areas covered by the stencil reinforcing will not be required to be painted.

Mix the paint thoroughly prior to pouring into the painting machine. Apply paint to the pavement by spray or other means approved by the Engineer.

Conduct field testing in accordance with FM 5-541. Remove and replace painted pavement markings not meeting the requirements of this Section at no additional cost to the Department.

Apply all pavement markings prior to opening the road to traffic.

**710-4.1.1 Painted Pavement Markings (Final Surface):** On concrete surfaces or newly constructed asphalt without rumble striping, the painted pavement markings (final surface) will include one application of standard paint and one application of Class B retroreflective pavement markers applied to the final surface.

On newly constructed asphalt with rumble striping, apply two applications of standard paint and one application of Class B retroreflective pavement markers. Additionally, for center line rumble striping installations, install Class D retroreflective pavement markers with the first application of standard paint. Remove Class D markers prior to grinding, and install Class B retroreflective pavement markers in an unground area after grinding. The second application of standard paint must be applied within 24 hours of each day's grinding operation.

Do not apply final surface paint for bicycle arrows or bicycle messages, 24 inch longitudinal bars in special emphasis crosswalks, or route shields where preformed thermoplastic will be applied.

Install all retroreflective pavement markers in accordance with Design Standards, Index Nos. 17352 and 17345, prior to opening the road to traffic.

Temporary retroreflective pavement markers must meet the requirements of Section 102.

Permanent retroreflective pavement markers must meet the requirements of Section 706.

**710-4.2 Thickness:** Apply standard paint to attain a minimum wet film thickness in accordance with the manufacturer's recommendations. Apply durable paint to attain a minimum wet film thickness of 0.025 inches or 25 mils. Measure, record, and certify on a Department approved form and submit to the Engineer, the thickness of white and yellow durable paint pavement markings in accordance with FM 5-541.

**710-4.3 Retroreflectivity:** Apply white and yellow standard paint that will attain an initial retroreflectance of not less than  $300 \text{ mcd/lx}\cdot\text{m}^2$  and not less than  $250 \text{ mcd/lx}\cdot\text{m}^2$ , respectively. Apply white and yellow durable paint that will attain an initial retroreflectance of not less than  $450 \text{ mcd/lx}\cdot\text{m}^2$  and not less than  $300 \text{ mcd/lx}\cdot\text{m}^2$ , respectively.

Measure, record and certify on a Department approved form and submit to the Engineer, the retroreflectivity of white and yellow pavement markings in accordance with FM 5-541.

The Department reserves the right to test the markings within three days of receipt of the Contractor's certification. Failure to afford the Department opportunity to test the markings will result in non-payment. The test readings should be representative of the Contractor's pavement marking performance. If the retroreflectivity values measure below values shown above, reapply the pavement marking at no additional cost to the Department.

For standard paint, ensure that the minimum retroreflectance of white and yellow pavement markings are not less than 150 mcd/lx m<sup>2</sup>. If the retroreflectivity values for standard paint fall below the 150 mcd/lx m<sup>2</sup> value within 180 days of initial application, the pavement marking will be reapplied at the Contractor's expense. If the retroreflectivity values for durable paint fall below the initial values of 450 mcd/lx m<sup>2</sup> value for white and 300 mcd/lx m<sup>2</sup> for yellow within 180 days of initial application, the pavement marking will be reapplied at the Contractor's expense.

**710-4.4 Color:** Use paint material that meets the requirements of 971-1.

**710-4.5 Glass Spheres:** Apply glass spheres on all pavement markings immediately and uniformly following the paint application. The rate of application shall be based on the manufacturer's recommendation.

For longitudinal durable paint markings, apply a double drop of Type 1 and Type 3 glass spheres. For transverse durable paint markings, apply a single drop of Type 3 glass spheres.

The rate of application shall be based on the manufacturer's recommendation.

### **710-5 Tolerances in Dimensions and in Alignment.**

Establish tack points at appropriate intervals for use in aligning pavement markings, and set a stringline from such points to achieve accuracy.

#### **710-5.1 Dimensions:**

**710-5.1.1 Longitudinal Lines:** Apply painted skip line segments with no more than plus or minus 12 inches variance, so that over-tolerance and under-tolerance lengths between skip line and the gap will approximately balance. Apply longitudinal lines at least 2 inches from construction joints of portland cement concrete pavement.

**710-5.1.2 Transverse Markings, Gore Markings, Arrows, and Messages:** Apply paint in multiple passes when the marking cannot be completed in one pass, with an overall line width allowable tolerance of plus or minus 1 inch.

**710-5.1.3 Contrast Lines:** Use black paint to provide contrast on concrete or light asphalt pavement, when specified by the Engineer. Apply black paint in 10 foot segments following each longitudinal skip line.

**710-5.2 Alignment:** Apply painted pavement markings that will not deviate more than 1 inch from the stringline on tangents and curves one degree or less. Apply painted pavement markings that will not deviate more than 2 inches from the stringline on curves greater than one degree. Apply painted edge markings uniformly, not less than 2 inches or more than 4 inches from the edge of pavement, without noticeable breaks or deviations in alignment or width.

Remove and replace at no additional cost to the Department, pavement markings that deviate more than the above stated requirements.

**710-5.3 Correction Rates:** Make corrections of variations in width at a maximum rate of 10 feet for each 0.5 inch of correction. Make corrections of variations in alignment at a maximum rate of 25 feet for each 1 inch of correction, to return to the stringline.

### **710-6 Contractor's Responsibility for Notification.**

Notify the Engineer prior to the placement of the materials. At the time of notification, submit a certification to the Engineer with the APL number and the batch or Lot numbers of the paint and glass spheres to be used.

### **710-7 Protection of Newly Applied Pavement Markings.**

Do not allow traffic onto or permit vehicles to cross newly applied pavement markings until they are sufficiently dry. Remove and replace any portion of the pavement markings damaged by passing traffic or from any other cause, at no additional cost to the Department.

### **710-8 Corrections for Deficiencies to Applied Painted Pavement Markings.**

Reapply a 1.0 mile section, centered around any deficiency, at no additional cost to the Department.

### **710-9 Submittals.**

**710-9.1 Submittal Instructions:** Prepare a certification of quantities, using the Department's current approved form, for each project in the Contract. Submit the certification of quantities and daily worksheets to the Engineer. The Department will not pay for any disputed items until the Engineer approves the certification of quantities.

**710-9.2 Contractor's Certification of Quantities:** Request payment by submitting a certification of quantities no later than Twelve O'clock noon Monday after the estimate cut-off date or as directed by the Engineer, based on the amount of work done or completed. Ensure the certification of quantities consists of the following:

1. Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.
2. The basis for arriving at the amount of the progress certification, less payments previously made and less any amount previously retained or withheld. The basis will include a detailed breakdown provided on the certification of items of payment.

### **710-10 Method of Measurement.**

The quantities, authorized and acceptably applied, under this Section will be paid as follows:

1. The length, in gross miles, of solid, 10'-30' skip, 3'-9' dotted, 6'-10' dotted, and 2'-4' dotted lines.
2. The length, in linear feet, of transverse lines, diagonal lines, chevrons, and parking spaces.
3. The number of pavement messages, symbols, and arrows. Each arrow is paid as a complete marking, regardless of the number of "points" or directions.
4. Lump Sum, as specified in 710-4.1.1 (final surface).
5. The area, in square feet, for removal of existing markings acceptably removed. Payment for removal of conflicting markings will be in accordance with 102-5.8. Payment for removal of non-conflicting markings will be paid separately.

The gross mile measurement will be taken as the distance from the beginning of the painted line to the end of the painted line and will include the unmarked gaps for skip and dotted lines. The gross mile measurement will not include designated unmarked lengths at intersections, turn lanes, etc. Final measurement will be determined by plan dimensions or stations, subject to 9-1.3.1.

### **710-11 Basis of Payment.**

**710-11.1 General:** Price and payment will be full compensation for all work specified in this Section, including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools,

machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

**710-11.2 Painted Pavement Markings (Final Surface):** Price and payment for painted pavement markings (final surface) will be full compensation for all applications of painted pavement markings, and all applications and removal of retroreflective pavement markers in accordance with 710-4.1.1.

Payment will be made under:

Item No. 710	Painted Pavement Markings. Solid - per gross mile. Solid - per linear foot. Skip - per gross mile. Dotted - per gross mile. Message or Symbol -each. Arrows - each. Yield Line - per linear foot. Island Nose – per square foot
Item No. 710- 90	Painted Pavement Markings (Final Surface) - lump sum.