

**701 AUDIBLE AND VIBRATORY PAVEMENT MARKINGS.**  
**(REV 12-9-08) (FA 12-11-08) (7-09)**

PAGE 731. The following new Section is added after Section 700:

**SECTION 701**  
**AUDIBLE AND VIBRATORY PAVEMENT MARKINGS**

**701-1 Description.**

Apply audible and vibratory pavement markings in accordance with the Contract Documents.

**701-2 Materials.**

**701-2.1 Thermoplastic:** Use thermoplastic material meeting the requirements of 971-1 and 971-10 and listed on the Qualified Products List (QPL). The Engineer will take random samples of the materials in accordance with the Department's Sampling, Testing and Reporting Guide schedule.

**701-2.2 Glass Spheres:** Use glass spheres meeting the requirements of 971-1 and 971-2 and listed on the QPL. The Engineer will take random samples of glass spheres in accordance with ASTM D1214 and the Department's Sampling, Testing and Reporting Guide schedule.

**701-3 Equipment.**

Use equipment capable of providing continuous, uniform heating of the striping material to temperatures exceeding 390°F, mixing and agitating the material in the reservoir to provide a homogenous mixture without segregation. Use equipment that will maintain the striping material in a plastic state, in all mixing and conveying parts, including the line dispensing device until applied. Use equipment which is capable of producing a consistent pattern of transverse bars positioned at regular and predetermined intervals. Use equipment which meets the following requirements:

(a) capable of traveling at a uniform rate of speed, both uphill and downhill, to produce a uniform application of striping material and capable of following straight lines and making normal curves in a true arc.

(b) capable of applying glass spheres to the surface of the completed stripe by automatic sphere dispensers attached to the striping machine such that the glass spheres are dispensed closely behind the installed line. Use a glass sphere dispensers equipped with an automatic cut-off control that is synchronized with the cut-off of the thermoplastic material and applies the glass spheres uniformly on the entire traffic stripe surface with 50 to 60% embedment.

(c) equipped with a special kettle for uniformly heating and melting the striping material. The kettle must be equipped with an automatic temperature control device and material thermometer for positive temperature control and to prevent overheating or scorching of the thermoplastic material.

(d) meets the requirements of the National Fire Protection Association, state and local authorities.

## **701-4 Application.**

**701-4.1 General:** Before applying traffic stripes and markings, remove any material that would adversely affect the bond of the traffic stripes by a method approved by the Engineer.

Before applying traffic stripes to any Portland cement surface, apply a primer, sealer or surface preparation adhesive of the type recommended by the manufacturer. Offset longitudinal lines at least 2 inches from construction joints of Portland cement concrete pavement.

Apply traffic stripes or markings only to dry surfaces, and when the ambient air and surface temperature is at least 50°F and rising for asphalt surfaces and 60°F and rising for concrete surface.

Apply striping to the same tolerances in dimensions and in alignment specified in 710-5. When applying traffic stripes and marking over existing markings, ensure that not more than 2 inches on either end and not more than 1 inch on either side of the existing line is visible.

Conduct field tests in accordance with FM 5-541 and 5-579. Remove and replace markings not meeting the requirements of this Section.

**701-4.2 Thickness:** Apply base lines having a thickness of 0.079 to 0.085 inches, exclusive of the transverse audible bars, when measured above the pavement surface at the edge of the base line.

As an alternative to the flat base line, a profiled baseline meeting the following dimensions may be applied. The profiled baseline shall have a minimum height of 0.155 inches, when measured above the pavement surface at the edge of the inverted rib profile. The thickness in the bottom of the profile marking shall be 0.035 to 0.050 inches. The individual profiles shall be located transversely across the full width of the traffic stripe at approximately 1.0 inch on center, with a bottom width between 0.090-0.310 inches.

**701-4.3 Dimensions of Transverse Audible Bars:** Apply the raised transverse bar with a profile such that the leading and trailing edge are sloped at a sufficient angle to create an audible and vibratory warning.

Transverse bars on shoulder and centerline markings shall have a height of 0.45 to 0.55 inches, including the base line. The height shall be measured above the pavement surface at the edge of the marking, after application of drop-on glass spheres. The bars shall have an approximate length of 2.5 inches. The bars may have a drainage channel on each bar, the width of each drainage channel will not exceed 1/4 inch at the bottom of the channel. The longitudinal distance between bars shall be 30 inches.

**701-4.4 Retroreflectivity:** Apply white and yellow audible and vibratory markings that will attain an initial retroreflectance of not less than 300 mcd/lx·m<sup>2</sup> and not less than 250 mcd/lx m<sup>2</sup>, 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-5-579.

The Department reserves the right to test the markings within 3 days of receipt of the Contractor's certification. If the retroreflectivity values measure below values shown above, remove and reapply the striping.

**701-4.5 Glass Spheres:** Apply glass spheres to all markings. The manufacturer shall determine if a single or double application of glass spheres is used and the recommended drop rates for each application.

#### **701-5 Contractor's Responsibility for Notification.**

Notify the Engineer prior to the placement of audible and vibratory markings. Furnish the Engineer with the manufacturer's name and LOT numbers of the thermoplastic materials and glass spheres to be used. Ensure that the LOT numbers appear on the thermoplastic materials and glass spheres packages.

#### **701-6 Protection of Newly Applied Audible and Vibratory 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.

#### **701-7 Observation Period.**

Pavement markings are subject to a 180 day observation period under normal traffic. The observation period will begin with the satisfactory completion and acceptance of the pavement marking work.

The pavement markings shall show no signs of failure during the observation period. The Department reserves the right to check the color and retroreflectivity within 30 days prior to the end of the observation period.

Replace, at no expense to the Department, any pavement markings that do not perform satisfactorily under traffic during the 180 day observation period.

#### **701-8 Corrections for Deficiencies.**

Correct all deficiencies by removal and reapplication of a 1.0 mile LOT centered around the deficiency at no cost to the Department.

#### **701-9 Submittals.**

**701-9.1 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.

**701-9.2 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:

(a) Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

(b) 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.

#### **701-10 Method of Measurement.**

The quantities to be paid for under this Section will be as follows:

(a) The length, in net miles, of 6" Solid Traffic Stripe, authorized and acceptably applied.

(b) The total traversed distance in gross miles of 10-30 skip line. The actual applied line is 25% of the traverse distance for a 1:3 ratio. This equates to 1,320 feet of marking per mile of single line.

**701-11 Basis of Payment.**

Prices and payments 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.

Payment will be made under:

Item No. 701- 1 Audible and Vibratory Pavement Markings.