

SECTION 701
PROFILED THERMOPLASTIC PAVEMENT MARKINGS

701-1 Description.

Profiled thermoplastic pavement markings consist of thermoplastic material with raised thermoplastic bumps creating a raised profile marking. Apply profiled thermoplastic pavement markings in accordance with the Contract Documents.

701-2 Materials.

Use only materials listed on the Department's Approved Product List (APL) as an approved system and meeting the following requirements:

Profiled Thermoplastic.....	971-1 and 971-9
Retroreflective Elements*	971-1.7
Glass Spheres*	971-1 and 971-2

*Use retroreflective elements or glass spheres recommended by the manufacturer.

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

701-3 Equipment.

Use equipment capable of providing continuous, uniform heating of the pavement marking 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 pavement marking 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 bumps with a longitudinal distance between bumps of approximately 30 inches center-to-center intervals. Use equipment which meets the following requirements:

1. Capable of traveling at a uniform, predetermined rate of speed, both uphill and downhill, to produce a uniform application of pavement marking material and capable of following straight lines and making normal curves in a true arc.
2. Capable of applying retroreflective elements or glass spheres to the surface of the completed pavement marking by automatic dispensers attached to the pavement marking machine such that the retroreflective elements or glass spheres are dispensed closely behind the installed line. Use retroreflective element or glass sphere dispensers equipped with an automatic cut-off control that is synchronized with the cut-off of the thermoplastic material and applies the retroreflective elements or glass spheres uniformly on the entire pavement marking surface with 50 to 60% embedment.
3. Equipped with a special kettle for uniformly heating and melting the pavement marking 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.
4. Meets the requirements of the National Fire Protection Association (NFPA), State and Local authorities.

701-4 Application.

701-4.1 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. Cost for removing conflicting pavement markings during maintenance of traffic operations to be included in Maintenance of Traffic, Lump Sum.

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

Before applying pavement markings to any portland cement concrete 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 pavement markings to dry surfaces only, and when the ambient air and surface temperature is at least 60°F and rising.

Apply pavement markings to the same tolerances in dimensions and in alignment specified in 710-5. When applying pavement marking over existing markings, ensure that no 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. Take test readings representative of the pavement marking performance. Remove and replace pavement markings not meeting the requirements of this Section at no additional cost to the Department.

701-4.2 Thickness: Apply flat base lines having a thickness of 0.100 inches or 100 mils to 0.150 inches or 150 mils, exclusive of the bumps, when measured above the pavement surface.

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

The Engineer will verify the thickness of the pavement markings in accordance with FM 5-541 within 30 days of receipt of the Contractor's certification.

701-4.3 Dimensions of Raised Bumps: Apply the raised bumps with a profile such that the leading and trailing edges are sloped at a sufficient angle to create an audible and vibratory warning.

Bumps on edge line and centerline markings shall be at least 0.45 inches at the highest point of the bump, above the pavement surface, including the base line. The height shall be measured after application of drop-on retroreflective elements or glass spheres. Bumps shall have a minimum baseline coverage dimension of 2.5 inches in both transverse and longitudinal directions. The bumps may have a drainage channel, the width of each drainage channel will not exceed 1/4 inch at the bottom of the channel. The longitudinal distance between bumps shall be approximately 30 inches.

701-4.4 Retroreflectivity: Apply white and yellow profiled thermoplastic markings that will attain an initial retroreflectance of not less than 300 mcd/lx·m² and not less than 250 mcd/lx·m², 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.

701-4.5 Color: Use pavement marking materials that meet the requirements of 971-1.

701-4.6 Retroreflective Elements or Glass Spheres: Apply retroreflective elements or glass spheres to all markings at the rates determined by the manufacturer's recommendations as identified for the APL System.

701-4.7 Loss: If more than 1% of the bumps or more than three consecutive bumps are missing or broken (less than half a bump remaining) within the first 45 days under traffic, replace all failed bumps at no expense to the Department. If more than 2% of the bumps fail

within the first 45 days under traffic, the replacement period will extend an additional 45 days from the date all replacement bumps were installed. If, at the end of the additional 45 days, more than 2% of all bumps (initial and replacement) fail, replace all failed bumps at no expense to the Department. Measure, record and certify on a Department approved form and submit to the Engineer, the loss of bumps.

701-5 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 thermoplastic materials and retroreflective elements or glass spheres to be used.

701-6 Protection of Newly Applied Profiled Thermoplastic 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.

701-7 Observation Period.

Longitudinal pavement markings, with the exception of bumps, are subject to a 180 day observation period under normal traffic. The observation period will begin with the satisfactory completion and acceptance of the work. The observation period for bumps will be in accordance with the requirements of 701-4.7.

The longitudinal pavement markings shall show no signs of failure due to blistering, excessive cracking, chipping, discoloration, poor adhesion to the pavement, loss of retroreflectivity or vehicular damage. The retroreflectivity shall meet the initial requirements of 701-4.4. The Department reserves the right to check the retroreflectivity anytime prior to the end of the observation period.

Replace, at no expense to the Department, any longitudinal 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 one mile section 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:

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 shown on the certification of items of payment.

701-10 Method of Measurement.

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

1. The length, in gross miles, of 6 inch solid and 10’-30’ skip lines.
2. 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 profiled thermoplastic line to the end of the profiled thermoplastic line and will include the unmarked gaps for skip lines. The gross mile 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.

701-11 Basis of Payment.

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.

Payment will be made under:

Item No. 701	Profiled Thermoplastic Pavement Markings.
	Solid - per gross mile
	Skip - per gross mile
	Remove - per square foot