

**711 THERMOPLASTIC ~~TRAFFIC STRIPES AND~~ PAVEMENT MARKINGS.**  
**(REV ~~1-292-24-15~~) (~~FA 3-13-15~~) (7-15)**

SECTION 711 is deleted and the following substituted:

**SECTION 711**  
**THERMOPLASTIC ~~TRAFFIC STRIPES AND~~ PAVEMENT MARKINGS**

**711-1 Description.**

Apply new thermoplastic ~~traffic stripes and~~ pavement markings, or refurbish existing thermoplastic ~~traffic stripes and~~ pavement markings, in accordance with the Contract Documents.

**711-2 Materials.**

~~711-2.1 Thermoplastic:~~ Use only ~~thermoplastic~~ materials listed on the Department's Approved Product List (APL) meeting the following requirements. The Engineer will take random samples of all material in accordance with the Department's Sampling, Testing and Reporting Guide schedule.

~~711-2.1.1 Initial or Recapped Stripes and Markings:~~ Use materials meeting the requirements of 971-1 and 971-5.

~~711-2.1.2 Refurbishing Existing Stripes and Markings:~~ Use materials meeting the requirements of 971-1 and 971-5.

~~711-2.1.3 Preformed Stripes and Markings:~~ Use Materials meeting the requirements of 971-1 and 971-6.

~~711-2.2 Glass Spheres:~~ Use only glass spheres listed on the APL, meeting the requirements of 971-1 and 971-2. The Engineer will take random samples of all glass spheres in accordance with ASTM D1214 and the Department's Sampling, Testing and Reporting Guide schedule.

Standard and Refurbishment Thermoplastic.....

..... 971-1 and 971-5

Preformed Thermoplastic..... 971-1 and 971-6

Glass Spheres ..... 971-1 and 971-2

~~711-2.3 Sand:~~ Use sand materials meeting the requirements of 971-5.4.

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

**711-3 Equipment.**

Use equipment capable of providing continuous, uniform heating of ~~the striping pavement marking~~ materials to temperatures exceeding 390°F, mixing and agitation of the material in the reservoir to provide a homogeneous mixture without segregation. Use equipment that will maintain the ~~striping pavement marking~~ material in a plastic state, in all mixing and conveying parts, including the line dispensing device until applied. Use equipment which can produce varying width ~~traffic stripes~~ lines and which meets the following requirements:

(a) 1. Capable of traveling at a uniform, predetermined rate of speed, both uphill and downhill, in order to produce a uniform application of striping pavement marking material and capable of following straight lines and making normal curves in a true arc.

~~(b)2. e~~Capable of applying glass spheres to the surface of the completed ~~stripe pavement marking~~ by a double drop application for ~~initial traffic striping and marking standard thermoplastic pavement markings~~ and a single drop application for recapping and refurbishment ~~thermoplastic pavement markings~~. The bead dispenser for the first bead drop shall be attached to the ~~striping pavement marking~~ machine in such a manner that the beads are dispensed closely behind ~~with the thermoplastic material installed line~~. The second bead dispenser bead shall be attached to the ~~striping pavement marking~~ machine in such a manner that the beads are dispensed immediately after the first bead drop application. ~~Use G~~glass spheres dispensers ~~shall be~~ equipped with an automatic cut-off control that is synchronized with the cut-off of the thermoplastic material and applies the glass spheres ~~uniformly in a manner such that the spheres appear uniform~~ on the entire ~~traffic stripes and pavement~~ markings surface with 50 to 60% embedment.

~~(e)3. E~~equipped with a special kettle for uniformly heating and melting the ~~striping 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.

~~(d)4. M~~meet the requirements of the National Fire Protection Association, state, and local authorities.

#### 711-4 Application.

**711-4.1 General:** Remove existing pavement markings such that scars or traces of removed markings will not conflict with new ~~stripes and 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 ~~traffic stripes and pavement~~ markings, remove any material ~~that would adversely affect the bond of the pavement markings~~ by a method approved by the Engineer ~~that would adversely affect the bond of the traffic stripes~~.

Before applying ~~traffic stripes 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 any longitudinal joints of portland cement concrete pavement.

Apply ~~traffic stripes or pavement~~ markings ~~only~~ to dry surfaces ~~only~~, 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 surfaces.

Apply ~~striping pavement markings~~ to the same tolerances in dimensions and in alignment specified in 710-5. When applying ~~traffic stripes and pavement~~ markings 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.

Apply thermoplastic material to the pavement ~~either~~ by ~~spray~~, extrusion, or other means approved by the Engineer.

Conduct field tests in accordance with FM 5-541. Take test readings representative of the ~~striping pavement marking~~ performance. Remove and replace ~~traffic stripes and pavement~~ markings not meeting the requirements of this Section at no additional cost to the Department.

~~Apply all final pavement markings prior to opening the road to traffic. Wait at least 14 days after constructing the final asphalt surface course to place thermoplastic pavement markings. Provide temporary pavement markings during the interim period prior to opening the road to traffic.~~

**711-4.1.1 Preformed Thermoplastic:** Apply markings ~~only~~ to dry surfaces only and when ambient air temperature is at least 32°F. Prior to installation, follow the manufacturer's recommendations for pre-heating.

**711-4.2 Thickness:**

**711-4.2.1 ~~Initial or Recapped Stripes and Markings~~ Standard Thermoplastic Markings:** Apply or recap standard thermoplastic ~~traffic stripes or pavement~~ markings for longitudinal lines to attain a minimum thickness such that all lane lines, center lines, transverse markings and traffic stripes and markings within traffic wearing areas, will have a thickness of 0.10 inch (or 100 mils) to and a maximum thickness 0.15 inch (or 150 mils) maximum thickness, when measured above the pavement surface.

Also, all ~~gore, island, and diagonal stripe~~ chevrons, diagonal and transverse line markings, bike lane symbols and messages, messages, symbols, and arrows, wherever located, will have a thickness of 0.09 inch or (90 mils) to 0.12 inch (or 120 mils) when measured above the pavement surface.

Measure, record and certify on 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.

**711-4.2.2 ~~Refurbishing Existing Traffic Stripes and~~ ment Thermoplastic Markings:** Apply a minimum of 0.06 inch or (60 mils) of thermoplastic material. Ensure that the combination of the existing stripe marking and the overlay after application of glass spheres does not exceed the maximum thickness of 0.150 inch or 150 mils for all lines.

Measure, record and certify on 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.

**711.4.2.3 Preformed Thermoplastic: Apply 0.125 inch or 1205- mils of preformed thermoplastic material.**

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

**711-4.3 Retroreflectivity:** Apply white and yellow ~~traffic stripes and pavement~~ markings that will attain an initial retroreflectivity of not less than 450 mcd/lx·m<sup>2</sup> and not less than 350 mcd/lx·m<sup>2</sup>, respectively for all longitudinal lines. All chevrons, diagonal lines, transverse stop lines, messages, symbols, and arrows will attain an initial retroreflectivity of not less than 300 mcd/lx·m<sup>2</sup> and 250 mcd/lx·m<sup>2</sup> for white and yellow respectively. All pedestrian crosswalks and bike cycle lane symbols or messages in a proposed bike lane markings shall attain an initial retroreflectivity of not less than 275 mcd/lx·m<sup>2</sup>.

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

**711-4.4 Glass Spheres:**

**711-4.4.1 Longitudinal Lines:** For ~~initial traffic striping and~~ standard thermoplastic markings, apply the first drop of Type 4 or larger glass spheres immediately followed by the second drop of Type 1 glass spheres. For refurbishment thermoplastic markings,

apply a single drop of Type 3 glass spheres. Apply reflective glass spheres to all markings at the rates determined by the manufacturer's recommendations.

**711-4.4.2 Chevrons, Diagonal and Transverse Stripes and Markings Lines, Messages, Symbols, and Arrows:** For standard or refurbishment thermoplastic markings,

~~A~~apply a single drop of Type 1 glass spheres. Apply ~~retro~~reflective glass spheres to all markings at the rates determined by the manufacturer's recommendations.

Apply a mixture consisting of 50% glass spheres and 50% sharp silica sand to all standard thermoplastic ~~pedestrian~~ crosswalk lines ~~and bike lane symbols~~ at the rates determined by the manufacturer's recommendations.

**711-4.4.3 Preformed Markings:** These markings are factory supplied with glass spheres and skid resistant material. No additional glass spheres or skid resistant material should be applied during installation.

### **711-5 Contractor's Responsibility for Notification.**

Notify the Engineer prior to the placement of the ~~thermoplastic~~ materials. Furnish the Engineer with the manufacturer's name and batch numbers of the thermoplastic materials and glass spheres to be used. Ensure that the approved batch numbers appear on the thermoplastic materials and glass spheres packages.

### **711-6 Protection of Newly Applied ~~Traffic Stripes and~~ Thermoplastic 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.

### **711-7 Observation Period.**

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

The longitudinal pavement markings shall show no signs of failure due to blistering, excessive cracking, chipping, discoloration, poor adhesion to the pavement, loss of ~~retro~~reflectivity or vehicular damage. The retroreflectivity shall meet the initial requirements of 711-4.3. The Department reserves the right to check the retroreflectivity any time prior to the end of the observation period.

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

### **711-8 Corrections for Deficiencies.**

Recapping applies to conditions where additional ~~striping pavement marking~~ material is applied to new or refurbished ~~traffic stripes or pavement~~ markings to correct a thickness deficiency. Correct deficiencies by Recapping a 1.0 mile section centered around the deficiency with additional striping pavement marking material or by complete removal and reapplication or removal and reapplication of a 1 mile section centered around the deficiency, as determined by the Engineer, at no additional cost to the Department.

~~———— If recapping will result in a thickness exceeding the maximum allowed, the traffic stripes or markings will be removed and reapplied.~~

**711-9 Submittals.**

**711-9.1 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.

**711-9.2 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)1. Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

(b)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.

**711-10 Method of Measurement.**

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

(a)1. The length, in net gross miles, of ~~6 inch solid, traffic stripe, authorized and acceptably applied~~ 10'-30' skip, 3'-9' dotted, 6'-10' dotted, and 2'-4' dotted lines.

(b)2. ~~The total traversed distance in gross miles of 10-30 or 3-9 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~~ length, in linear feet, of transverse lines, diagonal lines, chevrons, and parking spaces.

(c)3. ~~The net length, in feet, of all other types of lines and stripes, authorized and acceptably applied~~ number of pavement messages, symbols, and arrows. Each arrow is paid as a complete marking, regardless of the number of "points" or directions.

(d)4. The area, in square feet, ~~of for~~ removal of existing ~~pavement~~ 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.

~~(e) The number of pavement messages, symbols and directional arrows, authorized and acceptably applied.~~

The gross mile measurement will be taken as the distance from the beginning of the ~~painted~~ thermoplastic line to the end of the ~~painted~~ thermoplastic 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.

**711-11 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. 711-	Thermoplastic <u>Pavement Markings</u>
	<del>Traffic Stripes</del> , Solid - per <u>net gross</u> mile.

~~Traffic Stripes~~, Solid - per linear foot.

~~Traffic Stripes~~, Skip - per gross mile.

Dotted ~~Guideline~~ - per ~~foot~~ gross mile.

Messages or Symbol - each.

Arrows - each.

Yield ~~Markings~~ Line - per linear foot.

~~Thermoplastic~~, Remove - per square foot.