

Market Test Specification For Durable, Retroreflective, Preformed,
Patterned Pavement Markings With Improved
Pre-coated Pressure Sensitive Adhesive

3M™ Stamark™ Tape Series 270 ES

May 2010

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I. **Description**

This work shall consist of furnishing and installing retroreflective preformed patterned pavement markings in accordance with this provision and in reasonably close conformance to the dimensions and lines shown on the plans or established by the engineer.

II. **Materials - General**

The preformed patterned markings shall consist of white or yellow films with pigments selected and blended to conform to standard highway colors. Glass beads shall be incorporated to provide immediate and continuing retroreflection.

Preformed words and symbols shall conform to the applicable shapes and sizes as outlined in the "Manual on Uniform Traffic Control Devices for Streets and Highways."

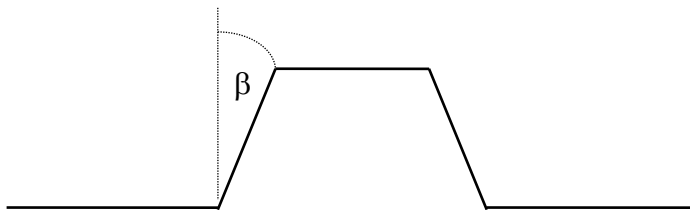
The preformed markings shall be capable of being adhered to asphalt cement concrete and Portland cement concrete by a pre-coated pressure sensitive adhesive. A surface preparation adhesive may be used to precondition the pavement surface. The preformed markings shall conform to pavement contours by the action of traffic. The pavement markings shall be capable of application on new, dense and open-graded asphalt concrete wearing courses during the paving operation in accordance with the manufacturer's instructions. After application, the markings shall be immediately ready for traffic. The bidder shall identify proper surface preparation adhesives (where necessary) to be applied at the time of application, all equipment necessary for proper application, and recommendations for application that will assure effective product performance. The preformed markings shall be suitable for use for one year after the date of receipt when stored in accordance with the manufacturer's recommendations.

III. Classification

The marking shall be a general purpose pliant polymer material for preformed longitudinal, transverse, and symbol and legend markings subjected to low to medium traffic volumes.

IV. Requirements

Composition: The retroreflective pliant polymer pavement markings shall consist of a mixture of high-quality polymeric materials, pigments and glass beads distributed throughout its base cross-sectional area, with a reflective layer of glass beads bonded to a durable polyurethane topcoat surface. The patterned surface shall have approximately $50\% \pm 15\%$ of the surface area raised and presenting a near vertical face (β angle of 0° to 60°) to traffic from any direction. (See diagram below.) The channels between the raised areas shall be substantially free of exposed beads or particles.



Reflectance: The white and yellow markings should be no less than the following expected initial average retroreflectance values as measured in accordance with the testing procedures of ASTM D4061. The photometric quantity to be measured shall be coefficient of retroreflected luminance (R_L) and shall be expressed as millicandelas per square foot per foot-candle $[(\text{mcd} \cdot \text{ft}^{-2}) \cdot \text{fc}^{-1}]$. The metric equivalent shall be expressed as millicandelas per square meter per lux $[(\text{mcd} \cdot \text{m}^{-2}) \cdot \text{lx}^{-1}]$. The test distance shall be 100 feet (30 m).

EXPECTED INITIAL AVERAGE REFLECTANCE

	<u>White</u>	<u>Yellow</u>
Entrance Angle	88.76°	88.76°
Observation Angle	1.05°	1.05°
Retroreflected Luminance R_L ($\text{mcd} \cdot \text{ft}^{-2}) \cdot \text{fc}^{-1}$)	300	250

*These retroreflectance values are based on dark room photometric readings per ASTM D4061.

Note: The test instrument shall use an Entrance Angle of 88.76° and Observation Angle of 1.05° which represent a simulated driver viewing geometry at a 30 meter distance.

Beads: The size, quality and refractive index of the glass beads shall be such that the performance requirements for the markings shall be met. The bead adhesion shall be such that beads are not easily removed when the material surface is scratched.

Acid Resistance: The beads shall show resistance to corrosion of their surface after exposure to a 1% solution (by weight) of sulfuric acid. The 1% acid solution shall be made by adding 5.7cc of concentrated acid into 1000cc of distilled water. CAUTION: Always add the concentrated acid into the water, not the reverse. The test shall be performed as follows:

Take a 1 inch x 2 inch sample, adhere it to the bottom of a glass tray and place just enough acid solution to completely immerse the sample. Cover the tray with a piece of glass to prevent evaporation and allow the sample to be exposed for 24 hours under these conditions. Then decant the acid solution (do not rinse, touch or otherwise disturb the bead surfaces) and dry the sample while adhered to the glass tray in a 150° F. (66° C.) oven for approximately 15 minutes.

Microscopic examination (20X) shall show no more than 15% of the beads having a formation of a very distinct opaque white (corroded) layer on their entire surface.

Color: The preformed markings shall consist of white and yellow films with pigments selected and blended to conform to standard highway colors.

Skid Resistance: The patterned surface of the retroreflective pliant polymer shall provide an initial average skid resistance value of at least 45 BPN when tested according to ASTM E303 except values shall be taken in one direction and then at a 45° angle from that direction. These two values shall then be averaged to find the skid resistance of the patterned surface.

Patchability: The pavement marking material shall be capable of use for patching worn areas of the same type in accordance with manufacturer's instructions.

Thickness: The patterned material without adhesive shall have a minimum caliper of 0.065 inch (1.651mm) at the thickest portion of the patterned cross-section and a minimum caliper of 0.02 inch (.508mm) at the thinnest portion of the cross-section.



V. Installation

The markings shall be applied in accordance with the manufacturer's installation instructions. Marking configurations shall be in accordance with the "Manual on Uniform Traffic Control Devices."

When markings are specified in the contract for newly paved asphalt concrete surfaces, they shall be applied before public traffic is allowed on the freshly paved surface. Preferably, the markings should be inlaid in the fresh surface during final rolling of the mat, but in any case they shall be applied before the close of the shift on the day which the surface is paved. These markings can also be overlaid on existing pavement surfaces in accordance with the manufacturers installation instructions.

VI. General Performance Considerations

The pavement marking, when applied according to the recommendations of the manufacturer, shall provide a neat, durable marking that will not flow or distort due to temperature if the pavement surface remains stable. The film shall be weather resistant and, through normal traffic wear, shall show no fading, lifting or shrinkage which will significantly impair the intended usage of the marking and shall show no significant tearing, roll back or other signs of poor adhesion.

VII. Contract Units And Basis For Payment

Linear pavement markings will be measured in linear feet complete-in-place for the width specified.

Retroreflective preformed pavement markings will be paid for at the contract unit price, which shall be full compensation for cleaning and preparing the pavement surface, for furnishing and placing all materials, and for all materials, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Preformed Pavement Marking, Linear (width)	Linear Foot
Preformed Pavement Marking, Words/Symbols	Each