

**Florida Method of Test  
for  
FIELD EVALUATION of TRAFFIC MARKING MATERIALS  
Designation: 5-541**

This method delineates field testing for evaluating the following traffic marking materials: thermoplastic, two reactive components, hot spray thermoplastic, preformed thermoplastic, audible and vibratory thermoplastic, wet weather, standard paint, durable paint, standard permanent tape, high performance permanent tape, and temporary tape.

**Note:** This test method contains three parts:

*PART A - Project Based Testing of Traffic Marking Materials*

*PART B - Approved Products List Testing of Thermoplastic, Two Reactive Components, Hot Spray Thermoplastic, Preformed Thermoplastic, Audible and Vibratory Thermoplastic, Wet Weather, Standard Paint, Durable Paint, Standard Permanent Tape and High Performance Permanent Tape Traffic Marking Materials*

*PART C - APL Evaluation of Temporary Tape and Standard Waterborne Paint*

**PART A - Project Based Testing of Traffic Marking Materials**

**1. TYPES OF TESTING REQUIRED:**

- 1.1 Dry retroreflectivity for all traffic marking materials.
- 1.2 Wet retroreflectivity for wet weather traffic marking materials.
- 1.3 Thickness for thermoplastic, two reactive components and tape materials.

**2. EQUIPMENT:**

- 2.1 Traffic Marking Thickness gauge as described in Section 4.1.1, **Figure 1**. Thickness gauges may be purchased or fabricated.
- 2.2 30 meter retroreflectometer meeting the requirements of ASTM E 1710.
- 2.3 Micrometer
- 2.4 Taper gauge

### 3. MATERIALS

3.1 Aluminum panels

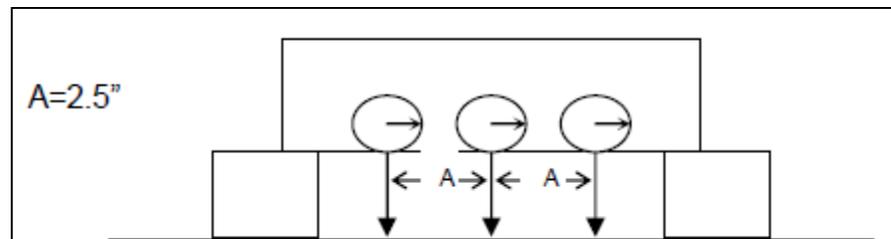
3.2 Duct tape

### 4. PROCEDURE

4.1 Thickness:

4.1.1 Longitudinal Thermoplastic

Measure the thickness of longitudinal thermoplastic markings using an apparatus employing three dial indicators with the measuring points spaced 2 1/2 inches apart (**see Figure 1**). Center the thickness gauge over the marking material attempting to avoid irregular surface areas, i.e. voids, dimples, glass spheres or reflective elements, and read the values of all three dial indicators. When measuring the marking on a pavement joint, take the measurement in a location where the joint is even. The location thickness measurement is the average of the three dial indicators. Take a minimum of three location thickness measurements, one at the beginning, middle, and end of each one-mile section per pay item or line type (i.e. solid, broken/skip, and color). The measurements taken should be representative of the entire one-mile section. The average of the location measurements shall be used for acceptance of each one-mile section per pay item or line type.



**Figure 1: Example of a Traffic Marking Thickness Gauge**

4.1.2 Longitudinal Two Reactive Components

Use an aluminum panel to acquire samples of the traffic marking material. Measure the thickness of the traffic marking material using a micrometer. Make sure to subtract the thickness of the aluminum panel from the total measurement to obtain the actual thickness of the traffic marking material. Take a minimum of three location thickness measurements, one at the beginning, middle, and end of each one-mile section per pay item or line

type (i.e. solid, broken/skip, and color). The measurements taken should be representative of the entire one-mile section. The average of the location measurements shall be used for acceptance of each one-mile section per pay item or line type.

#### 4.1.3 Longitudinal Recapping/Refurbishment Thermoplastic

Use duct tape or aluminum panels to acquire samples of the traffic marking material. Measure the thickness of the traffic marking material with a micrometer. Make sure to subtract the thickness of the duct tape or aluminum panel from the total measurement to obtain the actual thickness of the traffic marking material. Take a minimum of three location thickness measurements, one at the beginning, middle, and end of each one-mile section per pay item or line type (i.e. solid, broken/skip, and color). The measurements taken should be representative of the entire one-mile section. The average of the location measurements shall be used for acceptance of each one-mile section per pay item or line type.

#### 4.1.4 Messages, Symbols and Transverse Lines (Hot applied Thermoplastic)

Use a taper gauge to measure the thickness of the traffic marking material. Perform at a minimum, one thickness measurement at one message, one symbol and one transverse line per intersection. Take one measurement per mile for locations other than intersections (i.e. school messages, railroad messages, bike symbols, diagonal markings, etc.).

#### 4.1.5 Messages, Symbols and Transverse Lines (Preformed Thermoplastic)

Measure the thickness, prior to application, using a micrometer. Perform at a minimum, one thickness measurement at one message, one symbol and one transverse line per intersection. Take one measurement per mile for locations other than intersections (i.e. school messages, railroad messages, bike symbols, diagonal markings, etc.).

#### 4.1.6 Tape

Measure the thickness of each batch number, prior to application, using a micrometer.

### 4.2 Retroreflectivity:

#### 4.2.1 Dry and Wet Retroreflectivity

Perform a minimum of nine retroreflectivity measurements; three at the beginning, middle, and end of each one-mile section. The measurements taken should be representative of the entire one-mile section. Use the

average of the measurements for acceptance. Retroreflectivity measurements shall be taken in the direction of travel. Centerlines will require measurements in both directions. Calibrate the instrument at the beginning of each day of use per the manufacturer's instructions. Perform additional calibrations if testing conditions change, i.e. substantial change in ambient temperature or irregular readings. For evaluating wet retroreflectivity, review the Evaluation of Wet Weather Traffic Marking video located on the State Construction Office website.

#### 4.2.2 Longitudinal Lines

Take measurements at the beginning, middle, and end of each one-mile section per pay item or line type (i.e. solid, skip, and color).

#### 4.2.3 Messages, Symbols, and Transverse Lines

Perform at a minimum, one retroreflectivity measurement at one message, one symbol and one transverse line per intersection. Take one measurement per mile for locations other than intersections (i.e. school messages, railroad messages, bike symbols, diagonal markings, etc.).

### **PART B - Approved Products List Testing of Thermoplastic, Two Reactive Components, Hot Spray Thermoplastic, Preformed Thermoplastic, Audible and Vibratory Thermoplastic, Wet Weather, Standard Paint, Durable Paint, Standard Permanent Tape and High Performance Permanent Tape Traffic Marking Materials**

## 5. EQUIPMENT

- 5.1 Delta Retroreflectometer.
- 5.2 BYK Gardner Color Guide.
- 5.3 Traffic Marking Thickness Gauge as described in Section 8.3 (Fig 1).
- 5.4 Stopwatch with second indicator.
- 5.5 One quart sample containers with air tight lids.
- 5.6 Aluminum Panels (8 inches wide x 24 inches long) and/or duct tape.
- 5.7 Micrometer.
- 5.8 Wet Film Thickness Gauge.

5.9 1 and 5 gallon containers.

**6. SITE SELECTION REQUIREMENTS**

6.1 Roadway Composition

6.2 Traffic Flow - Annual Daily Traffic Count (AADT) per lane.

Material	AADT per lane
Thermoplastic, Two Reactive Components, Durable Paint, and Permanent Tape	≥ 9,500
Audible Vibratory	3,000 to 8,000
Wet Weather	≥ 1,250

**Table 1: AADT for Traffic Marking Materials**

**7. EVALUATION FREQUENCY FOR COLOR AND RETROREFLECTIVITY:**

All evaluations are to be performed on dry pavement. Failure of any portion of the test requirements shall constitute failure of the product.

	Initial	Intermittent	Final	Location	Application Length
<b>Thermoplastic and Two Reactive Components</b>	Within 14-28 days	6 mos. ± 2 wks.	3 yrs. ± 2 wks.	White – Skip line/Yellow-Edge line	½ mile-Thermoplastic ¼ to ½ mile –Two reactive components
<b>Hot Spray Thermoplastic</b>	Within 14-28 days	4 mos. ± 2 wks.	1 yr. ± 2 wks.	White – Skip line/Yellow-Edge line	½ mile
<b>Preformed Thermoplastic *</b>	Immediately after installation	6 mos. ± 2 wks.	3 yrs. ± 2 wks.	Stop Bar and Arrow	1-Stop bar and 1 arrow
<b>Audible Vibratory and Wet Weather Thermoplastic</b>	Within 14-28 days	6 mos. ± 2 wks.	3 yrs. ± 2 wks.	Edge Line	½ to 1 mile
<b>Standard Paint</b>	Within 14 days	2 mos. ± 2 wks.	6 mos. ± 2 wks.	White – Skip line/Yellow-Edge line	½ mile
<b>Durable Paint</b>	Within 14 days	6 mos. ± 2 wks.	18 mos. ± 2 wks.	White – Skip line/Yellow-Edge line	½ mile
<b>Standard and High Performance Tape</b>	Installation to 28 days	6 mos. ± 2 wks. 3 yrs. ± 2 wks. (Performance requirement)	Std. 3 yrs. ± 2 wks. High Perf. 5 yrs. ± 2 wks.	White – Skip line/Yellow-Edge line	44 skip lines

*\*Test white only, yellow evaluation not required*

**Table 2: Measurement Frequency for Traffic Marking Materials**

## 8. THERMOPLASTIC, TWO REACTIVE COMPONENTS, HOT SPRAY THERMOPLASTIC, AUDIBLE-VIBRATORY THERMOPLASTIC, WET WEATHER, STANDARD AND DURABLE PAINT, AND PERMANENT TAPE TRAFFIC MARKING MATERIALS:

### 8.1 Sampling

Collect approximately one quart sample of traffic marking material, glass beads and/or reflective elements from the application nozzles at the beginning and at the end of the application. Collect one foot in length of preformed thermoplastic and permanent tape.

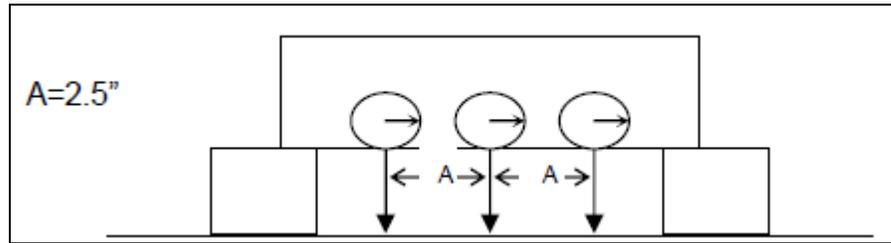
### 8.2 Application

Apply thermoplastic, hot-spray thermoplastic, two reactive components and paint materials as white skip lines and yellow edge lines in accordance with the Table 2 above.

Allow the traffic marking to cure as specified in FDOT Specification Section 971. Drive over the newly applied line once with a passenger car in a simulated passing maneuver traveling at 25 to 35 mph. There shall be no visual tracking of the material onto the roadway when viewed from 15 feet away in full sunlight.

### 8.3 Thickness

With the exception of two reactive components and traffic paint, measure the thickness of marking using an apparatus employing three dial indicators as shown in **Figure 2**. Allow the marking to harden before taking thickness measurements. Center the thickness gauge over the marking material attempting to avoid irregular surface areas, i.e. voids, dimples, glass spheres or reflective elements, and read the values of all three dial indicators. The location thickness measurement is the average of the three dial indicators. Take three location thickness measurements: four at the beginning, middle, and end of each test section. The grand average of the twelve measurements will be used for thickness evaluation. Only initial thickness measurements are required for traffic marking materials. However, for audible-vibratory bumps, thickness measurements shall be measured initially with final measurements at 36 months. Intermittent measurements on the bumps may be taken at any time. Using the same frequency as above, utilize a wet film thickness gauge on panels to quantify the thickness of traffic paints and two reactive components materials.



**Figure 2: Example of a Traffic Marking Thickness Gauge**

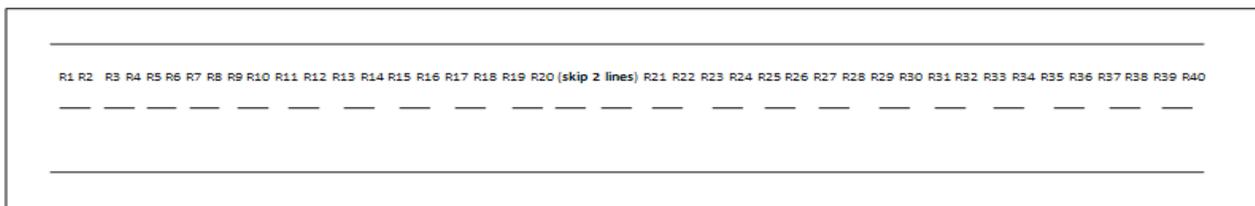
When measuring recapping and refurbishment markings, use duct tape or aluminum panels to acquire samples.

#### 8.4 Calibration

Calibrate the retroreflectometer at the beginning of each day and ensure all measurements and calibrations are performed in accordance with the written instructions of the instrument manufacturer. Verify the retroreflectometer continues to measure the standard test block accurately with intermittent checks as well as one check at the end of the readings.

#### 8.5 Dry Retroreflectivity

Perform measurements in the direction in which the material was installed. Start on the twentieth skip line utilizing ten stripes to generate twenty retroreflectivity measurements as shown in **Figure 3**. Skip at least two skip lines and take another twenty retroreflectivity measurements per **Figure 3**. For edge line markings, use the skip line for reference to identify edge line measurement locations. A total of forty retroreflectivity measurements are required. The average of the forty measurements shall be used to evaluate the test section. Do not evaluate stripes that are damaged or are not representative of the entire test section. Substitute representative skip lines as needed to acquire forty readings per test section. For evaluation, if the total average or more than 20 percent of the individual readings are below the specified retro-reflectance value, the product fails.

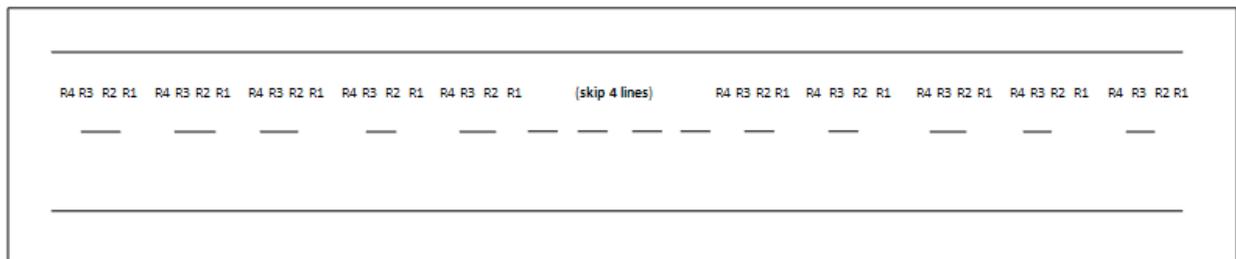


R= Retroreflectivity Measurements

**Figure 3: Dry Retroreflectivity Measurement Locations**

## 8.6 Wet Retroreflectivity (Wet Weather Traffic Markings only)

Perform measurements in the direction in which the material was installed. Start on the twentieth skip line. Use ASTM 2177 (Bucket Method). Take 4 measurements as shown in **Figure 4** below. Repeat this step 4 more times for a total of the 20 required wet retroreflectivity measurements. The average of the twenty measurements shall be used to evaluate the test section. Do not evaluate stripes that are damaged or are not representative of the entire test section. Substitute representative skip lines as needed to acquire twenty readings per test section. For evaluation, if the total average or more than 20 percent of the individual readings is below the specified wet retroreflectance value, the product fails. For confirmation of a failed test section, skip 4 lines and perform another series of 20 measurements on the remaining test section starting on the 5<sup>th</sup> skip line after the last measurement.



R=Wet Retroreflectivity Measurement Locations

**Figure 4: Wet Retroreflectivity Measurement Locations**

## 8.7 Color Measurements

Measure Daytime luminance (Cap Y) and chromaticity using a BYK Gardner Handy Color. Cap Y measurement is only required for Preformed Thermoplastic. Chromaticity measurement is only required on yellow material. Ensure all measurements and calibrations are performed in accordance with the written instructions of the instrument manufacturer. Read x, y, and Y data with 45/0 geometry, observer angle of 2°, and illuminant D65. Take ten color measurements starting at the center of the twentieth skip line and each skip line thereafter. The average of 10 measurements will be used for evaluation. For edge line markings, use the skip line for reference to identify edge line measurement locations. For confirmation of a failed test section, skip 4 lines and perform another series of 10 measurements on the remaining test section starting on the 5<sup>th</sup> skip line after the last measurement.

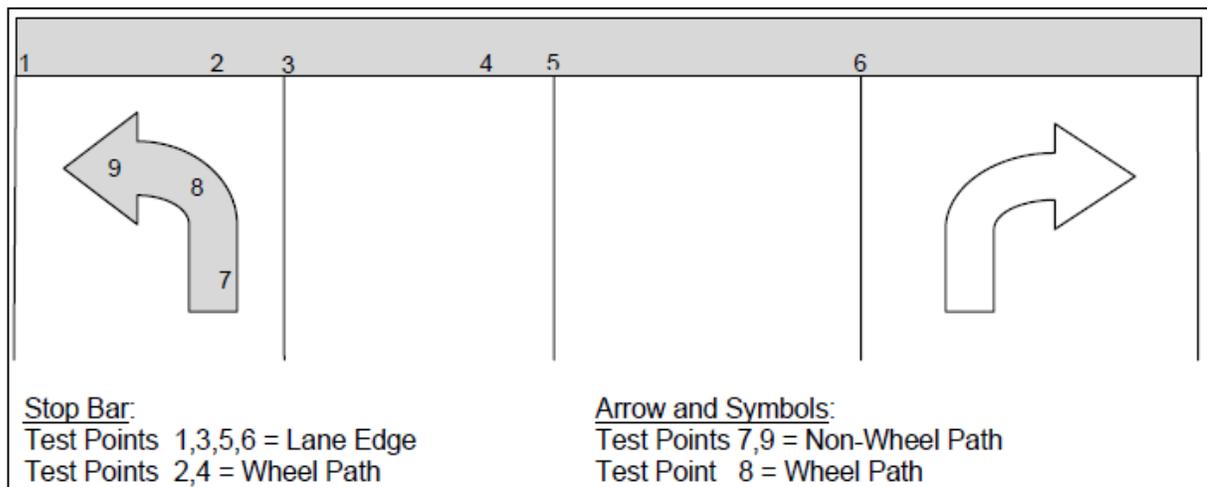
## 9. PREFORMED THERMOPLASTIC TRAFFIC MARKING MATERIALS

Prefomed thermoplastic products shall be applied at an intersection as one stop bar and one left turn arrow symbol.

### 9.1 Sampling

Collect one, three foot long sample for thickness measurements and lab testing. Measure the thickness using a micrometer. Perform one thickness measurement on the sample.

### 9.2 Location of Retroreflectivity and Color Measurements - Measurements shall be taken in the location as shown below in **Figure 5**. All measurements shall be taken in the direction of traffic. The average of the nine retroreflectivity values shall be used for the evaluation of the preformed markings.



**Figure 5: Stop Bar and Turn Arrow test locations**

## **PART C - APL Evaluation of Temporary Tape and Standard Waterborne Paint**

Evaluation of Temporary Tape marking materials will be performed utilizing data submitted by an independent testing organization, such as the National Transportation Product Evaluation Program (NTPEP). Evaluation of Standard Waterborne Paint materials may be performed utilizing data submitted by an independent testing organization, such as the National Transportation Product Evaluation Program (NTPEP), in lieu of Product Evaluation testing from Part B above.