

## **REFLECTANCE, DRY OPACITY, AND YELLOWNESS INDEX OF TRAFFIC PAINT**

(An Arizona Method)

### **SCOPE**

1. (a) This method is used for integrated testing of traffic paints for their reflectance properties. It is applied primarily in testing water-borne white and yellow traffic paints. Yellowness Index is determined on white traffic paints.

(b) This test method may involve hazardous material, operations, or equipment. This test method does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user to consult and establish appropriate safety and health practices and determine the applicability of any regulatory limitations prior to use.

(c) See Appendix A1 of the Materials Testing Manual for information regarding the procedure to be used for rounding numbers to the required degree of accuracy.

(d) Metric (SI) units and values are shown in this test method with English units and values following in parentheses. Values given for metric and English units may be numerically equivalent (soft converted) for the associated units, or they may be given as rounded or rationalized values (hard converted). Either the metric or English units along with their corresponding values shall be used in accordance with applicable specifications. See Appendix A2 of the Materials Testing Manual for additional information on the metric system.

### **APPARATUS**

2. Requirements for the frequency of equipment calibration and verification are found in Appendix A3 of the Materials Testing Manual. Apparatus for this test procedure shall consist of the following:

- (a) Black and white opacity charts - Leneta, form 2C.
- (b) 0.25 mm (10 mil) doctor blade, 101.6 mm (4 inch) width.

- (c) 0.38 mm (15 mil) doctor blade, 101.6 mm (4 inch) width.
- (d) Photovolt 577 reflectance meter with "T" search unit.

### **PREPARATION OF TEST SPECIMENS (PAINT FILMS)**

3. Two test films, on separate charts, are prepared for each paint sample as follows:

- (a) Apply a bead of paint approximately 50.8 mm (2 inches) long and 5 milliliters in volume across the top of the upper (black) portion of a chart.
- (b) Draw the paint down across both portions of the chart (black and white) using the 0.25mm (10 mil) doctor blade.
- (c) Repeat, steps 3(a) and 3(b) using a bead of approximately 10 milliliters volume and the 0.38 (15 mil) doctor blade.
- (d) Prior to testing, allow the test specimens to dry for a minimum of 24 hours at  $25 \pm 5$  °C ( $77 \pm 9$  °F).

### **SETUP AND CALIBRATION OF REFLECTANCE METER**

4. After an initial warmup time of a minimum of 30 minutes, calibrate the meter for use on the applicable filter channels (green "G", amber "A", and/or blue "B") as follows:

- (a) Load the green filter in the filter rack of the "T" search unit and rotate the rack until the filter is in front of the lens.
- (b) Select the green memory location by depressing the "G" button on the front face of the meter.
- (c) Place the black cavity standard on the head of the search unit.
- (d) Set the dark current (zero offset) by depressing first the "CHANGE" button and then the "ZERO" button on the face of the meter.

(e) Place the Photovolt ceramic reflectance standard plaque on the head of the search unit.

(f) Enter the standard reflectance value for the green filter on the meter display, by depressing first the "CHANGE" button, then the "STD" button, and finally, the "A", "B", and "G" buttons as necessary to increment the tens, units, and tenths digits respectively until the value is displayed. Then depress the "STD" button again. The standard reflectance value for the green filter is now stored in the memory, and the meter is now calibrated on the green filter channel.

(g) If reflectance data is to be obtained for a white paint sample, repeat steps 4(a) through 4(f) for the amber filter channel and again for the blue filter channel.

(h) For each channel used, immediately prior to obtaining reflectance data for paint samples, the calibration will be checked and, if necessary, corrected. First replace the black cavity standard on the head of the search unit and if drift has occurred, depress the "CHANGE" button and then the "ZERO" button. Next replace the standard plaque on the head of the search unit and if drift has occurred, depress the "CHANGE" button, and then depress the "STD" button twice.

## **MEASURING AND RECORDING REFLECTANCE DATA**

5. (a) Obtain reflectance data for a white paint sample as follows:

1) After set up of the meter on the green filter channel, check and correct the calibration as described in paragraph 4(h). Measure the reflectance of the 0.25 mm (10 mil) specimen over the black and white portions of the chart. Record the results in the appropriate boxes of the reflectance data worksheet. (See Figure 1 for an illustration of a blank worksheet.) Then measure the reflectances of the 0.38 mm (15 mil) specimen over both portions of the chart and record similarly.

2) After set up of the meter on the amber filter channel, check and correct the calibration as described in paragraph 4(h). Measure and record reflectances of the 0.38 (15 mil) specimen over both the black and the white portion of the chart.

3) Repeat step 5(a)(2), on the blue channel.

(b) Obtain reflectance data for a yellow paint sample as in step 5(a)(1).

## CALCULATING AND REPORTING REFLECTANCE PROPERTIES

6. (a) Report "Reflectance" of a white or yellow paint as the reflectance of the 0.38 mm (15 mil) specimen on the green channel over the white portion of the chart.

(b) Calculate and report "Dry Opacity" of a white or yellow paint as the ratio of reflectance of the 0.25 mm (10 mil) specimen over the black portion of the chart to the reflectance of the same over the white portion, both reflectances being measured on the green channel.

(c) Calculate and report "Yellowness Index" of a white paint according to the following formula: (Yellowness Index does not apply to a yellow paint.)

$$\text{Yellowness Index} = \frac{\text{Amber} - \text{Blue}}{\text{Green}} \times 100$$

Where: Amber, Blue, and Green are the measured reflectances of the 0.38 mm (15 mil) specimen over the white portion of the chart on the respective filter channels.

NOTE: Any reflectance and yellowness index properties derived from measurements made over the black portions of the charts are for informational purposes only.

# REFLECTANCE DATA WORKSHEET

DATE \_\_\_\_\_

OPERATOR \_\_\_\_\_

	1		2		3		4		5		6	
SERIAL #												
BATCH #												
COLOR												
BACKGROUND	BLACK	WHITE	BLACK	WHITE	BLACK	WHITE	BLACK	WHITE	BLACK	WHITE	BLACK	WHITE
0.25 mm (10 mil) GREEN (G <sub>1</sub> )												
DRY OPACITY (BLACK/WHITE)												

0.38 mm (15 mil) GREEN (G <sub>2</sub> ) REFLECTANCE												
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0.38 mm (15 mil) AMBER (A)												
0.38 mm (15 mil) BLUE (B)												
YELLOWNESS INDEX (ON WHITE PAINT) $\frac{A - B}{G_2} (100)$												

FIGURE 1