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# **NTPEP Committee Work Plan for Evaluation of Roll Up Signing Materials**

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**NTPEP Designation: RUP-13-01**



**National Transportation Product Evaluation Program  
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## INTRODUCTION

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*The National Transportation Product Evaluation Program (NTPEP) was established to minimize the amount of duplicative testing of transportation materials performed by AASHTO member states by providing a process where manufacturer/suppliers submit their products to NTPEP for laboratory and field testing. The results of the testing are then shared with member Departments for their use in product quality verification.*

*This work plan provides the NTPEP member departments information on the roll up signing material testing program. In keeping with the NTPEP philosophy of purely testing materials, no conclusions are provided with the test results. The evaluation of the test results is left up to each member department. The states that are involved in testing roll up signing materials are Arizona, Louisiana, and Minnesota.*

*Louisiana is the lead state and is responsible for coordinating the fabrication of the roll up signing material test panels and the oversight of the test result data entry into DataMine, the web- based data base program. Arizona, Louisiana, and Minnesota each operate a test deck site for the collection of data on sign panels exposed to outdoor environmental conditions. Louisiana DOTD performs a portion of the lab testing for the Arizona DOT.*

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## 1. SCOPE

- 1.1 This work plan covers the requirements and testing criteria for the National Transportation Product Evaluation Program (NTPEP) evaluation of roll up signing materials. The National Transportation Product Evaluation Program (NTPEP) serves the member departments of the American Association of State Highway and Transportation Officials (AASHTO).
- 1.2 The results of this program may be used for product quality verification by individual member Departments. If used for quality verification, a letter of certification from the roll up signing materials (RUPs) manufacturer indicating testing was conducted by NTPEP that supports published values may be required by member Departments.
- 1.3 *This work plan may involve hazardous materials, operations, and equipment. It does not purport to address all safety problems associated with its use. It is the responsibility of the user of this work plan to establish the appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

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## 2. REFERENCED DOCUMENTS

- 2.1 AASHTO Standards:
- AASHTO M 268, Standard Specification for Retroreflective Sheeting for Traffic Control
- 2.2 ASTM Standards:
- ASTM D 4956, Standard Specification for Retroreflective Sheeting for Traffic Control
  - ASTM E 991, Standard Test Method for Color Measurement of Fluorescent Specimens Using the One-Monochromator Method
  - ASTM E 810 Test Method for Coefficient of Retroreflection of Retroreflective Sheeting Utilizing the Coplanar Geometry
  - ASTM E 1709, Standard Test Method for Measurement of Retroreflective Signs Using a Portable Retroreflectometer at a 0.2 Degree Observation Angle
  - ASTM G 7, Standard Practice for Atmospheric Environmental Exposure Testing of Nonmetallic Materials

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### 3. TERMINOLOGY

- 3.1 **Chromaticity Color Coordinates (*x and y*)** – The color of the sample is described through an x and y, CIE Color Coordinate System. The sample is assigned an x, y coordinate on a color graph diagram that defines the hue and saturation of that color. Chromaticity measurements on non-fluorescent and fluorescent sheeting are made using 2° observer and Illuminant D65.
- 3.2 **Luminance Factor (*Y %*)** – Ratio of the luminance of a specimen to that of a perfect white diffuser. (The lightness or darkness of a sample compared to an ideal white surface). Luminance measurements are made using 2° observer and Illuminant D65.
- 3.3 **Coefficient of Retroreflection (*R<sub>A</sub>*)** – Measure of the amount of light reflected by the sheeting material directly back to the source of light. Refer to ASTM E 810.
- 3.4 **Observation Angle (*0.2° ; 0.5° ; 1.0° OBS*)** – The angle the observer or light measuring device is located relative to the incident light beam. Roadway example: The angle between the light from the vehicle headlamps striking the highway sign and the reflected light returning to the eye of the motorist.
- 3.5 **Entrance Angle (*-4° or 30° ENT*)** – The angle formed between the incident light beam and a line perpendicular to the surface of the sheeting. Highway example: The angle between the headlight beam and a line perpendicular to the sign surface.
- 3.6 **Rotational Angle (Orientation Angle, *Epsilon*) (*0°, 90°*)** – The angle a sample is rotated about the reference axis (datum mark). 0° orientation refers to the long edge vertically placed.
- 3.7 **NTPEP Manager** – The AASHTO/NTPEP administrative manager.
- 3.8 **Louisiana DOTD Coordinator** – The Louisiana DOTD representative responsible for oversight of the program, including planning, fabrication, Data Mine Reviews, and Data Mine releases to the manufacturer.

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## 4. SUMMARY OF WORK PLAN

On a yearly basis (spring), manufacturers of retroreflective roll up signing materials submit their products to be tested. Fabricated samples are sent to the testing DOT states for outdoor weathering and testing. Roll up signing material samples are initially tested for retroreflectivity, color and visual appearance. Samples are then placed on outdoor weathering racks and exposed to environmental conditions for a total of one year. Samples are tested and evaluated monthly for the first 6 months of outdoor exposure and again at 9 and 12 months. Test result data is entered into the web-based DataMine program after initial evaluation and after each test period.

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## 5. SIGNIFICANCE AND USE

- 5.1 This work plan utilizes laboratory and field testing to determine physical properties and evaluate the performance (new and weathered) of roll up signing materials. This work plan is intended to only determine the physical properties and performance of roll up signing materials. Acceptability of each material based upon the data generated as a result of the testing and evaluation in this work plan is the responsibility of the user.

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## 6. APPLICATION FOR PRODUCT TESTING

### 6.1 *Submittal of Product Evaluation Form(s) and other information.*

The manufacturer will submit to the NTPEP Manager the Product Evaluation Form (PEF), product literature, Material Safety Data Sheets for the signing material and process color inks (if submitted) along with other pertinent information.

After review of the PEF(s) for completeness and accuracy, the NTPEP Manager will work with the Louisiana DOTD Coordinator to decide on the products to be tested. The NTPEP Manager will then advise the manufacturer within two weeks of receipt of the PEF the products approved for testing.

### 6.2 **Assignment of Test Number**

A test number shall be assigned to each product approved for testing. The test number shall indicate the Roll Up Signing Material designation (RUP), the year of submission, and a sequential sample number (RUP-Year-01-Sample No.) For example, RUP-2014-01-021.

**Note 1** - Roll Up Signing Material (RUP) numbers that are assigned to a Manufacturer's product will not change for the life of the test. The Product Name that the manufacturer gives the product at the time of application will be allowed to change until the first data is issued to the manufacturer for review. Once this report is submitted to the manufacturer for review, no changes to the product name will be allowed.

**Note 2** - Product Evaluation Form(s) Submittal Deadlines - Product Evaluation Forms (PEF) shall be submitted to the NTPEP Manager by February 1<sup>st</sup> of the year in which evaluation is to begin.

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## 7. FABRICATION AND SHIPMENT

- 7.1 The Louisiana DOTD Coordinator will work with the manufacturers providing requirements for shipping of the roll up signing materials.

- 7.2 Manufacturers will submit 21 prefabricated 4 inch by 12 inch test specimens with suitably sealed edges (1 set of 3 panels each for Louisiana DOTD and Minnesota DOT, 3 sets for Arizona DOT, and 2 extra sets as replacements, if necessary). Manufacturers will also submit a 3 foot (or roll width) wide by 12 foot length of the sheeting from which the test specimens were fabricated. Ink, if submitted, will be applied by the manufacturer.
- 7.3 The samples must be clearly labeled with the assigned RUP-YYYY-01-XXX number. The sample identification should include lot no., batch no., drum no., etc. The samples of material must arrive at the Lead State (Louisiana DOTD) by April 15.
- 7.4 All test products shall be shipped by and at the manufacturer's expense via a carrier with a freight tracking system.

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## **8. TEST DECK PROCEDURES**

### **8.1 General**

- 8.1.1 Each test deck will receive three specimens for each sample supplied and labeled xA, xB, and xC, except for Arizona which will receive nine specimens labeled x1A, x1B, x1C, x2A, x2B, x2C, x3A, x3B, x3C. The specimen designations will be provided by the Lead State Coordinator.
- 8.1.2 Louisiana DOTD will evaluate all of Arizona's specimens for measurement of coefficient of retroreflection in the light tunnel, and daytime color, according to Sections 10.3.1 and 10.3.2. Once Arizona's specimens have been initially tested by Louisiana DOTD, they will be shipped to Arizona for measurement using their portable reflectometer and visual evaluation prior to the A and B specimens being placed on the Arizona test deck.
- 8.1.3 State DOT labs will inspect the test deck specimens received and record the initial condition in a notebook. Each specimen will be examined closely for any flaws or damage which may have occurred during fabrication or shipping, and measured to the nearest 1 mm. for initial dimensions. Notes on flaws (if any) will be recorded so that they can be distinguished from changes or damage due to exposure. Initial sample panel testing will be carried out as outlined in Section 11.
- 8.1.4 After initial testing, panels labeled xA and xB will be placed on the outdoor exposure racks on May 1 of the submittal year or as soon as possible thereafter. In mounting the specimens, the physical integrity of the specimen must be maintained i.e. holes should not be made in the specimen to attach wires, ties, etc. to affix to the test deck. A recommended attachment device is shown in Figure 1.
- 8.1.5 A test deck consists of a number of outdoor exposure racks facing south and inclined at an angle of 45° from the horizontal as stated in ASTM G 7. All exposures shall be unbacked as described in Section 5.5.1 of ASTM G 7.
- 8.1.6 Panels labeled xC (the control or file specimen) will be stored in a file cabinet or other suitable indoor storage place protected from the sunlight and weather and temperature extremes. Panels should not be stored in vertical stacks of more than 10 panels. Horizontal stacking is preferred. Panels should be stacked face to face and should be separated by slip sheeting and foam packing material.
- 8.1.7 Per the Sample Testing Schedule in Section 10.4, panels xA and xB are removed from the outdoor

exposure racks for full evaluation, they will be returned to the outdoor exposure racks within four weeks for continued exposure per the schedule. Records will be maintained indicating the length of time the panels were not exposed due to testing or for any other reason.

- 8.1.8 Weather information from the National Weather Service station nearest each test deck will be summarized and recorded.

**Figure 1:** Diagram showing clamping bars used for mounting roll up sign specimens to test rack for outdoor exposure. Each bar is 6061 T6 aluminum, 25 mm x 200 mm x 2 mm. When attaching to test rack, clamped specimen is oriented with long axis horizontal so that the bolts used to clamp specimen ends do not interfere with attachment to test rack.

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## 9. TEST DECK LOCATIONS

- 9.1 *Arizona test deck* is located at the AZDOT facility in Phoenix, AZ
- 9.2 *Louisiana test deck* is located in Baton Rouge at the Louisiana DOTD, Traffic Services Section on Tom Drive.
- 9.3 *Minnesota test deck* is located near the Maplewood test laboratory north of St. Paul, Minnesota.

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## 10. SAMPLE TESTING

- 10.1 **General** – The following tests will be performed on each panel (A, B, C) at testing intervals as indicated in the Sample Testing Schedule. The specimens shall be removed from the racks and brought into the laboratory to equilibrate by conditioning at a temperature of  $73 \pm 3^{\circ}\text{F}$  and  $50 \pm 5\%$  relative humidity for 24 hours prior to making measurements. Field-exposed panels will be washed with water and dried prior to measurement of retroreflectivity and color and visual evaluation. The schedule for these evaluations is summarized in Table 1.
- 10.2 **Arizona** will perform monthly portable reflectometer readings and visual evaluations as described in Sections 10.3.3 and 10.3.4. After these evaluations have been performed at 3, 6 and 12 months of exposure, two exposed specimens and one control will be shipped to Louisiana DOTD for measurement of retroreflectivity in the light tunnel, and chromaticity (color coordinates and daytime luminance) according to Sections 10.3.1 and 10.3.2. The removed specimens will not be returned to the test deck.
- 10.3 **Louisiana and Minnesota** will conduct the following evaluations prior to exposure and after 1, 2, 3, 4, 5, 6, 9 and 12 months exposure.
- 10.3.1 **Coefficient of Retroreflection** – Values will be measured in a 50 ft. (15 m) or 100 ft. (30m) Light Tunnel in accordance with ASTM E 810 using an Illuminant A light source. The Coefficient of Retroreflection value will be recorded at an observation angle of  $0.2^{\circ}$  and an entrance angle of  $-4^{\circ}$  and  $+30^{\circ}$ . The rotational angle (Epsilon) will be  $0^{\circ}$  and  $90^{\circ}$ . The rotational or orientation angle of  $0^{\circ}$  refers to the long edge vertically placed.
- Note:* Louisiana DOTD performs light tunnel testing for AZDOT.
- 10.3.2 **Lab and Portable Color** (chromaticity including luminance Y) – Values will be measured in accordance with AASHTO M 268 (CIE, Illuminant D65 and  $2^{\circ}$  observer) or ASTM E 991 for fluorescent materials and recorded for panels A, B and C. Color values for panels A and B will be averaged and reported.

*Note:* Louisiana DOTD performs lab color testing for AZDOT.

- 10.3.3 **Portable Retroreflectivity** When making measurements with the portable retroreflectometer, the precautions with respect to angular positioning, as cited in ASTM E 1709 should be observed. Refer to 10.3.3.1 and 10.3.3.2 below.
- 10.3.3.1 **Annular Instrument (Portable Retroreflectometer)** - When reading with an annular instrument, each panel will be measured on the top, middle, and bottom, with the panel positioned at the 0° rotational angle as described in Section 10.3.1. The average of these readings on each panel will be recorded in the report.
- 10.3.3.2 **Point Instrument (Portable Retroreflectometer)** - When reading with a point instrument, each panel will be positioned at the 0° and 90° rotational angles, as described in Section 10.3.1. Readings will be taken at the top, middle and bottom of the panel, and two separate averages (0° and 90° rotation) will be reported. The control panel (File Specimen - Panel C) will be read at the same time the test panels are read.
- 10.3.4 **Visual Evaluation** – *Visual comparison* with the control sample (file specimen) will be made at the time intervals indicated in the Sample Testing Schedule in Section 11.8. Samples will be evaluated as follows:
- 10.3.4.1 **Shrinkage / Expansion** – Shrinkage will be reported in accordance with AASHTO M 268 at the specified time interval as the number of mm change in dimensions from those originally recorded. Expansion will also be noted in this category. Additional observations can be noted in the “Appearance” fields.
- 10.3.4.2 **Cracking** – The sheeting, ink or film will be evaluated for cracking, crazing or scaling. Observations should be noted in the “Appearance” fields.
- 10.3.4.3 **Blistering** – The sheeting, ink or film will be evaluated for blisters, delamination or edge lifting. Observations should be noted in the “Appearance” fields.
- If NO Shrinkage, Expansion, Cracking, or Blistering is observed, enter “NONE” or “NO CHANGE” in these fields (including Initial field). If Shrinkage, Expansion, Cracking, or Blistering is noted, this change should be carefully followed and noted in future time periods.*
- 10.3.4.4 **Appearance** – *This field should be used to further describe any Shrinkage, Expansion, Cracking, or Blistering issues. For Example:*
- Sheeting is blistering or Sheeting is cracking.*
- This field can also be used to describe any other appearance changes. For Example:
- If a Color change is observed, the following note should be entered:**
- Color Change Observed – Refer to Color Data**
- DO NOT describe color change by noting “Color Faded.”**
- 10.3.5 **Comments Field** – *This field is located under, “Raw Sheeting Data” – This field is used to note*

*any information on the "Raw Sheeting" (new sheeting that has not been inked or coated with any film or other surface treatment).*

10.4

Table 1 – Schedule of Field Evaluations

<b>Outdoor Exposure @ 45° South, months</b>	<b>Phoenix, AZ Test Deck<sup>1</sup></b>	<b>Baton Rouge, LA Test Deck</b>	<b>St. Paul, MN Test Deck</b>
<b>0</b>	C/R/P/V	C/R/P/V	C/R/P/V
<b>1</b>	P/V	C/R/P/V	C/R/P/V
<b>2</b>	P/V	C/R/P/V	C/R/P/V
<b>3</b>	C/R/P/V	C/R/P/V	C/R/P/V
<b>4</b>	P/V	C/R/P/V	C/R/P/V



<b>5</b>	P/V	C/R/P/V	C/R/P/V
<b>6</b>	C/R/P/V	C/R/P/V	C/R/P/V
<b>9</b>	P/V	C/R/P/V	C/R/P/V
<b>12</b>	C/R/P/V	C/R/P/V	C/R/P/V

<sup>1</sup>The color coordinate data and the light tunnel retroreflectivity data for Phoenix, AZ Test Deck will be obtained by the Louisiana DOTD laboratory at 0, 3, 6 and 12 months.

C – Color coordinate and daytime luminance data

R – Retroreflectivity data obtained in light tunnel

P – Portable retroreflectivity data

V – Visual evaluation

10.5

Table 2 – State DOT Test Equipment Utilized

<b>Instrument</b>	<b>Arizona</b>	<b>Louisiana</b>	<b>Minnesota</b>
Light Tunnel	<i>None:</i> LADOTD uses ART 940	ART 940	Gamma 940
Portable Retrometer	RetroSign 4500	ART 920L	Gamma 922
Lab (bench) Colorimeter *	<i>None:</i> LADOTD uses Hunterlab, Labscan XE	Hunterlab Labscan XE	Hunterlab Labscan XE
Portable Colorimeter *	Hunterlab Miniscan	Hunterlab Miniscan	Hunterlab Miniscan

\*Color Instrumentation Specifications

<b>Hunterlab Instruments</b>	<b>Geometry</b>	<b>Observer</b>	<b>ILL</b>	<b>Detector</b>	<b>Port size</b>	<b>Light Source</b>
Labscan XE	0°/45°	2°	D65	Circum.	50 mm	Xenon
Miniscan	45°/0°	2°	D65	Circum.	31 mm	Xenon

10.6

All material submitted for testing (fabricated samples and sheeting material) will remain the property of AASHTO/NTPEP. At the end of the 1 year test period, the panels will be retained by the test site state

## 11.

### LABORATORY EVALUATION OF ROLL UP SIGNING MATERIAL BY LOUISIANA DOTD

This roll up signing material is known as “Raw Sheeting” and is defined as new roll up signing material that has not been submitted to outdoor field exposure. The test results are listed under “Raw Sheeting Data.”

11.1

The 3 foot wide (or roll width) by 12 foot length of the sheeting from which the test specimen

were fabricated will be used by the Louisiana DOTD for evaluation as follows:

- 11.1.1 *Coefficient of Retroreflection* – Coefficient of Retroreflection will be taken at the rotation angles of 0° and 90° at both the 0.2° and 0.5° OBS and -4° ENT angles on new sheeting measured in accordance with ASTM E 810.
- 11.1.2 *Daytime Color and Luminance Factor (Y %) for non-Fluorescent Colors* measured in accordance with AASHTO M 268.
- 11.1.3 *Daytime Color and Luminance Factor (Y %) for Fluorescent Colors* – will be measured in accordance with ASTM E 991.
- 11.1.4 *Flexibility* measured in accordance with ASTM D 4956.
- 11.2 Results will be reported in the NTPEP web-based program – DataMine -under Field Data and Raw Sheeting Data.

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## 12. REPORTING OF TEST DATA

- 12.1 Test result data will be compiled and made available to all participating states and testing companies through the AASHTO/NTPEP DataMine<sup>1</sup>. This report will include data only. No judgment as to a product's acceptability will be made in this report. End user participants will establish individual criteria for product acceptability.
- 12.2 Test results will be reported to the NTPEP Manager in the web-based data base – DataMine as follows. Once the data is reviewed by the Louisiana DOTD coordinator, he will release the data to each manufacturer for his review. When the manufacturer reviews and accepts the data, the manufacturer will release the data to the public.

<b>DATAMINE EVENTS</b>	<b>Completion Dates</b>
Initial, 1, 2, 3, 4, 5, 6 month data entered by AZDOT, LADOTD, MNDOT. Raw Sheeting data entered by LADOTD.	December 1 <sup>st</sup>
Initial, 1, 2, 3, 4, 5, 6 month data and Raw Sheeting data reviewed by LADOTD and released to industry.	January 1 <sup>st</sup>
Data reviewed by industry and LADOTD notified if data is accepted or needs correction.	January 1 <sup>st</sup> - February 1 <sup>st</sup>
Industry releases data to public	January 1 <sup>st</sup> - February 1 <sup>st</sup>
9 and 12 month data entered by AZDOT, LADOTD, MNDOT.	June 1 <sup>st</sup>
Data reviewed by LADOTD and released to industry	July 1 <sup>st</sup>

Data reviewed by industry and LADOTD notified if data is accepted or needs correction.	July 1 <sup>st</sup> - August 1 <sup>st</sup>
Industry releases data to public	July 1 <sup>st</sup> - August 1 <sup>st</sup>
Note: Once data is released from LADOTD to industry, the data is auto released to public after 30 days, if the clock is not stopped.	August 1 <sup>st</sup>

- 12.3 <sup>1</sup>*DataMine* – This web-based data base can be accessed through the AASHTO-NTPEP web site link at [www.ntpep.org](http://www.ntpep.org). Refer to the *Sign Sheeting Materials Module Users Guide* under the Reference section for instructions on using the data base.

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### 13. SIGN SHEETING MATERIALS – QUALITY CONTROL PROGRAM

- 13.1 To ensure accuracy and precision in test data, each lab is required to maintain and follow an in-house Quality Control Program. This should include the proper storage, measurement and documentation of quality control standards. It is recommended that these standards be measured and the results recorded in conjunction with each roll up signing material testing period.
- 13.2 Any test results or trends that indicate a significant deviation from established guidelines are investigated by the lab and corrected prior to testing the submitted samples.

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### 14. ROUND ROBIN SAMPLE EVALUATION

- 14.1 In addition to the lab (in-house) quality control program, each lab participates in a yearly evaluation of Round Robin samples distributed by the Virginia DOT which is the lead state for Sign Sheeting Materials (SSM).
- 14.2 A set of approximately 10 sign sheeting samples are tested by each state lab with the same instruments used to test the sign sheeting samples. Results are collected by VDOT, reviewed and made available to each state. Any test results or trends that indicate a significant deviation from established guidelines are investigated by VDOT and corrected. Cursory results may also be presented at the annual NTPEP meeting. Sheeting manufacturers may also test the Round Robin samples for comparison purposes.
- 14.3 The Sign Sheeting Oversight Committee is currently working with industry to establish precision statements for all sign sheeting materials per ASTM guidelines.

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### 15. SSM SUBMITTAL REFERENCE INFORMATION

- 15.1 *The SSM Submittal Reference Information provides information on the fabrication of the samples for each submittal year and any out-of-ordinary events that took place while the submitted samples were being tested during the 12 month cycle.*

*This information* is located in the box labeled SSM/RUP on the right side of the Sign Sheeting

Material/Roll Up Signs (SSM/RUP) window. This window is listed under the Technical Committees box on the left side of the NTPEP Web Site.

**Note: This information for submittal years 2010 and newer is available on the NTPEP Web Site. Information for older submittals is maintained by the Lead State Coordinator.**

- 15.1.1 ***Out-Of-Ordinary Event Information*** - If an event occurs that may have a significant impact on the weathering, testing or data reporting of the roll up signing material samples during the 12-month field testing cycle, the event will be documented in this section. If an out-of-ordinary event occurs, the following guidelines will be followed:
- 15.1.1.1 Testing state where event occurs notifies the lead state coordinator and Technical Committee Chair within two business days of discovering the event.
- 15.1.1.2 Lead state coordinator and Technical Committee Chair investigate options for remedy then notify NTPEP coordinator within two business days of original notification by testing state.
- 15.1.1.3 NTPEP coordinator notifies affected industry within two business days of notification by lead state.
- 15.1.1.4 NTPEP coordinator will develop an agreeable resolution with industry.
- 15.1.1.5 Technical Committee Chair produces an incident report to distribute among the state members of the technical committee.
- 15.1.1.6 The out-of-ordinary event will be documented (by manufacturer and date) in the *SSM Submittal Reference Information*.

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## 16. TEST REPORT REVIEW AND TEST RESULT APPEALS

Each DOT testing lab will enter their data into Data Mine and contact the Louisiana DOTD Coordinator in accordance with the schedule in section 12.2. The Louisiana DOTD Coordinator will review the data from each state to ensure data is accurate. Once the review is complete, the data will be released to the manufacturer for their review. Each manufacturer will receive data on their specific products. Once approved, the manufacturer will release their data for public use. The manufacturer may appeal the results of the testing program in accordance with the AASHTO/NTPEP appeals procedures. Retesting of the materials will be performed by the DOT lab, and only on the relevant sample and parameter being questioned. Prior to retest, the manufacturer making the appeal shall submit a fee to NTPEP to cover the costs of retesting. If the results of the retesting indicates error in the initial data, the fee shall be reimbursed to the manufacturer. Upon agreement between the manufacturer appealing the test results and the NTPEP Manager, either the original data or retest data shall be published.

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## 17. RESUBMITTAL TESTING FREQUENCY

Resubmittal of sign sheeting material is recommended after 7 years.

Manufacturers may resubmit roll up signing material before the 7 year recommendation.

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**18. TESTING FEES**

PRODUCT SUBMITTALS - Product submittal testing fees are to be paid at time of application.

RE-TESTING FEES FOR APPEALS - A retest fee for challenged results shall be paid by the manufacturer. This fee is refundable if retesting upholds the challenge. This fee is to be retained by NTPEP only if the original test results are found to be accurate .

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**19. DISPOSITION OF OLD SAMPLES**

Retained samples from each test state may be discarded 10 years after the original submittal year. Panels to be discarded must not be shared with a third party.

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**21. KEYWORDS**

Chromaticity; Color; DataMine; NTPEP; Field Test Decks; Luminance; Retroreflectivity;

Roll Up Signs; Roll Up Signing Material; Sign Sheeting Materials; Weathering.