



**INDIANA DEPARTMENT OF TRANSPORTATION  
DIVISION OF MATERIALS AND TESTS**

**PROCEDURE FOR OUTDOOR WEATHERING  
EVALUATION AND APPROVAL LIST REQUIREMENTS FOR  
REFLECTIVE SHEETING MATERIALS  
ITM No. 930-15**

**1.0 SCOPE.**

- 1.1 This test procedure covers the methods that highway reflective sheeting is evaluated on the Departments outdoor weathering evaluation deck, and the procedures for placement, maintenance, or removal from an approval list.
- 1.2 If the reflective sheeting materials have completed National Transportation Product Evaluation Program (NTPEP) evaluation or have been submitted to NTPEP for evaluation, the manufacturer shall submit the NTPEP evaluation data to the Department as the data is received by the manufacturer.
- 1.3 This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and determining the applicability of regulatory limitations prior to use.

**2.0 REFERENCES.**

**2.1 AASHTO Standards.**

M 268 Specification for Retroreflective Sheeting for Traffic Control

**2.2 ASTM Standards.**

D4956 Specification for Retroreflective Sheeting for Traffic Control  
E991 Practice for Color Measurement of Fluorescent Specimens  
E1349 Test Method for Reflectance Factor and Color by Spectrophotometry  
Using Bidirectional Geometry  
E1709 Test Method for Retroreflective Signs Using a Portable  
Retorelectometer

**2.3 ITM Standards.**

806 Approval List Requirements  
804 Sample Material Certification Forms

**3.0 TERMINOLOGY.** Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101 and ASTM E1709.

**4.0 SIGNIFICANCE AND USE.** This ITM is used to evaluate, approve, maintain approval, and remove from the approval listing reflective sign sheeting materials which are placed on the Department's list of approved Reflective Sheeting Materials. Each color, class of adhesive and type of reflective sheeting material will be evaluated separately.

**5.0 APPARATUS.**

**5.1** Retroreflectometer, ART Technology, model 930 in accordance with ASTM E1709

**5.2** Spectrophotometer, BYK Gardner Color Guide 45/0 in accordance with ASTM E1349 and HunterLab MiniScan XE- Plus 45/0 in accordance with ASTM E991

**5.3** Outdoor Weathering Evaluation Deck, in accordance with AASHTO M 268

**5.4** Calibration. Annual certification of calibration of all instruments shall be done by the instrument manufacturer. Before each use of an instrument, a verification of each instrument calibration will be done using the secondary standards that are provided with the instruments.

**6.0 SAMPLING.** The manufacturer shall furnish at no cost to the Department, samples of the reflective sheeting material. The reflective sheeting shall be randomly selected from a normal production run of material.

**7.0 PREPARATION OF TEST SPECIMEN.** For each color, class of adhesive and type of sheeting, the manufacturer shall submit eight pieces of reflective sheeting with the protective backing paper. The reflective sheeting shall be in accordance with AASHTO M 268 except that the dimensions of the reflective sheeting shall be 9 in. x 14 in.. The Department will apply four pieces of the reflective sheeting to 8 in. x 12 in. aluminum panels according to the manufacturer's recommendations. A slit through the sheeting material will be made on one panel. The slit will be placed 2 in from the top and 2 in (50 mm) from the left side and the length of the slit will be 4 in. Each panel will have a weather resistant label (or marking) placed on the backside of the panel. The label will identify the manufacturer, sheeting type and adhesive class. The panels will not be clear coated after the application of the reflective sheeting material.

**8.0 OUTDOOR WEATHERING EVALUATION PROCEDURE.**

**8.1** The manufacturer of the material shall fill out the Preliminary Product Evaluation Form in Appendix A for each sheeting type, adhesive class, and color of sheeting that the manufacturer is requesting to be added to the approved list.

**8.2** The manufacturer of the material shall submit samples with the Preliminary Product Evaluation Form, laboratory test reports, all applicable NTPEP test reports or evidence of NTPEP submissions, product data sheets, and a QCP in accordance with section 5.1 of ITM 806 to the Division of Highway Operations.

The samples of the material will be used for evaluation on the Department's outdoor weathering evaluation deck.

- 8.3** The panel with the slit, in addition to two other panels will be placed on the test deck. The color coordinates  $x$  &  $y$ , luminance factor  $Y$ , and coefficient of retroreflection will be determined on each of the panels prior to installation.
- 8.4** The color coordinates and luminance factor of the fluorescent sheeting will be determined in accordance with ASTM E991 using a HunterLab MiniScan XE-Plus 45/0 spectrophotometer. The color coordinates and luminance factor on all other sheeting will be determined in accordance with ASTM E1349 using a BYK Gardner Color Guide 45/0 or a HunterLab MiniScan XE-Plus 45/0 spectrophotometer. A minimum of five readings for each of the color coordinates and the luminance factor will be taken on each panel and averaged.
- 8.5** The coefficient of retroreflection will be determined in accordance with ASTM E1709 and the following:
- 8.5.1** The observation angle will be of  $0.2^\circ$  &  $0.5^\circ$
- 8.5.2** The entrance angles will be  $-4^\circ$  and  $+30^\circ$
- 8.5.3** The rotational angles will be of  $0^\circ$  and  $90^\circ$
- 8.5.4** Additional rotational angles of  $\pm 45^\circ$  will be tested for warning sign materials
- 8.6** After installation on the outdoor weathering test deck, the color coordinates, luminance factor, coefficient of retroreflection and visual observation of sheeting delamination will be determined on each panel a minimum of twice a year throughout the evaluation period. The length of time for all outdoor weathering evaluations will be in accordance with AASHTO M 268, except type I sheeting will be evaluated for 36 months.

## **9.0 CALCULATIONS.**

- 9.1** The average coefficient of retroreflection of the reflective sheeting material for each of the panels is calculated to the nearest  $1 \text{ cd/lux/m}^2$  for those materials with a coefficient of retroreflection above  $10 \text{ cd/lux/m}^2$ . For coefficient of retroreflection readings of 10 or less, the average coefficient of retroreflection will be recorded to the nearest  $0.1 \text{ cd/lux/m}^2$ .
- 9.2** The average of the color coordinates  $x$  &  $y$  is calculated to the nearest 0.0001 unit and the luminance factor  $Y$  is calculated to the nearest 0.01% for the reflective sheeting material for each of the panels.

**10.0 REPORT.** The average data for the color coordinates, luminance factor, coefficient of retroreflection and the visual observation of delamination around the slit from the outdoor weathering evaluation on each color, class of adhesive and type of reflective sheeting will be tabulated into the final report.

**11.0 REFLECTIVE SHEETING MATERIAL APPROVAL LIST.**

**11.1 Approval of Reflective Sheeting Material.** A reflective sheeting material that maintains the color and coefficient of retroreflection in accordance with the requirements of AASHTO M 268 and does not delaminate throughout the full duration of the outdoor weathering evaluation process of this ITM procedure may be placed on the approval list.

**11.2 Maintaining Approval.** To maintain approval, the manufacturer shall submit an annual certification of compliance in accordance with ITM 804 and test reports for each color, type of sheeting and class of adhesive to the Division of Highway Operations.

**11.3 Removal from Approval List.** Reflective sheeting material will be removed from an approval list for, but not limited to, the following reasons:

**11.3.1** Changes in the materials or production process

**11.3.2** If three consecutive years elapse without furnishing the reflective sheeting material

**11.3.3** Performance of the reflective sheeting no longer meets the intended purpose

**11.3.4** Failure to annually submit certifications of compliance and test reports

**11.3.5** Changes to the QCP without notification to the Department

**INDIANA DEPARTMENT OF TRANSPORTATION  
OPERATIONS SUPPORT DIVISION  
PRELIMINARY INFORMATION FOR PRODUCT MATERIAL EVALUATION**

Trade Name: \_\_\_\_\_ Date: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Patented? Yes \_\_\_\_\_ No \_\_\_\_\_ Applied for \_\_\_\_\_

Address: \_\_\_\_\_  
Street No (P. O. Box) City State Zip Code

Representative: \_\_\_\_\_ Phone No ( ) \_\_\_\_\_

Address: \_\_\_\_\_  
Street No (P. O. Box) City State Zip Code

Product Information: \_\_\_\_\_  
\_\_\_\_\_

Materials Composition: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\*\* Is this product considered hazardous material when disposing of non-used or surplus materials? Yes \_\_\_\_\_ No \_\_\_\_\_

\*\* What is the shelf life of this material? Years \_\_\_\_\_ Months \_\_\_\_\_ N/A \_\_\_\_\_

Recommended Use (Primary): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Recommended Use (Alternate): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Advantages and/or Benefits: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\*\* Materials specifications by manufacturer, installation/operation manual, literature, test results, guarantee, hazardous material data sheets, plan, picture or sketch are required to be submitted with this form. In the case of electronic devices the schematic diagram, parts list, and parts layout diagram are required to be submitted for each printed circuit board within the device.

Meets following specifications:

AASHTO: \_\_\_\_\_

ASTM: \_\_\_\_\_

OTHER: \_\_\_\_\_

Use by highway authorities or similar agencies in other states.

Agency	Years Used	Remarks
_____	_____	_____
_____	_____	_____
_____	_____	_____

\*\* Has product ever been evaluated by and rejected for use by a governmental agency?

Yes \_\_\_\_\_ No \_\_\_\_\_ If yes, by what agency and for what reason:

\_\_\_\_\_

\_\_\_\_\_

Will demonstration be provided? Yes \_\_\_\_\_ No \_\_\_\_\_

Availability: Seasonal \_\_\_\_\_ Non-seasonal \_\_\_\_\_ Delivery at site \_\_\_\_\_

After receipt of order, are quantities limited? Yes \_\_\_\_\_ No \_\_\_\_\_

Will laboratory analysis be furnished? Yes \_\_\_\_\_ No \_\_\_\_\_

\*\* Approximate cost: \_\_\_\_\_ Royalty Cost: \_\_\_\_\_

When was the product introduced to the market? \_\_\_\_\_

This product is an alternate for what product? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Will warranty be provided? Yes \_\_\_\_\_ No \_\_\_\_\_ If yes, for how long? \_\_\_\_\_

Background of company, including principal products: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What offices of the Indiana Department of Transportation have been contacted?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Additional Information: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(Attach additional sheets as necessary)

Person furnishing information: \_\_\_\_\_  
Name

\_\_\_\_\_  
Title

Address: \_\_\_\_\_  
Street No (P. O. Box)

\_\_\_\_\_  
City

\_\_\_\_\_  
State Zip Code

Items marked \*\* are required to be responded to or further consideration may not be given for this product.

Please mail this form to:                      Manager of Traffic Administration  
100 N. Senate Ave., Room N758-TE  
Indianapolis, IN 46204

If INDOT elects to evaluate your product/material, ship samples to:  
  
Traffic Evaluations  
Indiana Department of Transportation  
8620 E. 21<sup>st</sup> Street  
Indianapolis, IN 46219