



## INDUSTRIAL TESTING LABORATORY

Report No. 120309-04A

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**TEST REPORT**

Report Date: 05 April 2012

Project Name: Aura 149 Yellow FRA Conspicuity  
Type V Metalized Retroreflective Sheeting

Submitted by: Aura Optical Systems  
Ft. Worth, TX 76118

Test Laboratory: Calcoast - ITL  
Emeryville, CA 94608

Products Submitted: Three (3) ~ 4" x 32" strip samples

**SUMMARY**

The above samples were submitted for retroreflective and color measurements for compliance to 49CFR224 FRA retroreflective sheeting. No other D4956 tests were performed.

Each submitted sample had two 4" x 8" pieces cut from it. The two pieces were then adhered to a 8" x 8" x 0.040" aluminum panel for photometric testing. Samples' Coefficients of Retroreflection were measured at  $\epsilon=0^\circ$  and  $\epsilon=90^\circ$  sheeting orientations, with  $\epsilon=0^\circ$  arbitrarily defined as direction of sheeting around its roll with "FRA-224" marking upright (see photos).

Samples meet photometric and daytime color requirements of ASTM D4956-04 Type V metalized retroreflective sheeting for FRA. See following pages.

Written by:

Approved by:

Handwritten signature of Douglas G. Cummins in blue ink.

Douglas G. Cummins  
Photometric Engineer

Handwritten signature of Mark A. Evans in blue ink.

Mark A. Evans  
Laboratory Director

**TEST DATA SHEET**

Project Name: Aura 149 Yellow FRA Conspicuity  
Type V Metalized Retroreflective Sheeting

Coefficient of Retroreflection

Requirement: 49CFR224 Table 1  
Test Method: ASTM E810 - Test Distance 100 feet (30.5 m)  
Projector: Hoffman GPS-102 (Illuminant A, 1.13 fc, 30" diameter)

Tested in accordance to ASTM E810 10.7.1 - since no rotation angle is specified the average of the two orientations ( $\varepsilon=0^\circ$  and  $\varepsilon=90^\circ$ ) is required to meet minimum requirements.

Units: Candela per footcandle per square foot (Candela per Lux per square meter)

## 0.2° Observation Angle

Entrance Angle:		-4°				+30°			
Sample		0°	90°	Avg.	Min R <sub>A</sub>	0°	90°	Avg.	Min R <sub>A</sub>
Aura 149 Yellow	#1	587.3	454.6	521.0	400	316.0	349.3	332.7	220
	#2	526.3	448.0	487.2		295.0	338.0	316.5	
	#3	500.7	424.4	462.6		286.4	307.1	296.8	
	Average	538.1	442.3	<b>490.2</b>		299.1	331.5	<b>315.3</b>	

## 0.5° Observation Angle

Entrance Angle:		-4°				+30°			
Sample		0°	90°	Avg.	Min R <sub>A</sub>	0°	90°	Avg.	Min R <sub>A</sub>
Aura 149 Yellow	#1	139.9	116.9	128.4	100	69.7	53.3	61.5	45
	#2	133.8	100.1	117.0		74.6	49.2	61.9	
	#3	148.4	101.1	124.8		79.2	45.8	62.5	
	Average	140.7	106.0	<b>123.4</b>		74.5	49.4	<b>62.0</b>	

Samples meet FRA Coefficient of Retroreflection requirements.

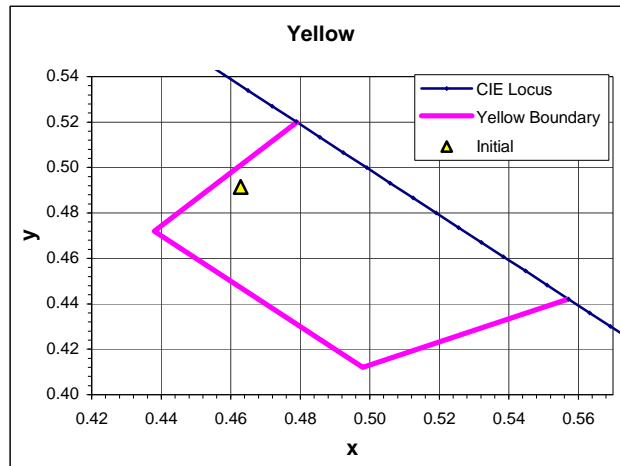
**TEST DATA SHEET**

Project Name: Aura 149 Yellow FRA Conspicuity  
 Type V Metalized Retroreflective Sheeting

Daytime Color

Requirement: ASTM D4956-04 Tables 12 and 17 (Type V Metalized)  
 Test Method: ASTM E308, E1347, E1349, E991, E1164  
 (Illuminant D65, 2° Observer, Annular 45/0 Geometry)  
 Average of 8 reads, each read oriented 45° apart  
 Instrument: Hunterlab Colorflex A60 Spectrocolorimeter (No SCF available)

Sample	x	y	Y		
			Measured	Required	
				Minimum	Maximum
Aura 149 Yellow	0.4629	0.4914	13.87	12	30

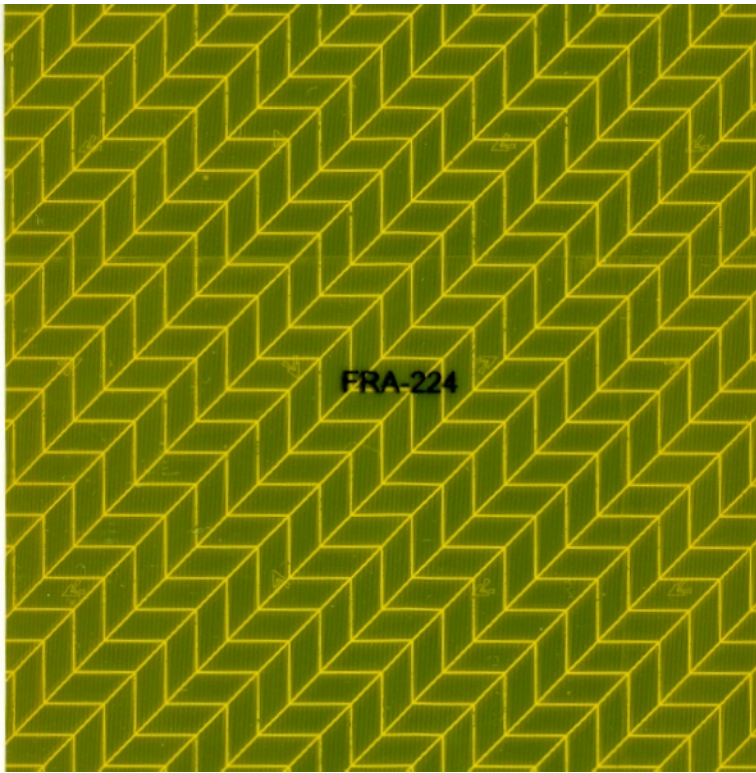


Samples meet ASTM D4956-04 Type V Daytime Color and Luminance requirements.

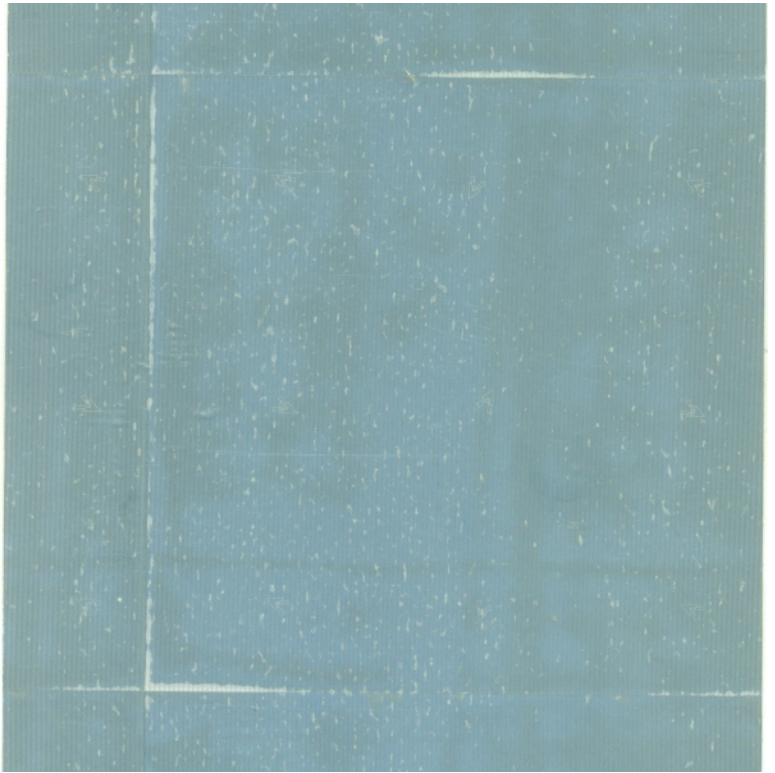
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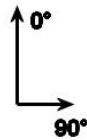
**Photographs**



Front



Rear



Sheeting Orientation