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Customer details: TOTAL REFLECTIVE GROUP SATRA reference: SPC0280707/1905/2/2  
S.A.S  
NIT 900.673.248-1  
CALLE 9 No 10-88 Your reference: 546373965  
CALI  
COLOMBIA Date of report: 25 March 2019  
Samples received: 28 January 2019

## TECHNICAL REPORT

Subject: ANSI/ISEA 107-2015 Retro-reflectivity testing.  
Reflective Material – TR-550

### Conditions of Issue:

This report may be forwarded to other parties provided that it is not changed in any way. It must not be published, for example by including it in advertisements, without the prior, written permission of SATRA.

Results given in this report refer only to the samples submitted for analysis and tested by SATRA. Comments are for guidance only.

**A satisfactory test report in no way implies that the product tested is approved by SATRA and no warranty is given as to the performance of the product tested. SATRA shall not be liable for any subsequent loss or damage incurred by the client as a result of information supplied in the report.**

Please note uncertainty of measurement has not been applied to the results in this report. SATRA uncertainty of measurement values are available on request.

Report signed by: Mark Gamble  
Position: PPE Technologist  
Department: Safety Products Centre

## WORK REQUESTED

Retro-reflective material TR450 was submitted to SATRA for testing as below. The material was measured according to CIE 54.2 with reporting in the format required by ANSI/ISEA 107-2015.

## CONCLUSIONS

Sample Reference	Standard/Clause		Result
	ANSI/ISEA 107-2015		
TR450	Clause 9.1	Retro-reflective Performance of new materials	PASS Separate
	Clause 9.2	Retro-reflectivity after pre-treatments	PASS
	Clause 9.2	Retro-reflectivity in rainfall	PASS
	Clause 9.2	Retro-reflectivity after washing (ISO6330), 50 cycles, 60°C	PASS
	Clause 9.2	Retro-reflectivity after dry cleaning (ISO3175), 25 cycles, normal	PASS

## TEST REQUIREMENTS

Retro-reflective materials shall comply with the requirements of ANSI/ISEA 107-2015, clause 9.1 Retro-reflective performance requirements prior to test exposure. Samples are tested at two rotation angles, designated x and y in this report. Retro-reflective materials shall comply with the minimum requirements for the coefficient of retro-reflection stated in Table 5, at one of the two rotation angles; and shall be not less than 75 % of the values stated in Table 5, at the other rotation angle. The minimum requirements for materials are indicated below.

**Table 5 – Minimum coefficient of retro-reflection for retro-reflective or combined performance material  $cd/(lx \cdot m^2)$**

Observation Angle	Entrance Angle			
	5°	20°	30°	40°
0.20° (12')	330	290	180	65
0.33° (20')	250	200	170	60
1.00°	25	15	12	10
1.50° (1°30')	10	7	5	4

## Retro-reflective Performance Requirements after Test Exposure - $cd/(lx \cdot m^2)$

After test exposure, as indicated below, the coefficient of retro-reflection  $R_A$ , measured at observation angle (0.2°) 12' and entrance angle 5°, shall exceed 100  $cd/lx/m^2$  at one of the two orientations (x or y in this report) and shall be not less than 75  $cd/lx/m^2$  at the other orientation.

Test Exposure	Test Method
Abrasion	Section 10.4.1
Flexing	Section 10.4.2
Folding at cold temperatures	Section 10.4.3
Temperature variation	Section 10.4.4
Washing	Section 10.4.5.2
Dry-cleaning	Section 10.4.5.3
Wet performance	Section 10.4.6

## RESULTS

### Material prior to test exposure – x orientation

Observation angle	Entrance angle			
	5°	20°	30°	40°
12'	[330] 473	[290] 470	[180] 386	[65] 339
20'	[250] 323	[200] 315	[170] 289	[60] 260
1°	[25] 33.5	[15] 33.1	[12] 30.1	[10] 25.7
1° 30'	[10] 21.5	[7] 21.3	[5] 19.6	[4] 17.6

All measurements in  $cd/(lx \cdot m^2)$  Minimum requirements for material shown in [square brackets]

### Material prior to test exposure – y orientation

Observation angle	Entrance angle			
	5°	20°	30°	40°
12'	[330] 484	[290] 471	[180] 423	[65] 341
20'	[250] 332	[200] 324	[170] 295	[60] 263
1°	[25] 34.4	[15] 34.2	[12] 32.3	[10] 26.9
1° 30'	[10] 22.1	[7] 21.2	[5] 20.1	[4] 18.1

All measurements in  $cd/(lx \cdot m^2)$  Minimum requirements for material shown in [square brackets]

## RESULTS

ANSI/ISEA 107-2015 Clause	Pre-Treatment	Observation angle 12', Entrance angle 5° x orientation cd/(lx·m <sup>2</sup> )	Observation angle 12', Entrance angle 5° y orientation cd/(lx·m <sup>2</sup> )	PASS / FAIL
10.4.1	Abrasion	476	473	PASS
10.4.2	Flexing	476	484	PASS
10.4.3	Folding at cold temperatures	404	417	PASS
10.4.4	Temperature variation	416	426	PASS
10.4.6	Wet Performance	222	---	PASS
10.4.5.2	Domestic Washing: 50 cycles	103	106	PASS
10.4.5.3	Dry Cleaning: 25 cycles	437	447	PASS
Domestic washing 60°C ISO 6330, method 6N, low heat tumble dry Dry Cleaning ISO 3175, normal				

\*\*\*\*\* END OF REPORT \*\*\*\*\*

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The laws of England shall govern all contracts and the parties submit to exclusive jurisdiction of the courts of England, unless otherwise agreed.

Issue Date: 1st October 2009