



INDUSTRIAL TESTING LABORATORY

Report No.

170227-01A Rev1

Page 1 of 7

TEST REPORT

Report Date: 30 March 2017

Revision Date: 11 April 2017 [*25X washing results*]

Project Name: Chinastars CSR-1303-2 Silver Retroreflective Sew-On Trim

Submitted by:

Test Laboratory: Calcoast - ITL
San Leandro, CA 94577Product: 50 mm wide silver retroreflective trim,
submitted 27 Feb 2017**SUMMARY**

Specifications:

ANSI/ISEA 107-2015 American National Standard for High-Visibility
Safety Apparel and AccessoriesCSA Z96-15 High-visibility safety apparel
Retroreflective and Combined Performance Material

Color, Combined Performance Material

Prior to Exposure. Not Applicable

Colorfastness. Not Applicable

Retroreflective Performance Prior to Test Exposure

ANSI 107. Passed

CSA Z96, Level 2. Passed

Retroreflective Performance after Test Exposure

Abrasion. Passed

Flexing. Passed

Folding at Cold Temperatures. Passed

Exposure to Temperature Variation. Passed

Washing (25X). Passed

Dry-cleaning (0X). Not Tested

Retroreflective Performance in Rainfall. Passed

Written by:

Douglas G. Cummins
Photometric Engineer

Approved by:

Mark A. Evans
Laboratory Director

TEST DATA SHEET

Project Name: Chinastars CSR-1303-2 Silver Retroreflective Sew-On Trim

Retroreflective Performance Prior to Exposure

Requirement: ANSI/ISEA 107-2015 9.1 Table 5

CSA Z96-15 6.1 Table 5 (Level 2)

Test Method: ANSI/ISEA 107-2015 10.3 / CSA Z96-15 7.3

ASTM E808, E809

Projector: Hoffman GPS-102 (Illuminant A, 10.7 Lux, 750 mm diameter)

Sample Area: 200 mm x 200 mm, 0.040 m²

Test sample created by cutting submitted material into 200 mm strips and mounting 4 strips side-by-side on a 200 mm x 200 mm black mounting surface. Measured sample at orientations of $\varepsilon_1 = 0^\circ$ and $\varepsilon_2 = 90^\circ$ where ε_1 mounting orientation is with the strips parallel to the projector/detector plane.

Coefficient of Retroreflection, Candela/(Lux·m²)

Observation Angle	Entrance Angle	Minimum Requirement ($\varepsilon_1/\varepsilon_2$)	Measured	
			ε_1	ε_2
0.20° (12')	5°	330 / 248	425.1	425.0
	20°	290 / 218	413.1	412.4
	30°	180 / 135	388.1	383.7
	40°	65 / 49	296.5	286.3
0.33° (20')	5°	250 / 188	299.5	299.3
	20°	200 / 150	290.3	289.7
	30°	170 / 128	272.6	269.1
	40°	60 / 45	220.0	211.3
1.00°	5°	25 / 18.8	32.7	32.7
	20°	15 / 11.3	32.7	32.8
	30°	12 / 9.0	33.9	34.2
	40°	10 / 7.5	34.7	34.9
1.50° (1°30')	5°	10 / 7.5	18.2	18.1
	20°	7 / 5.25	17.1	17.2
	30°	5 / 3.75	15.8	15.9
	40°	4 / 3.0	15.7	15.6

Samples meet requirements for Retroreflective Performance Prior to Test Exposure.

TEST DATA SHEET

Project Name: Chinastars CSR-1303-2 Silver Retroreflective Sew-On Trim

Abrasion

Requirement: ANSI/ISEA 107-2015 9.2 / CSA Z96-15 6.2
 Performance at 0.20° Observation / 5° Entrance Angle only

Test Method: ANSI/ISEA 107-2015 10.4.1 / CSA Z96-15 7.4.1
 ISO 12947-2:1998, (Wool Abradent / 5000 Cycles / 9 kPa)
 Instrument in inverted mode (sample on abradent table and
 abradent in test piece holder) per EN530:1995, Method 2 to
 provide suitable area for post-abrasion testing
 Abrasion performed by:
 SGS US Testing, project #4121082
 Average of 3 samples

Sample Area: 75 mm x 75 mm, 0.005625 m²

Coefficient of Retroreflection, Candela/(Lux·m²)

Sample	$\varepsilon_1 = 0^\circ$		$\varepsilon_2 = 90^\circ$	
	Measured	Required	Measured	Required
A1	410.0	100	410.4	75
A2	412.5	100	412.1	75
A3	402.0	100	400.2	75
Average	408.2	100	407.6	75

Samples meet Abrasion requirements.

Flexing

Requirement: ANSI/ISEA 107-2015 9.2 / CSA Z96-15 6.2
 Performance at 0.20° Observation / 5° Entrance Angle only

Test Method: ANSI/ISEA 107-2015 10.4.2 / CSA Z96-15 7.4.2
 ISO 7854:1995 Method A (7500 Cycles)
 Average of 3 samples

Sample Area: 50 mm x 120 mm, 0.006 m²

Coefficient of Retroreflection, Candela/(Lux·m²)

Sample	$\varepsilon_1 = 0^\circ$		$\varepsilon_2 = 90^\circ$	
	Measured	Required	Measured	Required
FL1	415.2	100	412.7	75
FL2	414.7	100	414.3	75
FL3	416.0	100	415.0	75
Average	415.3	100	414.0	75

Samples meet Flexing requirements.

TEST DATA SHEET

Project Name: Chinastars CSR-1303-2 Silver Retroreflective Sew-On Trim

Folding at Cold Temperatures

Requirement: ANSI/ISEA 107-2015 9.2 / CSA Z96-15 6.2
 Performance at 0.20° Observation / 5° Entrance Angle only

Test Method: ANSI/ISEA 107-2015 10.4.3 / CSA Z96-15 7.4.3
 ISO 4675:1990 (-20°C)
 Average of 3 samples

Sample Area: 50 mm x 100 mm, 0.005 m²

Coefficient of Retroreflection, Candela/(Lux·m²)

Sample	$\varepsilon_1 = 0^\circ$		$\varepsilon_2 = 90^\circ$	
	Measured	Required	Measured	Required
CF1	422.0	100	421.5	75
CF2	447.6	100	446.5	75
CF3	446.6	100	444.7	75
Average	438.7	100	437.6	75

Samples meet Folding at Cold Temperatures requirements.

Exposure to Temperature Variation

Requirement: ANSI/ISEA 107-2015 9.2 / CSA Z96-15 6.2
 Performance at 0.20° Observation / 5° Entrance Angle only

Test Method: ANSI/ISEA 107-2015 10.4.4 / CSA Z96-15 7.4.4
 12 Hours at 50°C immediately followed by 20 Hours at -30°C
 Average of 3 samples

Sample Area: 50 mm x 100 mm, 0.005 m²

Coefficient of Retroreflection, Candela/(Lux·m²)

Sample	$\varepsilon_1 = 0^\circ$		$\varepsilon_2 = 90^\circ$	
	Measured	Required	Measured	Required
T1	425.7	100	422.9	75
T2	434.2	100	434.0	75
T3	427.3	100	426.4	75
Average	429.1	100	427.8	75

Samples meet Exposure to Temperature Variation requirements.

TEST DATA SHEET

Project Name: Chinastars CSR-1303-2 Silver Retroreflective Sew-On Trim

Washing

Requirement: ANSI/ISEA 107-2015 9.2 / CSA Z96-15 6.2
 Performance at 0.20° Observation / 5° Entrance Angle only

Test Method: ANSI/ISEA 107-2015 10.4.5.2 / CSA Z96-15 7.4.6
 ISO 6330:2012, Method 6N
 After the last wash cycle the samples were dried,
 stress free, at 50°C.
 Average of 3 samples

Sample Area: Two (2) strips, 50 mm x 250 mm, 0.025 m²

Number of Wash Cycles: 25

Coefficient of Retroreflection, Candela/(Lux·m²)

Sample	$\varepsilon_1 = 0^\circ$		$\varepsilon_2 = 90^\circ$	
	Measured	Required	Measured	Required
W1	384.1	100	383.3	75
W2	378.6	100	378.4	75
W3	389.2	100	389.7	75
Average	384.0	100	383.8	75

Samples meet Washing requirements.

Dry-cleaning

Requirement: ANSI/ISEA 107-2015 9.2 / CSA Z96-15 6.2
 Performance at 0.20° Observation / 5° Entrance Angle only

Test Method: ANSI/ISEA 107-2015 10.4.5.3 / CSA Z96-15 7.4.7
 ISO 3759-2011 (ISO 3175:1998 Method 9.1)
 Average of 3 samples

Sample Area: Two (2) strips, 50 mm x 250 mm, 0.025 m²

Number of Dry-cleaning Cycles: Not Applicable

Coefficient of Retroreflection, Candela/(Lux·m²)

Sample	$\varepsilon_1 = 0^\circ$		$\varepsilon_2 = 90^\circ$	
	Measured	Required	Measured	Required
DC1	-	100	-	75
DC2	-	100	-	75
DC3	-	100	-	75
Average	-	100	-	75

No samples tested.

TEST DATA SHEET

Project Name: Chinastars CSR-1303-2 Silver Retroreflective Sew-On Trim

Retroreflective Wet Performance

Requirement: ANSI/ISEA 107-2015 9.2 / CSA Z96-15 6.2
Performance at 0.20° Observation / 5° Entrance Angle only

Test Method: ANSI/ISEA 107-2015 10.4.6, Appendix A / CSA Z96-15 7.4.8
Rainfall flow rate: 284 mm/hour
Retroreflection measured after 2 minutes exposure
while maintaining water spray

Projector: Hoffman GPS-102 (Illuminant A, 10.7 Lux, 750 mm diameter)

Sample Area: 200 mm x 200 mm, 0.040 m²

Sample from Retroreflective Performance Prior to Exposure used for
Retroreflective Wet Performance.

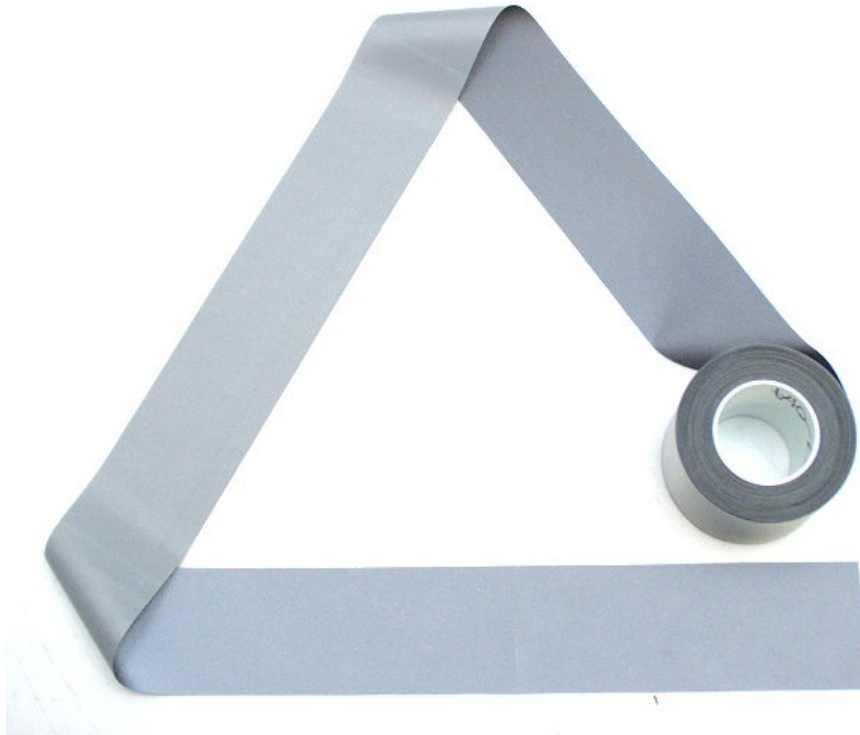
Coefficient of Retroreflection, Candela/(Lux·m²)

Sample	$\varepsilon_1 = 0^\circ$		$\varepsilon_2 = 90^\circ$	
	Measured	Required	Measured	Required
R1	182.4	100	140.4	75

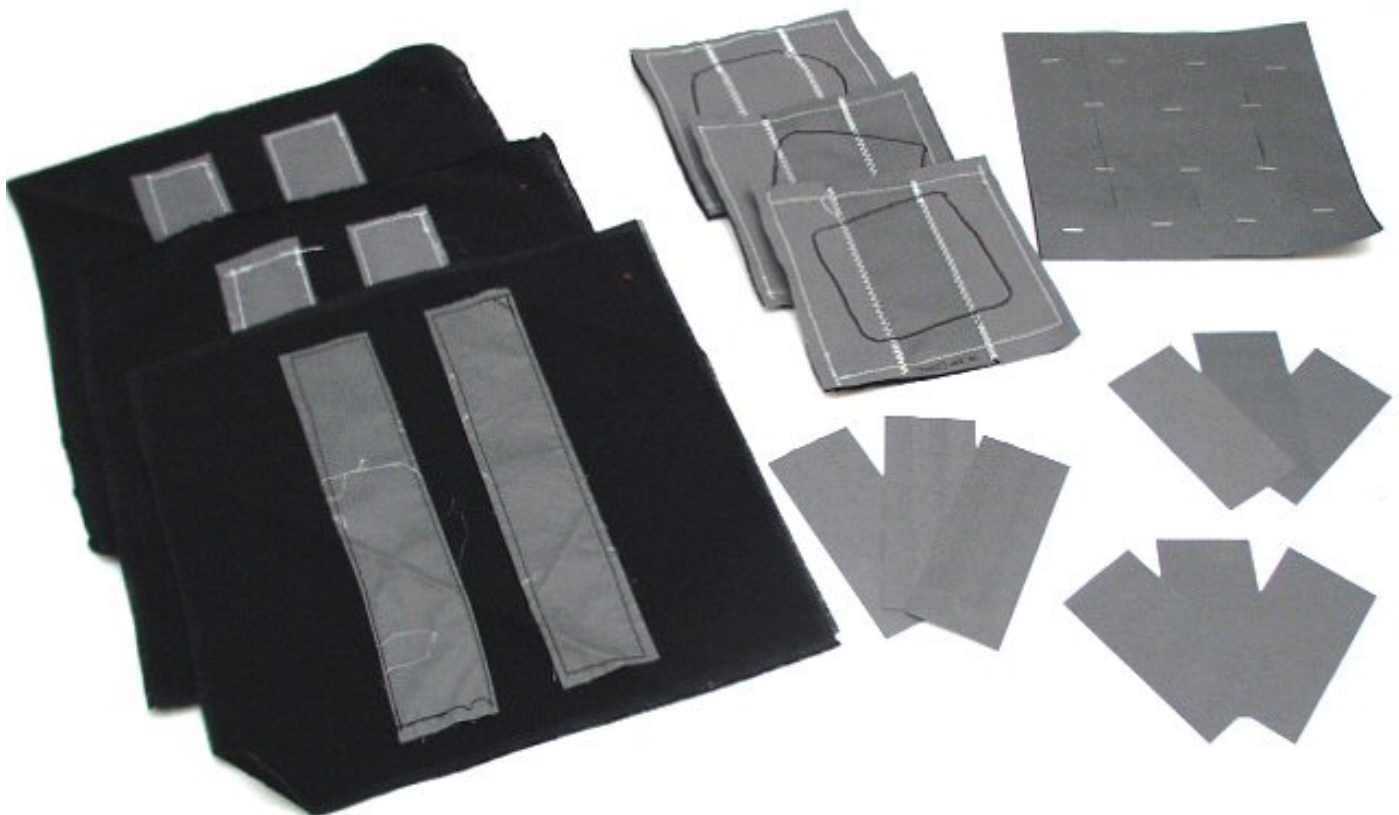
Sample meets Retroreflective Wet Performance requirements.

PHOTOGRAPH SHEET

Project Name: Chinastars CSR-1303-2 Silver Retroreflective Sew-On Trim



Roll, as received



Test Samples