

CINTA REFLEJANTE

ST-6-500-600, ST-6-500-605 y ST-6-500-610



Report No.

CONFIDENCIAL

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TEST REPORT

Report Date: 10 February 2015
 Revision Date: 11 August 2015 [added D4956-90 tests except weathering]
 Project Name: 11" Red / 7" White DOT-C2 Conspicuity Trim
 Submitted by: CONFIDENCIAL

Test Laboratory: Calcoast - ITL
 San Leandro, CA 94577

Samples Submitted: One (1) roll of alternating 280 mm Red / 177 mm White
 50 mm wide conspicuity tape submitted 21 Jan 2015
 Three (3) 12"x12" White sheets submitted 17 Jul 2015

SUMMARY

Specification: FMVSS-108 / ASTM D4956-90 Type V Sheeting, Class 1 Backing

FMVSS 108 S8.2.1

S8.2.1.1 ConstructionPassed
 S8.2.1.2 / S8.2.1.4 Pattern/DimensionsPassed
 S8.2.1.3 Certification MarkingPassed
 S8.2.1.7 / Table XVI-c Coefficient of RetroreflectionPassed

ASTM D4956-90

7.4 Accelerated Weathering (modified)Passed
 7.3 Daytime Color and LuminanceNot Tested
 7.5 ColorfastnessNot Tested
 7.6 ShrinkagePassed
 7.7 FlexibilityPassed
 7.8 Liner RemovalPassed
 7.9 AdhesionPassed
 7.10 Impact ResistancePassed
 7.11 Specular GlossPassed

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TEST DATA SHEET

Project Name: 11" Red / 7" White DOT-C2 Conspicuity Trim

S8.2.1.1 Construction

Retroreflective sheeting consists of a smooth, flat, transparent exterior film with retroreflective elements embedded or suspended beneath the film so as to form a non-exposed retroreflective optical system.

S8.2.1.2 Pattern / S8.2.1.4.1 Dimensions

Reflective sheeting is made up of alternating white and red color segments of the following dimensions:

Segment	Red	White	Required
Length	280 mm (61.3%)	177 mm (38.7%)	300 ± 150 mm
Width	50.5 mm	50.5 mm	50 mm (DOT-C2) 75 mm (DOT-C3) 100 mm (DOT-C4)

Neither white nor red sheeting shall represent more than two thirds (66.7%) of the aggregate of any continuous strip marking the width of a trailer, or any continuous or broken strip marking its length.

Samples meet Pattern/Dimension requirements.

S8.2.1.3 Certification Marking

The letters "DOT-C2" appear on white sheeting segments at least once every 300 mm in characters at least 3 mm high.

Samples meet Certification Marking requirements.



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TEST DATA SHEET

Project Name: 11" Red / 7" White DOT-C2 Conspicuity Trim

S8.2.1.7 Coefficient of Retroreflection

Requirement: FMVSS 108 S8.2.1.7 / Table XVI-c

Test Method: ASTM E810

Samples tested in four orientations (0°, 90°, 180°, and 270°)

Sample Areas:

Red: 50.5 mm x 280 mm = 0.0141 m²

Sample	Entrance Angle	Orientation	Coefficient of Retroreflection (Candela / Lux / m ²)			
			0.2° Obs. Angle		0.5° Obs. Angle	
			Measured	Required	Measured	Required
Red #1	-4°	Horizontal (0°)	267.2	60	55.4	15
		Vertical (90°)	260.5	†	52.5	†
		Horizontal (180°)	266.7	60	54.7	15
		Vertical (270°)	262.7	†	53.7	†
	+30°	Horizontal (0°)	119.2	60	51.7	15
		Vertical (90°)	113.9	†	43.1	†
		Horizontal (180°)	121.1	60	53.3	15
		Vertical (270°)	111.4	†	44.5	†
	+45°	Horizontal (0°)	34.4	15	20.4	4
		Vertical (90°)	34.6	†	18.8	†
		Horizontal (180°)	34.6	15	20.7	4
		Vertical (270°)	33.3	†	18.7	†
Red #2	-4°	Horizontal (0°)	267.5	60	55.3	15
		Vertical (90°)	265.9	†	53.0	†
		Horizontal (180°)	267.9	60	50.1	15
		Vertical (270°)	267.0	†	52.6	†
	+30°	Horizontal (0°)	118.3	60	51.3	15
		Vertical (90°)	115.3	†	43.9	†
		Horizontal (180°)	119.7	60	51.7	15
		Vertical (270°)	114.2	†	46.2	†
	+45°	Horizontal (0°)	34.1	15	20.3	4
		Vertical (90°)	34.8	†	19.2	†
		Horizontal (180°)	33.4	15	20.2	4
		Vertical (270°)	33.9	†	19.1	†
Red #3	-4°	Horizontal (0°)	272.3	60	55.2	15
		Vertical (90°)	267.5	†	52.9	†
		Horizontal (180°)	271.4	60	54.2	15
		Vertical (270°)	268.4	†	52.9	†
	+30°	Horizontal (0°)	121.4	60	51.7	15
		Vertical (90°)	116.2	†	43.7	†
		Horizontal (180°)	123.3	60	53.7	15
		Vertical (270°)	114.6	†	45.8	†
	+45°	Horizontal (0°)	34.9	15	20.5	4
		Vertical (90°)	35.1	†	19.1	†
		Horizontal (180°)	34.7	15	20.8	4
		Vertical (270°)	34.3	†	19.2	†

† Note: Red not normally mounted on vehicle in vertical orientation. Testing only for sake of thoroughness.

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TEST DATA SHEET

Project Name: 11" Red / 7" White DOT-C2 Conspicuity Trim

S8.2.1.7 Coefficient of Retroreflection (continued)

Requirement: FMVSS 108 S8.2.1.7 / Table XVI-c

Test Method: ASTM E810

Samples tested in four orientations (0°, 90°, 180°, and 270°)

Sample Areas:

White: 50.5 mm x 177 mm = 0.0089 m²

Sample	Entrance Angle	Orientation	Coefficient of Retroreflection (Candela / Lux / m ²)			
			0.2° Obs. Angle		0.5° Obs. Angle	
			Measured	Required	Measured	Required
White #1	-4°	Horizontal (0°)	868.6	250	121.1	65
		Vertical (90°)	867.1		137.7	
		Horizontal (180°)	867.0		119.7	
		Vertical (270°)	874.0		135.2	
	+30°	Horizontal (0°)	400.9	250	148.5	65
		Vertical (90°)	393.4		141.3	
		Horizontal (180°)	408.7		155.0	
		Vertical (270°)	391.5		148.1	
	+45°	Horizontal (0°)	118.0	60	63.9	15
		Vertical (90°)	121.0		62.2	
		Horizontal (180°)	118.3		65.5	
		Vertical (270°)	119.9		62.9	
White #2	-4°	Horizontal (0°)	893.3	250	127.0	65
		Vertical (90°)	892.5		130.9	
		Horizontal (180°)	890.3		125.4	
		Vertical (270°)	889.8		127.3	
	+30°	Horizontal (0°)	412.2	250	154.2	65
		Vertical (90°)	399.0		136.9	
		Horizontal (180°)	418.4		160.0	
		Vertical (270°)	393.9		146.3	
	+45°	Horizontal (0°)	120.8	60	65.5	15
		Vertical (90°)	123.0		61.5	
		Horizontal (180°)	120.9		67.2	
		Vertical (270°)	119.1		62.4	
White #3	-4°	Horizontal (0°)	882.9	250	113.7	65
		Vertical (90°)	891.3		133.6	
		Horizontal (180°)	879.8		111.3	
		Vertical (270°)	886.5		128.8	
	+30°	Horizontal (0°)	404.0	250	146.0	65
		Vertical (90°)	395.7		139.4	
		Horizontal (180°)	413.1		155.3	
		Vertical (270°)	393.2		148.8	
	+45°	Horizontal (0°)	116.9	60	63.2	15
		Vertical (90°)	118.9		60.4	
		Horizontal (180°)	117.7		65.1	
		Vertical (270°)	117.0		62.1	

Samples meet Coefficient of Retroreflection requirements.

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7.3 Daytime Color and Luminance

Requirement: ASTM D4956-90 Tables 8 and 10 (Type V Sheeting)

Test Method: ASTM E308, E1347, E1349, E991, E1164
(Illuminant C, 2° Observer, 45/0 Geometry)

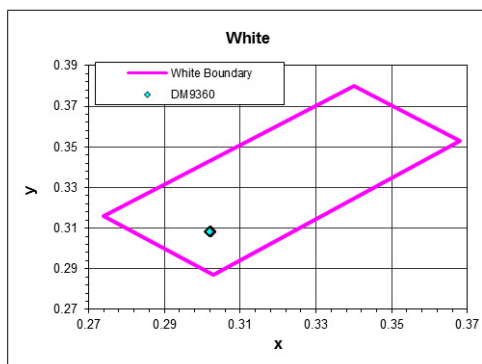
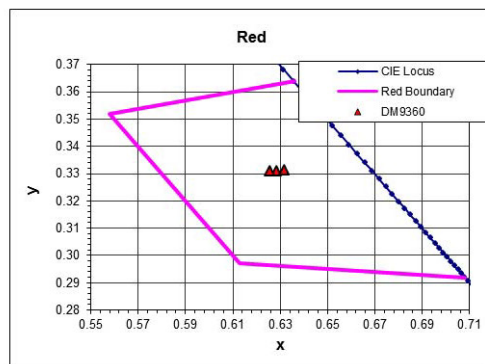
Instrument: Hunterlab Colorflex A60 Spectrocolorimeter (No SCF available)

Color	Sample	x	y	Y		
				Measured	Minimum	Maximum
Red	#1	0.6286	0.3308	5.65	2.5	11
	#2	0.6256	0.3309	5.66		
	#3	0.6318	0.3312	5.60		
White	#1	0.3024	0.3083	25.88	15	-
	#2	0.3022	0.3083	25.92		
	#3	0.3021	0.3081	26.08		

Samples meet Daytime Color and Luminance requirements.

Note: Current ASTM D4956 uses D65 as illuminant instead of C.

Color Plots



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7.6 Shrinkage

Requirement: ASTM D4956-90 7.6

Test Method: ASTM D4956-90 8.8

Removed liner from 9" x 9" sample and measured the sample side lengths at t = 0, t = 10 min, and t = 24 hours then determined the length changes.

Product	Side	10 minutes		24 hours	
		Measured	Maximum Allowed	Measured	Maximum Allowed
White	1	N/C	1/32"	N/C	1/8"
	2	N/C		N/C	
	3	N/C		N/C	
	4	N/C		N/C	

N/C indicates no change.

Sample meets Shrinkage requirements.

7.7 Flexibility

Requirement: ASTM D4956-90 7.7

Test Method: ASTM D4956-90 8.9

Samples prepared by removing protective liner from 2 3/4" x 11" specimen and liberally applying talc on adhesive side. Samples then bent around 1/8" diameter mandrel by grasping long ends of sample and placing center of sample at the mandrel with adhesive side contacting mandrel, then pulling long ends downward and together within 1 second until material had a 180° bend at its center. Samples tested in three (3) orientations - 0°, 45°, and 90° as defined for coefficient of retroreflection.

Product	Results		
	0°	45°	90°
White	No cracking.	No cracking.	No cracking.

Sample meets Flexibility requirements.

7.8 Liner Removal

Requirement: ASTM D4956 7.8

Test Method: ASTM D4956 8.10

2" x 4" samples exposed to accelerated storage conditions of 71°C at 2.5 psi for 4 hours then cooled to 23°C for 1 hour.

Product	Results
Red/White	Liner easily removed without assistance and did not break, tear, or remove adhesive.

Sample meets Liner Removal requirements.

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7.9 Adhesion

Requirement: ASTM D4956-90 7.9

Test Method: ASTM D4956-90 8.5

4" each of two (2) 1"x6" sheeting samples were bonded to 0.040" thick degreased and acid-etched 6061-T6 aluminum panels. After conditioning, a 0.79kg weight was hung from the free end of sample 90° to the panel. After 5 minutes, the peel distance was measured.

Product	Peel Distance		Maximum
	1	2	
Red/White	0.17"	0.17"	2.0"

Samples meet Adhesion requirements.

7.10 Impact Resistance

Requirement: ASTM D4956-90 7.10

Test Method: ASTM D4956-90 8.11

2" x 6" samples mounted to 0.040" thick 6061-T6 aluminum and subjected to a 10 in-lb impact from a mass with a steel 5/8" diameter round tip.

Product	Results
Red/White	No cracking or delamination outside impact area.

Sample meets Impact Resistance requirements.

7.11 Specular Gloss (85°)

Requirement: ASTM D4956-90 8.12

Test Method: ASTM D523 (85°)

Instrument: Gardco 85° Glossmeter

Gloss of a 8" x 8" sample was measured across three (3) orientations ($\epsilon=0^\circ$, 45° , and 90°) and averaged.

Product	Measured				Minimum
	0°	45°	90°	Avg	
White	95.1	99.5	98.1	97.6	40

Sample meets Specular Gloss requirements.