994 RETROREFLECTIVE AND NONREFLECTIVE SIGN SHEETING. (REV 5-18-05) (FA 6-29-05) (1-06)

ARTICLE 994-3 (Pages 948 and 949) is deleted and the following substituted:

994-3 Physical Requirements.

994-3.1 Testing: The retroreflective sheeting shall be tested in accordance with ASTM D4956 and the Florida Test Method for retroreflective and nonreflective sheeting, FM 5-571. For retroreflectivity, the sheeting materials shall meet the minimum requirements as stated for 0.2 degree and 0.5 degree observation angles in ASTM D4956. Evaluation of test samples shall be field tested in accordance with FM 5-571 for each color.

994-3.2 Retroreflective Intensity: The retroreflective sheeting shall meet the requirements in ASTM D4956 for the overall performance of each property listed. In addition to minimum coefficients of retroreflection listed in ASTM D4956, fluorescent yellow-green sheeting shall have a minimum coefficient of retroreflection of 200 at 0.2 /-4, 100 at 0.2 /30, 80 at 0.5 /-4 and 45 at 0.5 /30 (observation angle/entrance angle) for ASTM D4956 Tables 4, 6, 7 and 8. Type VII requirements are listed in Table 13 below.

994-3.3 Color: The retroreflective and nonreflective sheeting or film shall have the same daytime and nighttime color when viewed by reflective light regardless of type classification. The diffused color of the retroreflective sheeting, through instrumental color testing, shall conform to the requirements of ASTM D4956. In addition to ASTM D4956 Table 13, the fluorescent orange, fluorescent yellow-green and fluorescent pink colors shall meet the following x, y chromaticity coordinates:

Fluorescent	1	2	3	4
Yellow/Green				
x	.387	.368	.421	.460
y	.610	.539	.486	.540
Orange				
x	.583	.535	.595	.645
y	.416	.400	.351	.355

Fluorescent Pink	1	2	3	4
X	.450	.590	.644	.536
Y	.270	.350	.290	.230

The daytime luminance for fluorescent orange, fluorescent yellow-green and fluorescent pink sheeting shall have a luminance factor of 25 minimum, 60 minimum and 25 minimum respectively, in addition to ASTM D4956 Table 9.

994-3.3.1 Accelerated Outdoor Test: The retroreflective and nonreflective materials shall meet the ASTM D4956 weathering requirements for performance. Retroreflective materials shall meet the minimum coefficient of retroreflection as listed in Table 11 in accordance with FM 5-571.

994-3.4 Adhesive Backing:

994-3.4.1 General: The adhesive backing of the retroreflective and nonreflective sheeting or film shall be either Class 1, Class 2 or Class 5 per ASTM D956, Section 4.3. The retroreflective and nonreflective sheeting or film, after application, shall tightly adhere to the application surface and show no discoloration, cracking, crazing, blistering or dimensional change.

994-3.4.2 Protective Liner: The protective liner over the adhesive backing shall be removable from the adhesive backing by peeling without soaking in water or other solvents and without breaking, tearing or removing any adhesive from the adhesive backing in accordance with ASTM D4956, Section 7.10.

994-3.5 Film: The exterior film of the sheeting shall be a flexible, smooth-surfaced, moisture resisting material and shall have sufficient strength and flexibility to be easily handled, cut to shape, processed and applied without stretching, tearing, or other damage. In addition, retroreflective sheeting shall have a transparent exterior film.

994-3.6 Tensile Strength: The retroreflective and nonreflective sheeting or film shall have a minimum tensile strength of five pounds-force so that the sheeting can be handled, processed and applied without damage to sheeting. The tensile strength shall be tested in accordance with ASTM D882.

994-3.7 Physical Properties: The retroreflective and nonreflective sheeting or film material shall meet the ASTM D956 minimum requirements for specular gloss, shrinkage and flexibility.

994-3.8 Workability: The retroreflective and nonreflective sheeting or film shall permit preapplication handling, positioning, cutting by hand or die machine and oven drying. In addition, retroreflective sheeting shall permit color processing.

994-3.9 Chemical Resistance: The retroreflective and nonreflective sheeting or film shall be chemically resistant so as to permit cleaning with naphtha and mineral spirits, turpentine, mild soaps, detergents and alcohol.

994-3.10 Color Processibility: The retroreflective sheeting shall permit color processing with compatible transparent and opaque process inks as approved by the sheeting manufacturer and listed on the QPL.

Table 13
Type VII Sheeting

Minimum Coefficient of Retroreflection
(cd/(Foot-candle ft_2)) [(cd/((1x m_2))]

Observation/Entrance Angle (degree)	White	Yellow	Red	Orange	Blue	Green	Brown	Fluorescent Orange	Fluorescent Yellow	Fluorsecent Yellow/Green
0.2/-4	380	304	95	250	19	38	19	180	220	360
0.5/-4	250	195	55	100	12	25	8	60	145	235
0.2/30	220	176	48	110	11	22	9	85	125	205
0.5/30	135	105	30	50	7	14	3	33	75	125

Note: Tables 1-12 are found in ASTM D4956

Type VI Sheeting

Minimum Coefficient of Retroreflection
(cd/Foot-candle ft_2)) [(cd/lx m_2))]

Observation/Entrance Angle	Fluorescent Pink
(degree)	

Type VI Sheeting	
Minimum Coefficient of Retroreflection (cd/Foot-candle ft_2)) [(cd/lx m_2))]	
Observation/Entrance Angle	Fluorescent Pink
(degree)	
0.2/-4	160
0.5/-4	100
0.2/30	100
0.5/30	40

ARTICLE 994-7 (Pages 950 and 951) is deleted and the following substituted:

994-7 Certification.

For permanently installed signs, the Contractor shall be required to furnish to the Engineer one certified test report from the sheeting manufacturer documenting that the retroreflective sheeting meets the requirements of this Section. The certified test report shall include test results for retroreflectivity, color, adhesive backing properties, film description, tensile strength, specular gloss, shrinkage, flexibility and chemical resistivity. The certified test report shall affirm the product meets all the requirements specified. If test results indicate significant inconsistencies in material properties, new qualification tests and/or comparison with original infrared spectroscopic values may be required. Each certification shall cover only one type of retroreflective or non reflective sheeting or film. The certification shall meet the requirements in Section 6. Due to the wide range of applications of the products within some types, the certification shall additionally state that this product is recommended for use on this specified project.

Certification shall not be required for signs used in the work zone.