

SECTION 994
RETROREFLECTIVE AND NONREFLECTIVE
SHEETING FOR TRAFFIC CONTROL DEVICES

994-1 Description.

994-1.1 General: This Section specifies the requirements for retroreflective and nonreflective sheeting materials, transparent and opaque process inks for retroreflective sheeting materials and film overlays for traffic control devices. The sheeting materials used shall be one of the products included on the Qualified Products List (QPL), as specified in 6-1.

994-1.2 Classification: Retroreflective sheeting material Types III, IV, V, and VI shall be classified in accordance with ASTM D-4956. In addition, a special classification, Type VII (Special) is added for super high intensity retroreflective sheeting. This special classification shall include materials classified as Type VII and above in accordance with ASTM D-4956. A special classification for Type VI fluorescent pink is also added.

994-2 Materials.

Retroreflective sheeting, screen processing inks and film overlay materials used for any of the applications described herein shall be one of the products included on the QPL, as specified in 6-1. The retroreflective sheeting shall meet the requirements of Types III, IV, V, VI in ASTM D-4956 or Type VII (Special) and fluorescent pink listed below in accordance with their approved usage. Samples shall be taken in accordance with the Department's Sampling, Testing and Reporting Guide Schedule and on a random basis at the discretion of the Engineer.

994-3 Performance Requirements.

994-3.1 Testing: The retroreflective sheeting shall be tested in accordance with ASTM D-4956 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 D-4956. 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 minimum initial requirements as stated for 0.2 degree and 0.5 degree observation angles in ASTM D-4956. Type VI fluorescent pink sheeting and Type VII (Special) sheeting shall meet the minimum retroreflectivity requirements listed below.

994-3.3 Color: The retroreflective and nonreflective sheeting or film shall conform to both the daytime and nighttime color requirements of ASTM D-4956, In addition to ASTM D-4956, the fluorescent pink initial color shall meet the following x, y chromaticity coordinates:

Fluorescent Pink	1	2	3	4
x	.450	.590	.644	.536
y	.270	.350	.290	.230

The daytime luminance factor shall meet ASTM D-4596 except for fluorescent pink sheeting which shall have a minimum luminance factor of 25.

994-3.3.1 Accelerated Outdoor Test: The retroreflective and nonreflective materials shall meet the ASTM D-4956 Accelerated Outdoor Table weathering requirements for performance except Type VI fluorescent pink and fluorescent yellow.

994-3.4 Adhesive Backing: The adhesive backing of the retroreflective and nonreflective sheeting or film shall be either Class 1, Class 2 or Class 5 per ASTM D-4956. 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.

994-3.5 Physical Properties: The retroreflective and nonreflective sheeting or film material shall meet the ASTM D-4956 minimum requirements for colorfastness, shrinkage, flexibility, liner removal, adhesion, impact resistance and specular gloss.

994-3.6 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.

Type VII (Special) Sheeting										
Minimum Coefficient of Retroreflection (cd/foot-candle·ft ²)(cd/fc·ft ²)										
Observation/Entrance Angle (degree)	White	Yellow	Red	Orange	Blue	Green	Brown	Fluorescent Orange	Fluorescent Yellow	Fluorescent 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

Type VI Sheeting	
Minimum Coefficient of Retroreflection (cd/foot-candle·ft ²)(cd/fc·ft ²)	
Observation/Entrance Angle (degree)	Fluorescent Pink
0.2/-4	160
0.5/-4	100
0.2/30	100
0.5/30	40

994-4 Direct and Reverse Screen Processing.

994-4.1 General: The transparent and opaque process inks furnished for direct and reverse screen processing shall be of a type and quality formulated for retroreflective sheeting materials as listed on the QPL and applied in accordance with the manufacturer's instruction. Screen processing in accordance with the techniques and procedures recommended by the manufacturer shall produce a uniform legend of continuous stroke width of either transparent or opaque ink, with sharply defined edges and without blemishes on the sign background that will affect the intended sign use. The process inks shall be one of the products listed on the QPL.

994-4.2 Color: The daytime color of the finished transparent process inks shall conform to the requirements as specified in 994-3.3.

994-5 In-Service Minimum Requirements.

The retroreflective sheeting and screen processed retroreflective sheeting shall have the minimum coefficient of retroreflection as shown in ASTM D-4956, Outdoor Weathering Photometric Requirements for All Climates except Type VI fluorescent pink and fluorescent yellow. In addition, Type VII (Special) classified sheeting materials shall have a minimum coefficient of retroreflection of 80% of the values listed in the above table. Only the observation angle of 0.2 degrees and an entrance angle of -4 degrees shall be used in measuring in-service minimums. The in-service life for opaque overlay films, black processing inks and opaque lettering shall equal the life of the reflective sheeting to which it is applied.

994-6 Packaging and Labeling.

Shipment shall be made in containers which are acceptable to common carriers and packaged in such a manner as to ensure delivery is in perfect condition. Each package shall be clearly marked as to the name of the manufacturer, series, color, quantity enclosed and date of manufacture.

994-7 Certification.

For permanently installed signs, the Contractor shall be required to furnish to the Engineer one material certification from the sheeting manufacturer documenting that the retroreflective sheeting meets the requirements of this Section. Each certification shall cover only one type of retroreflective or non reflective sheeting or film. The certification shall meet the requirements in Section 6.

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

994-8 Qualified Products List.

994-8.1 General: All reflective and nonreflective sheeting materials and process inks shall be one of the products listed on the QPL. Products may only be used for applications recommended by the manufacturer. A notation of the sheeting materials approved for the inks may be placed on the QPL.

994-8.2 Other Requirements: Manufacturers seeking approval of sheeting material products shall submit an application, Material Safety Data Sheet (MSDS), and certification. Non-sheeting materials may be submitted under this Section with reference to specific equivalency of performance requirements of overall end product. Final acceptance will be based on tests and verification in accordance with this Specification, FM 5-571 and 6-1.

994-9 Samples.

Field samples will be obtained in accordance with the Department's Sampling, Testing and Reporting Guide Schedule.