Origination Form

Specifications

Name:	Kelly Shishlova	**Standard Specification Section:**	985
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Date:	2025-06-04T11:42:55Z	**Associated Specs:**	514

Summary:

(1) Moved language from 985-2.6 and Tables 985-1 and 985-2 to section 514, (2) added reference to 514 under 985-3.1, (3) deleted Minimum Permittivity and Maximum AOS for D-1e and D-2e, (4) changed Soil Geosynthetic Friction to Coefficient of Direct Sliding/Interaction for what is needed from direct shear/pullout tests and Pullout Resistance to Scale Correction Factor (α) for pullout tests.

Justification:

The current language includes requirements for the geotextile selection and construction requirements for overlapping the material, language that is better suited for under Division II since this is relevant to the contractor and not the manufacturer. Furthermore, updates are needed to remove requirements for D-1e and D-1f since this type of geotextile is not used for MSE wall joints. Lastly, updates are need to the properties obtained from pullout and direct shear tests for reinforcement geosynthetics to better align with what is used for design.

Do the changes affect other types of specifications?

Neither

List Specifications Affected:

Other Affected Documents/Offices	Contacted	Yes/No
Other Standard Plans		No
Florida Design Manual		No
Structures Manual		No
Basis of Estimates Manual		No
Approved Product List		No
Construction Office		No
Maintenance Office		No

Materials Manual		No
Traffic Engineering Manual		No

Are changes in line with promoting and making progress on improving safety, enhancing mobility, inspiring innovation, and fostering talent; explain how?

Yes, the changes ensure the requirements are in the correct location for the correct user and that the correct information is obtained for designers to use. This improves the quality of materials.

What financial impact does the change have; project costs, pay item structure, or consultant fees?

None

What impact does the change have on production or construction schedules?

None

How does this change improve efficiency or quality?

The change improves the quality of geosynthetics by placing the requirements for the contractor in the correct location and simplifying the specification and making it more practical.

Which FDOT offices does the change impact?

Materials and Construction.

What is the impact to districts with this change?

None

Does the change shift risk and to who?

No, the change does not shift risk.

Provide summary and resolution of any outstanding comments from the districts or industry.

Comments and Responses are available on the Track the Status of Revisions hyperlink located on the Specifications landing page: https://www.fdot.gov/programmanagement/Specs.shtm

What is the communication plan?

Through the established specification revision process (e.g., Internal and Industry Review)

What is the schedule for implementation?

The Standard Specifications eBook and Workbook are effective July 1st every year.

GEOSYNTHETIC MATERIALS
(REV 6-4-25)

SECTION 985 is deleted and the following substituted:

985-1 Description.

Geosynthetic materials are used for nonstructural and structural applications ~~and shall be~~consisting of either geotextiles (woven or non-woven) or geogrids (woven or extruded) that are used for drainage, erosion control, reinforcement, separation, or stabilization.

985-2 General Requirements.

985-2.1 Product Acceptance: All geosynthetic materials shall be one of the products listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of products for inclusion on the APL shall submit an application in accordance with Section 6 and include the following documentation. A separate application must be submitted for each ~~geotextile~~ geosynthetic application type to be evaluated, showing that the product meets the applicable requirements.

Documentation	Requirements
Installation Instructions	Include surface preparations, installation, overlap or sewing instructions, and repair procedures.
AASHTO Product Evaluation & Audit Solutions: Audit Report, for Structural Geosynthetic Materials Only	Manufacturer's facility included on list of compliant producers
AASHTO Product Evaluation & Audit Solutions: Test Results	Product meets requirements of this Section
Product Label Photo	Displays the Product Name and model number
Product Photo	Displays the significant features of the product as required in this section~~. Displays location of Manufacturer name and model number.~~
Technical Data Sheet	Uniquely identifies the product and includes product specifications, reporting requirements, and storage instructions

Products will be listed on the APL according to the geosynthetic application type.

985-2.2 Material Application: In addition to the general requirements, meet the following physical requirements:

Drainage 985-3
Erosion Control 985-4
Structural 985-5

985-2.3 Materials: The geosynthetic material shall be a woven, non-woven or extruded material consisting of long-chain polymeric filaments or yarns such as polypropylene, polyethylene, polyester, polyamides or polyvinylidene chloride formed into a stable network such that the filaments or yarns retain their relative position to each other. The base plastic shall contain stabilizers and/or inhibitors to make the filaments resistant to deterioration due to ultra-

violet light, heat exposure and potential chemically damaging environment. The edges of the material shall be selvaged or otherwise finished to prevent the outer yarn from pulling away from the material and shall be free of any treatment which may significantly alter its physical properties.

985-2.4 Physical Requirements: Each geosynthetic material shall be tested by an independent third party in accordance with the methods shown. All testing and reported values, except Apparent Opening Size (AOS), are to be minimum average roll values in the weakest principal direction, unless indicated otherwise in this Section. Values for AOS are maximum average roll values.

985-2.5 Packaging and Labeling: Geosynthetics shall be packaged in a protective covering sufficient to protect the material from temperatures greater than 140 F, sunlight, dirt, and other debris during shipment and storage. The manufacturer's name, product name, style number, roll dimensions, roll numbers, and LOT numbers must be clearly labeled on all packaging.

~~**985-2.6 Overlaps and Seams:** Overlaps shall be in accordance with the manufacturer's recommendations, unless specified otherwise in the Contract Documents for a particular application. To reduce overlaps, the geosynthetic material may be sewn together in accordance with the manufacturer's recommendations. Sew the seams with thread meeting the chemical requirements and minimum seam strength requirements for the application.~~

985-3 Drainage.

985-3.1 Application: Requirements for geotextile materials used for drainage are ~~Select geotextile materials~~ based on the applications listed in Section 514., ~~following applications:~~

~~Table 985-1~~
~~Drainage Applications~~

~~Geotextile Type~~	~~Description~~	~~Standard Plans Index~~
~~D-1~~	~~Revetment (Special)~~	
	~~Rock, Rubble without bedding stone~~	
	~~Ditch Pavement (Rubble Riprap) without bedding stone~~	~~524-001~~
~~D-2~~	~~Revetment (Standard)~~	
	~~Articulating Block~~	
	~~Gabions~~	~~524-001~~
	~~Rock, Rubble, and Broken Concrete with bedding stone~~	
	~~Ditch Pavement (Rubble Riprap) with bedding stone~~	~~524-001~~
	~~Joint Cover for Mechanically Stabilized Retaining Wall with Coarse Aggregate Backfill~~	
	~~Joint Cover for Mechanically Stabilized Retaining Wall Supporting Spread Footing Foundations~~	
~~D-3~~	~~Underdrain: Types II, III, and V~~	~~440-001~~
	~~French Drain~~	~~443-001~~
	~~Sheet Piling Filter~~	
	~~Filter Fabric Jacket (Culvert)~~	~~430-001~~
	~~Box Culvert Joints~~	~~400-289 and~~

Table 985-1 Drainage Applications		
Geotextile Type	Description	Standard Plans Index
		400-291
	Concrete Pavement Subdrainage	446-001
	Joint Cover for Mechanically Stabilized Retaining Wall with Sand or Limerock Backfill	
D-4	Slope Pavement	
	Ditch Pavement (Sand-Cement Riprap or Concrete)	524-001
	Coarse Aggregate Wrap	
D-5	Separation Geotextile	
	Cast-In-Place Retaining Wall	

985-3.2 Physical Requirements: Materials for drainage applications must be tested in accordance with and meet the following physical requirements of Table 985-1 and Table 985-2.:

Table 985-2 Geotextile Selection	
In-situ Soil Type or Drainage Application	Class for Type D1, D2, D3 Materials
< 15% passing a No. 200 Sieve*	a
15% to 50% passing a No. 200 Sieve*	b
> 50% passing a No. 200 Sieve*	c
> 50% passing a No. 200 Sieve* with Plastic Index >7	d
MSE Joint Cover for Sand or Limerock Backfill	e
MSE Joint Cover for Coarse Aggregate Backfill	f
*as per AASHTO T88.	

Table 985-13 Drainage Geotextiles Test Methods and Requirements for Types D-1, D-2 and D-3			
Property/Test Method	D-1	D-2	D-3
Limitation	Woven Monofilament Geotextiles only	Woven Geotextiles only. No Slit Film Geotextiles	No Slit Film Geotextiles
Minimum Permittivity (Sec^{-1}) per ASTM D4491	D-1a = 0.7 D-1b = 0.2 D-1c = 0.1 D-1d = 0.1 ~~D-1e = 0.25~~ ~~D-1f = 1.5~~	D-2a = 0.7 D-2b = 0.2 D-2c = 0.1 D-2d = 0.1 D-2e = 0.25 D-2f = 1.5	D-3a = 0.5 D-3b = 0.2 D-3c = 0.1 D-3d = 0.1 D-3e = 0.7
Maximum AOS (mm, US Sieve No.) per ASTM D4751	D-1a = 0.425 (40) D-1b = 0.250 (60) D-1c = 0.212 (70) D-1d = 0.300 (50) ~~D-1e = 0.212 (70)~~ ~~D-1f = 0.600 (30)~~	D-2a = 0.425 (40) D-2b = 0.250 (60) D-2c = 0.212 (70) D-2d = 0.300 (50) D-2e = 0.212 (70) D-2f = 0.600 (30)	D-3a = 0.425 (40) D-3b = 0.250 (60) D-3c = 0.212 (70) D-3d = 0.300 (50) D-3e = 0.212 (70)
Minimum Grab Tensile Strength (lbs) per ASTM D4632	315	Woven Monofilament = 248 Other Woven Geotextiles = 315	Elongation <50% = 248 Elongation ≥50% = 158
Mass per Unit Area (oz/sy) per ASTM D5261	Provide Test Result	Provide Test Result	Provide Test Result
Minimum Puncture Strength (lbs) per ASTM D6241	618	Woven Monofilament = 495 Other Woven Geotextiles = 618	Elongation <50% = 495 Elongation ≥50% = 309
Minimum Trapezoidal Tear (lbs) per ASTM D4533	113	Woven Monofilament = 57 Other Woven Geotextiles: = 113	Woven Monofilament = 57 Other Geotextiles: Elongation <50% = 90 Elongation ≥50% = 57
Minimum UV Resistance per ASTM D4355 (% Retained Strength)	50% @500 hours	50% @500 hours	50% @500 hours

Table 985-24 Test Methods and Requirements for Drainage Geotextiles Types D-4 and D-5		
Property/Test Method	D-4	D-5
Minimum Permittivity (Sec^{-1}) per ASTM D4491	0.5	0.5
Maximum AOS (mm, US Sieve No.) per ASTM D4751	0.425 (40)	0.212 (70)
Minimum Grab Tensile Strength (lbs) per ASTM D4632	180	90
Mass per Unit Area (oz/sy) per ASTM D5261	Provide Test Result	Provide Test Result
Minimum Puncture Strength (lbs) per ASTM D6241	223	223
Minimum Trapezoidal Tear (lbs) per ASTM D4533	70	40
Minimum UV Resistance per ASTM D4355 (% Retained Strength)	50% @500 hours	50%@500 hours

985-4 Erosion Control.

985-4.1 Application: Materials may contain natural fibers added to acceptable plastic erosion mats for the sole purpose of facilitating turf growth. However, materials used for erosion control applications must be tested without any natural fiber components in accordance with and meet the physical requirements Table 985-64.

Table 985-35 Erosion Control Applications	
Type	Description
E-1	Staked Silt Fence
E-2	Wind Screen
E-3	Plastic Erosion Mat (Turf Reinforcement Mat) (Type 1)
E-4	Plastic Erosion Mat (Turf Reinforcement Mat) (Type 2)
E-5	Plastic Erosion Mat (Turf Reinforcement Mat) (Type 3)

985-4.2 Physical Requirements: Each geosynthetic material shall meet the following requirements:

Table 985-46 Test Methods and Requirements for Erosion Control Materials					
Property/Test Method	E-1	E-2	E-3	E-4	E-5
Permittivity (Sec^{-1}) per ASTM D4491	0.05	0.05	N/A	N/A	N/A
Grab Tensile Strength (lbs) per ASTM D4632	90	90	N/A	N/A	N/A
Minimum UV Resistance per ASTM D4355 (% Retained Strength)	80% @500 hours	80% @150 hours	80% @500 hours		
Tensile Strength **(lbs/ft) per ASTM D6818 or D5035	N/A	N/A	135x70	275x135	550x275

Table 985-46 Test Methods and Requirements for Erosion Control Materials					
Property/Test Method	E-1	E-2	E-3	E-4	E-5
Filtration Efficiency (%) per ASTM D5141	75% and min. flow rate of 0.3 gal/sf/min	N/A	N/A	N/A	N/A
Design Shear***	N/A	N/A	≥2.1 psf	≥3.6 psf	≥5.0 psf
**Tensile Strength is expressed in units of measure of lbs/ft, in machine direction and cross direction as MD x CD. ***Design Shear limits for Erosion mats must be determined by 30 minutes sustained flow in an unvegetated state as determined by tests performed by Utah State University, Texas Transportation Institute or an independent testing laboratory approved by the State Drainage Engineer.					

985-4.3 Rolled Erosion Control Blanket (RECB): Erosion control blankets must be capable of sustaining a maximum design velocity of 6.5 ft/sec as determined from tests performed by Utah State University, Texas Transportation Institute, or an independent testing laboratory approved by the Department. Submit a certified test report showing that the erosion control blankets meet these requirements. Provide two samples for product identification, upon request.

985-5 Structural.

985-5.1 Applications: Materials for reinforcement, separation, and stabilization applications must be tested in accordance with and meet the physical requirements below. The ultimate tensile strength of all R-1 materials must be at least 4800 pounds per foot in both the machine and cross machine directions.

Table 985-57 Reinforcement, Separation, and Stabilization Applications	
Type	Description
R-1	Geosynthetic Reinforced Soil (GRS-IBS)
R-2	Reinforcement of Foundations over Soft Soils
R-3	Reinforced Soil Slopes
R-4	Reinforced Embankment
R-5	Construction Expedient

985-5.2 Physical Requirements: Each geosynthetic material shall be tested in accordance with the following requirements:

Table 985-68 Test Methods and Reporting Requirements for Structural Geosynthetics			
Property/Test Method	Structural Application Type	Test Methods for Woven Geotextiles	Test Methods for Woven or Extruded Geogrids
Permittivity (sec^{-1})	R - 1, 2, 3, 4, 5	ASTM D4491	N/A
UV Stability (Min Retained Strength @ 500 hr)	R - 3	ASTM D4355	ASTM D4355
Puncture Strength (lbs)	R - 5	ASTM D6241	N/A

Table 985-68 Test Methods and Reporting Requirements for Structural Geosynthetics			
Property/Test Method	Structural Application Type	Test Methods for Woven Geotextiles	Test Methods for Woven or Extruded Geogrids
Grab Strength (lbs)	R - 5	ASTM D4632	N/A
Opening Size	R - 1, 2, 3, 4, 5	AOS (US Sieve No.) ASTM D4751	Aperture Size (in x in)
Tensile Strength (lbs/ft)		ASTM D4595	ASTM D6637
Machine Direction Ultimate, (T_{ult})			
2% Strain	R - 1, 3		
5% Strain	R - 2, 3, 4, 5		
10% Strain	R - 1, 2, 3, 4, 5		
Cross Direction Ultimate			
2% Strain	R - 1, 3,		
5% Strain	R - 2, 3, 4, 5		
10% Strain	R - 1, 2, 3, 4, 5		
Strain @ Ultimate Tensile Strength	R - 1, 2, 3, 4, 5		
Tear Strength (lbs)		ASTM D4533	N/A
Machine Direction	R - 5		
Cross Direction	R - 5		
~~Soil-Geosynthetic Friction~~Coefficient of Direct Sliding (C_{ds})	R - 1, 2~~, 3~~	ASTM D5321	ASTM D5321~~/6706~~
Coefficient of Interaction (C_i)	R - 3	~~ASTM D6706~~ASTM D6706	~~ASTM D6706~~ASTM D6706
~~Pullout Resistance~~Scale Correction Factor (α)	R - 3		
Pullout Resistance	R - 3	ASTM D6706	ASTM D6706
Creep Resistance-T_{creep} (lbs/ft)	R - 2, 3	ASTM D5262	ASTM D5262
Creep Reduction Factor (T_{ult}/T_{creep})	R - 2, 3	N/A	N/A
Installation Damage (RF_{ID})		AASHTO R 69	AASHTO R 69
Sand	R - 2, 3, 4		
Limestone	R - 2, 3, 4		
Durability (RF_D)		AASHTO R 69	AASHTO R 69
Chemical	R - 2, 3, 4		
Biological	R - 2, 3, 4		
Joint Strength (RF_j)			
Mechanical	R - 2, 3	GRI: GT7	GRI: GG4(a) & GG4(b)
Sewn	R - 2, 3	ASTM D4884	N/A