

SECTION 02320 - GEOSYNTHETICS

(Follow all instructions and make all edits with "Track Changes" turned on. If there are no instructions [purple text] above a subsection, paragraph, sentence, or bullet, then include it in the Project. Delete all purple text before preparing the final document. All other modifications to this Section will require ODOT Technical Resource and State Specifications Engineer approval.)

Comply with Section 02320 of the Standard Specifications modified as follows:

02320.10(a)(1) Geotextiles - Replace the bullet that begins "Fibers used in manufacture of..." with the following bullet:

- Use fibers and threads consisting of long-chain synthetic polymers, composed of at least 95 percent by weight of polyolefins or polyesters in the manufacture and joining of geotextiles. Form geotextiles into a stable network such that the filaments or yarns retain their dimensional stability to each other, including selvages.

(Use the following subsection .10(a)(3) when geomembranes are required.)

Add the following subsection:

02320.10(a)(3) Geomembranes - Furnish geomembranes ~~which~~that meet or exceed the properties specified in 02320.30 for the applicable resin type and thickness.

02320.10(b) Identification - Replace the paragraph that begins "Allow the Engineer to..." with the following paragraph:

Allow the Engineer to visually verify geosynthetic products before installation. Open packaged geosynthetics before use in the presence of the Engineer to confirm the correct product. Geotextile rolls without the product name printed on the geotextile or the product label affixed to the geotextile or roll core by the Manufacturer are rejected. Any other geosynthetics that are unwrapped, missing original packaging or previously opened may not be used unless approved by the Engineer.

02320.10(c) Manufacturer's Test Certification - Replace the paragraph that begins "Furnish test result..." with the following paragraph:

Provide test result certificates according to 00165.35 from the geosynthetic manufacturer, and the following:

02320.10(c)(1) Geotextiles - Replace the bullet that begins "Product name printed..." with the following bullet:

- Product name printed directly on the geotextile by the Manufacturer. For geotextiles that are not marked with a product name, furnish geotextile with product label attached to the geotextile or original packaging by the Manufacturer.

(Use the following subsection .10(c)(3) when geomembranes are required.)

Add the following subsection:

02320.10(c)(3) Geomembranes - Include the following:

- Average roll values for each of the specified properties from the same production run as the delivered material.
- Production run number, production plant name, and location.
- Manufacturer's name and address.
- Full product name and information.
- Identify the resin type and location for use referencing the Plans drawing number.

02320.10(d) Manufacturer's Sampling/Testing - Replace this subsection, except for the subsection number and title, with the following:

Provide manufacturer's reported property values based on the following sampling and testing requirements:

(1) **Sampling** - Sample all geosynthetics according to ASTM D4354. Use a roll or sheet for the production unit used for sampling.

(2) **Geotextile Testing** - Perform the specified tests to determine geotextile properties for the intended applications. Test the tensile strength requirements in both machine and cross-machine directions.

(3) **Geogrid Testing** - For mechanically stabilized earth retaining wall geogrid, provide laboratory test results that demonstrate the average roll value for each geogrid product is greater than or equal to the geogrid ultimate wide width tensile strength reported for the initial geogrid product evaluation and approval on the QPL. Determine the ultimate wide width tensile strength (T_{ult}) according to ASTM D6637. If the average roll value for each geogrid reinforcement product is less than the geogrid ultimate wide width tensile strength identified on the QPL, the entire production run is rejected.

(Use the following subsection ~~.10(d)~~(4) when geomembranes are required.)

Add the following subsection:

~~02320.10(d)~~(4) Geomembrane Testing - Perform the specified tests to determine the geomembrane properties for the type and thickness of membrane.

(Use the following subsection .11 when geomembranes are required.)

02320.11 Seam Testing and Acceptance - Replace this subsection with the following subsection: ~~Replace the title of this subsection with~~

02320.11 [“] Geotextile Seam Testing and Acceptance: [”]

(a) Factory Seams - Where factory seams are made, furnish sheets of geotextile that:

- Are sewn together using a lock type stitch Type 301 or 401 as shown.
- Are sewn with polymeric thread that is at least 95 percent, by weight, polyolefin or polyester, and as resistant to deterioration as the geotextile being sewn.
- Have test results showing that the seams meet or exceed 90 percent of the specified tensile strength minimum values for the intended application.
- Are not sewn with nylon thread.

(b) Field Seams - Where field sewn seams are used, provide:

- The manufacturer's test result certificate, according to 00165.35, that includes wide strip, tensile strength test results and verifies that seam tensile strength and seam grab tensile strength meet or exceed 90 percent of the minimum specified tensile strength values for the geotextile.
- A field-stitched seam test sample.

(Use the following subsection .12 when geomembranes are required.)

Add the following subsection:

02320.12 Geomembrane Seam Testing and Acceptance:

(a) Geomembrane Factory Seams - Factory seams are not allowed in HDPE and LLDPE geomembrane; ~~provide~~ furnish HDPE and LLDPE geomembrane as continuous sheets in rolls. ~~Provide~~ Furnish PVC geomembrane with factory seams in the panels to reduce field seaming and testing.

(b) Geomembrane Field Seams - Perform geomembrane field seam testing according to 00350.43.

(Use the following subsection .20 when sediment fence is required.)

02320.20 Geotextile Property Values – Replace Table 02320-3 with the following table:

Table 02320-3 Geotextile Property Values for Sediment Fence ¹

Geotextile Property	ASTM Test Method	Unit	Geotextile Property Requirements Woven and Nonwoven
Grab Tensile Strength (minimum) Machine and Cross Machine Directions	D 4632	lb	120 100
Apparent Opening Size (AOS) (maximum) U.S. Standard Sieve	D 4751	—	30
Permittivity (minimum)	D 4491	sec ⁻¹	0.05
Ultraviolet Stability Retained Strength (minimum)	D 4355 (at 500 hours)	%	70

¹ All geotextile properties are Minimum Average Roll Values (MARV). The test results for any sampled roll in a lot shall meet or exceed the values shown in the table.

(Use the following subsection .30 and tables when geomembranes are required.)

Add the following subsection:

02320.30 Geomembrane Property Values:

**Table 02320-7a Property Values for High Density Polyethylene (HDPE)
Geomembrane – Textured**

Properties	ASTM Test Method	Test Value			
		30 mils	40 mils	50 mils	60 mils
Thickness mils (min. ave.) - mils	D5994	nom. - 5%	nom. - 5%	nom. - 5%	nom. - 5%
Formulated Density (min. ave.) - g/cc	D1505/D792	0.94	0.94	0.94	0.94
Tensile Properties (min. ave.)	D 6693				
• yield strength - lb/in.	Type IV	63	84	105	126
• break strength - lb/in.		45	60	75	90
• yield elongation - %		12	12	12	12
• break elongation - %		100	100	100	100
Tear Resistance (min. ave.) - lb	D1004	21	28	35	42
Puncture Resistance (min. ave.) - lb	D4833	45	60	75	90
Stress Crack Resistance - hr.	D5397 (App)	500	500	500	500
Carbon Black Content (range) - %	D4218	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0

**Table 02320-7b Property Values for Linear Low Density Polyethylene (LLDPE)
Geomembrane – Textured**

Properties	ASTM Test Method	Test Value			
		30 mils	40 mils	50 mils	60 mils
Thickness mils (min. ave.) - mils	D5994	nom. - 5%	nom. - 5%	nom. - 5%	nom. - 5%
Formulated Density (max) - g/cc	D1505/D792	0.94	0.94	0.94	0.94
Tensile Properties (min. ave.)	D 6693				
• break strength - lb/in.	Type IV	30	45	60	75
• break elongation - %		250	250	250	250
2% Modulus - lb/in - (max)	D5323	1200	1800	2400	3000
Tear Resistance (min. ave.) - lb	D1004	11	16	22	27
Puncture Resistance (min. ave.) - lb	D 4833	22	33	44	55
Axi-Symmetric Break resistance Strain (min) - %	D5617	30	30	30	30
Carbon Black Content (range) - %	D4218	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0

**Table 02320-7c Property Values for Non-Reinforced Polyvinyl Chloride (PVC)
Geomembrane Used in Buried Applications**

Properties	ASTM Test Method	Test Value			
		30 mils	40 mils	50 mils	60 mils
Thickness mils (min. ave.) - mils	D5994	nom. - 5%	nom. - 5%	nom. - 5%	nom. - 5%
Tensile Properties (min.)	D982				
• break strength - lb/in.		73	97	116	137
• break elongation - %		380	430	430	450
• Modulus at 100% - lb/in		30	40	50	60
Tear Strength (min.) - lb	D1004	8	10	13	15
Dimensional Stability (max change) - %	D1204	3	3	3	3
Low Temperature Impact Pass (°F)	D1790	-20	-20	-20	-20
Specific Gravity (min)	D790	1.2	1.2	1.2	1.2
Water Extraction (max loss) - %	D1239	0.15	0.20	0.20	0.20
Volatile Loss (max loss) - %	D1203	0.70	0.50	0.50	0.50
Soil Burial (max change) - %	G160				
Break Strength		5	5	5	5
Elongation		20	20	20	20
Modulus at 100%		20	20	20	20
Hydrostatic Resistance (min.) - psi	D751	100	120	150	180
Minimum Average Molecular Weight	D8133	400	400	400	400