North Carolina
DEPARTMENT OF TRANSPORTATION

WHAT'S NEW WITH ~~FABRICS~~ GEOTEXTILES?

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Geotechnical Engineering Unit

Standard Specifications, Section 1056

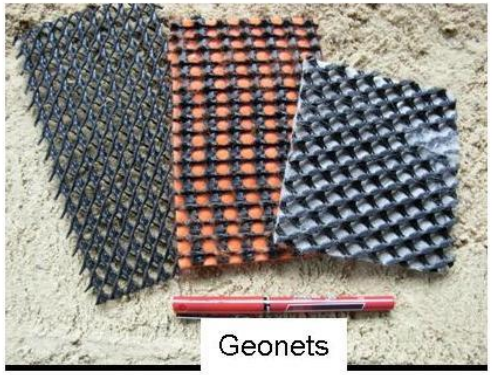
- Renamed from “Engineering Fabrics” to “Geosynthetics” in 2012 Spec Book
- Per ASTM D4439, *Standard Terminology for Geosynthetics* definition:

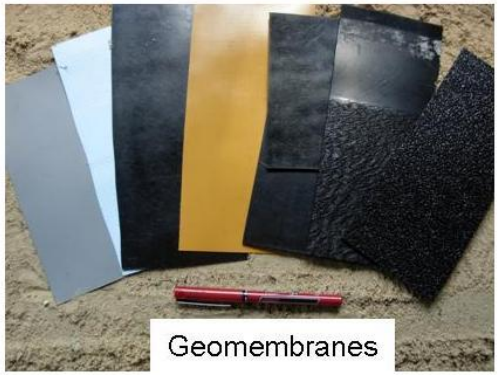
> **geosynthetic,** *n*—a planar product manufactured from polymeric material used with soil, rock, earth, or other geotechnical engineering related material as an integral part of a man-made project, structure, or system. **D 4354, D 4759, D 4873, D 5617, D 5818**

- Geotextiles, Geocomposites, Geogrids, Geomembranes, Geofoam, Geocells, etc.

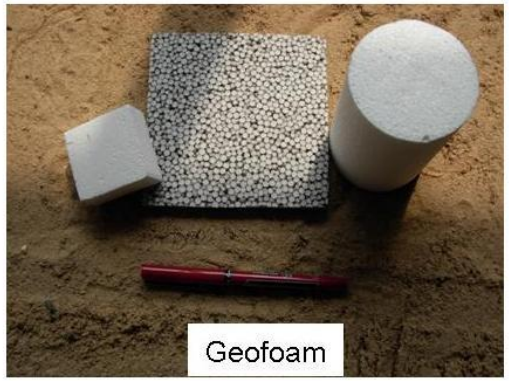
Geotextiles

Geogrids


Geonets


Geomembranes

Geosynthetic Clay Liners


Geofoam

Geocomposites

Geocells on NC 33 in Chocowinity

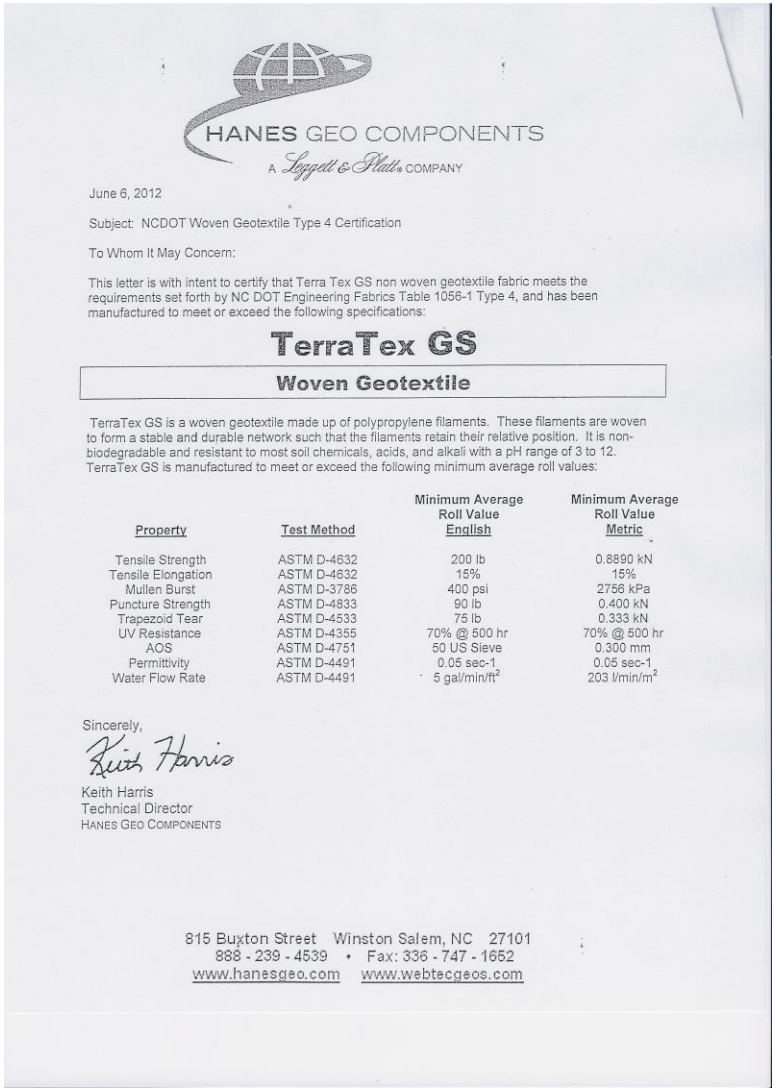
Non-Woven vs. Woven Geotextiles

TABLE 1056-1 GEOTEXTILE REQUIREMENTS						
Property	Requirement (MARV[A])					**Test Method**
	Type 1	Type 2	Type 3[B]	Type 4	Type 5[C]	
Typical Application	Shoulder Drains	Under Rip Rap	Temporary Silt Fence	Soil Stabilization	Temporary Walls	
Elongation (MD & CD)	**≥ 50%**	**≥ 50%**	**≤ 25%**	**< 50%**	**< 50%**	**ASTM D4632**

Materials Prov, Revised Section 1056

- Effective with Jan 2014 Letting
- 2012 Spec Book, Article 1056-1 requires geotextiles evaluated by NTPEP
- NTPEP is the National Transportation Product Evaluation Program
- Includes Geotextile Testing and Manufacturing Auditing, i.e., QC/QA
- Revised Article 1056-1 simply requires geotextiles that are on the APL
- Article 1056-3 still requires Type 1, 2 or 4 material certifications for geosynthetics

Type 4 Certification



HANES GEO COMPONENTS
A Leggett & Platt COMPANY

June 6, 2012

Subject: NCDOT Woven Geotextile Type 4 Certification

To Whom It May Concern:

This letter is with intent to certify that Terra Tex GS non woven geotextile fabric meets the requirements set forth by NC DOT Engineering Fabrics Table 1056-1 Type 4, and has been manufactured to meet or exceed the following specifications:

TerraTex GS

Woven Geotextile

TerraTex GS is a woven geotextile made up of polypropylene filaments. These filaments are woven to form a stable and durable network such that the filaments retain their relative position. It is non-biodegradable and resistant to most soil chemicals, acids, and alkali with a pH range of 3 to 12. TerraTex GS is manufactured to meet or exceed the following minimum average roll values:

Property	Test Method	Minimum Average Roll Value English	Minimum Average Roll Value Metric
Tensile Strength	ASTM D-4632	200 lb	0.8890 kN
Tensile Elongation	ASTM D-4632	15%	15%
Mullen Burst	ASTM D-3786	400 psi	2756 kPa
Puncture Strength	ASTM D-4833	90 lb	0.400 kN
Trapezoid Tear	ASTM D-4533	75 lb	0.333 kN
UV Resistance	ASTM D-4355	70% @ 500 hr	70% @ 500 hr
AOS	ASTM D-4751	50 US Sieve	0.300 mm
Permittivity	ASTM D-4491	0.05 sec-1	0.05 sec-1
Water Flow Rate	ASTM D-4491	5 gal/min/ft^2	203 l/min/m^2

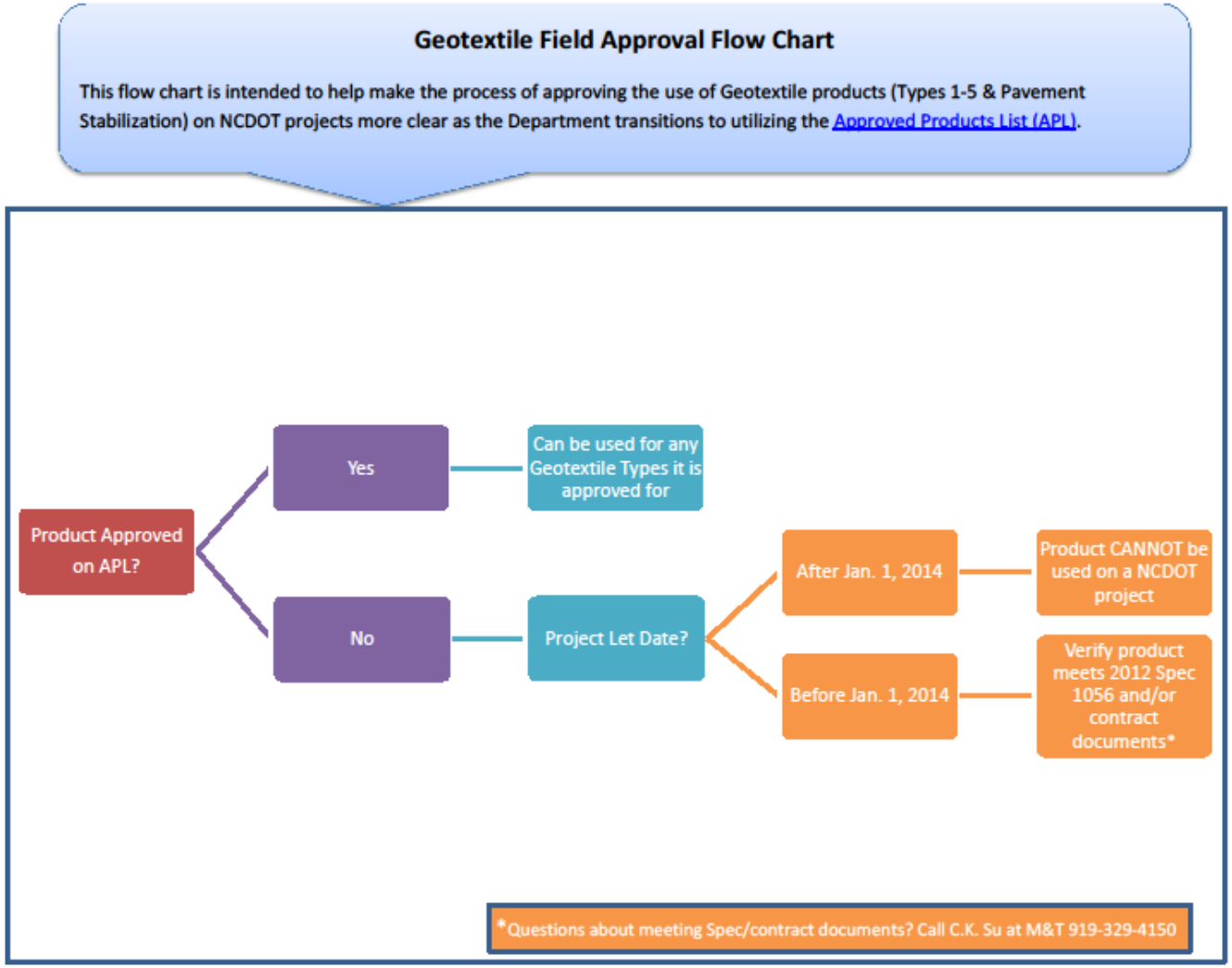
Sincerely,

Keith Harris

Keith Harris
Technical Director
HANES GEO COMPONENTS

815 Buxton Street Winston Salem, NC 27101
888 - 239 - 4539 • Fax: 336 - 747 - 1652
www.hanesgeo.com www.webtecgeos.com

Geotextile Field Approval Flow Chart



Where Is This Good Stuff?

- NTPEP DataMine (www.ntpep.org) – under “View Data”, then “Geotextiles and Geosynthetics”, then “Data”
- Geotextile APL (www.ncdot.gov) – under “Business”, then “Approved Product List”
- Geotextile Field Approval Flow Chart (connect.ncdot.gov) – under “Resources”, then “Products”
- Materials Prov – in Contract Proposal

Materials Prov, Revised Table 1056-1

TABLE 1056-1
GEOTEXTILE REQUIREMENTS

Property	**Requirement (MARV[A])**					**Test Method**
	Type 1	**Type 2**	**Type 3[B]**	**Type 4**	**Type 5[C]**	
Typical Application	*Shoulder Drains*	*Under Rip Rap*	*Temporary Silt Fence*	*Soil Stabilization*	*Temporary Walls*	
Elongation (MD & CD)	≥ 50%	≥ 50%	≤ 25%	< 50%	< 50%	ASTM D4632
Grab Strength (MD & CD)	Table 1[D], Class 3	Table 1[D], Class 1	100 lb	Table 1[D], Class 3	-	ASTM D4632
Tear Strength (MD & CD)			-		-	ASTM D4533
Puncture Strength			-		-	ASTM D6241
Ultimate Tensile Strength (MD & CD)	-	-	-	-	2,400 lb/ft (unless required otherwise in the contract)	ASTM D4595
Permittivity	Table 2[D], 15% to 50% *in Situ* Soil Passing No. 200[E]		Table 7[D]	Table 5[D]	0.20 sec^{-1}	ASTM D4491
Apparent Opening Size					No. 30[E]	ASTM D4751
UV Stability (Retained Strength)					70%	ASTM D4355

A. MARV does not apply to elongation
B. Minimum roll width of 36" required
C. Minimum roll width of 13 ft required
D. AASHTO M 288
E. US Sieve No. per AASHTO M 92

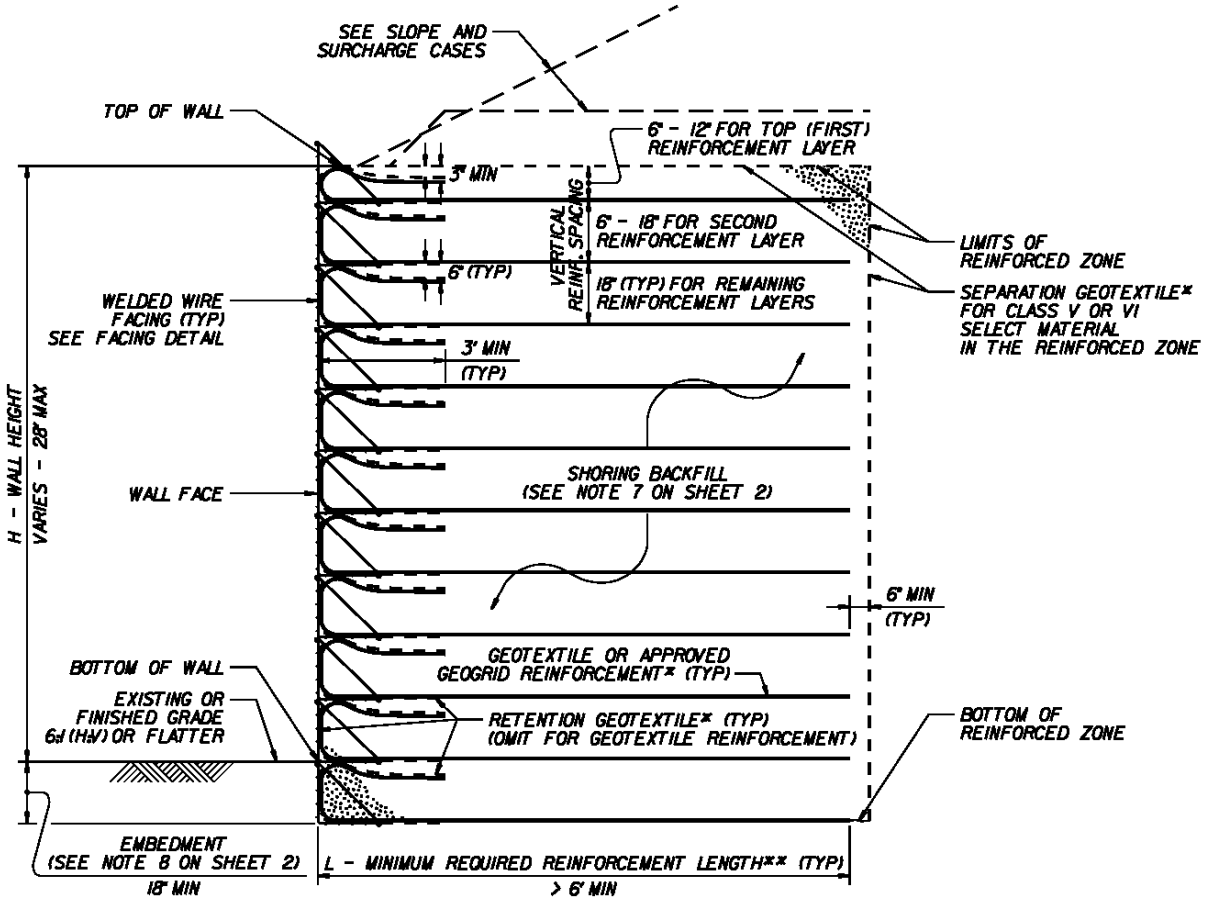
NTPEP Geotextile Marking

Type 5 Geotextile

- Added to Table 1056-1 in 2012 Spec Book
- Woven geotextile like Type 4
- Ultimate Tensile Strength (different ASTM test, no AASHTO Class or NTPEP Data) instead of Grab, Tear & Puncture Strength
- Higher permittivity than Type 4 (0.20 sec^{-1} vs. 0.05 sec^{-1}), i.e., it drains better
- Costs more than Type 4
- Typically used for Reinforced Bridge Approach Fills, Temporary Walls and Geotextile for Pavement Stabilization

Temporary Wall

Temporary Wall



Standard Temporary Wall

SLOPE OR SURCHARGE CASE	GROUNDWATER DEPTH BELOW BOTTOM OF REINFORCED ZONE (SEE NOTE 6 ON SHEET 2) (FT)	SHORING BACKFILL TYPE IN THE REINFORCED ZONE (SEE NOTE 7 ON SHEET 2)	H – WALL HEIGHT (FT)																								
			< 4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
SLOPE CASE	> 0	CLASS II,TYPE I, CLASS III,CLASS V OR CLASS VI SELECT MATERIAL	6	6	7	8	9	11	12	13	13	14	15	16	17	18	19	20	21	22	23	24	24	25	26	27	27
SURCHARGE CASE	> 0 TO 7 FOR H < 20' > 0 TO 10 FOR H ≥ 20'	ALL SHORING BACKFILL TYPES	6	7	7	8	8	9	9	10	11	11	12	12	13	14	14	15	16	17	17	18	19	19	20	21	22
	> 7 FOR H < 20' > 10 FOR H ≥ 20'	A-2-4 SOIL	6	6	7	8	8	9	9	10	11	11	12	12	13	14	14	15	16	16	17	18	18	19	20	20	21
		CLASS II,TYPE I OR CLASS III SELECT MATERIAL	6	6	7	7	8	8	9	10	10	11	11	12	12	13	14	15	15	16	16	17	17	18	18	19	20
		CLASS V OR CLASS VI SELECT MATERIAL	6	6	7	7	7	8	8	9	9	10	10	11	12	13	13	14	14	15	15	16	17	17	18	19	19

L – MINIMUM REQUIRED REINFORCEMENT LENGTH (FT)
(FOR ALL REINFORCEMENT TYPES)

REINFORCEMENT LAYER NUMBER*	SHORING BACKFILL TYPE IN THE REINFORCED ZONE (SEE NOTE 7 ON SHEET 2)				
	SLOPE CASE		SURCHARGE CASE		
	CLASS II,TYPE I OR CLASS III SELECT MATERIAL	CLASS V SELECT MATERIAL	A-2-4 SOIL	CLASS II,TYPE I OR CLASS III SELECT MATERIAL	CLASS V SELECT MATERIAL
1	2400	2400	2400	2400	2400
2	2400	2400	2400	2400	2400
3	2400	2400	2400	2400	2400
4	2400	2400	2500	2400	2400
5	2500	2400	3000	2400	2400
6	3000	2400	3500	2800	2400
7	3500	2700	4000	3200	2600
8	4000	3100	4500	3600	2900
9	4500	3500	5000	4000	3200
10	5000	3900	5500	4400	3500
11	5500	4300	6000	4800	3800
12	6000	4700	6500	5200	4100
13	6500	5100	7000	5600	4400
14	7000	5400	7500	6000	4700
15	7500	5800	8000	6400	5000
16	8000	6200	8500	6800	5300
17	8500	6600	9000	7200	5600
18	9000	7000	9500	7600	5900
19	9500	7400	10000	8000	6200
20	10000	7800	10500	8400	6500

GEOTEXTILE REINFORCEMENT
ULTIMATE TENSILE STRENGTH (LB/FT)

REINFORCEMENT LAYER NUMBER*	SHORING BACKFILL TYPE IN THE REINFORCED ZONE (SEE NOTE 7 ON SHEET 2)				
	SLOPE CASE		SURCHARGE CASE		
	CLASS II,TYPE I OR CLASS III SELECT MATERIAL	CLASS V OR CLASS VI SELECT MATERIAL	A-2-4 SOIL	CLASS II,TYPE I OR CLASS III SELECT MATERIAL	CLASS V OR CLASS VI SELECT MATERIAL
1	240	200	340	290	240
2	380	310	520	430	350
3	530	420	700	570	460
4	690	550	870	720	570
5	860	690	1050	860	680
6	1030	830	1220	1000	790
7	1200	970	1400	1150	900
8	1370	1110	1580	1290	1010
9	1550	1240	1750	1430	1120
10	1720	1380	1930	1580	1230
11	1890	1520	2100	1720	1340
12	2060	1660	2280	1860	1450
13	2240	1800	2450	2010	1560
14	2410	1940	2630	2150	1670
15	2580	2080	2800	2290	1780
16	2750	2220	2980	2440	1890
17	2930	2360	3160	2580	2000
18	3100	2500	3330	2720	2110
19	3270	2640	3510	2860	2220
20	3440	2780	3690	3000	2330

GEOGRID REINFORCEMENT
SHORT-TERM DESIGN STRENGTH (LB/FT)
(SEE NOTE 10 ON SHEET 2.)

MINIMUM REQUIRED REINFORCEMENT STRENGTH IN MD
(SEE NOTE 9 ON SHEET 2.)
*SEE PARTIAL ELEVATION ON SHEET 1
FOR REINFORCEMENT LAYER NUMBERING.

PROJECT REFERENCE NO. | SHEET
– | –

GEOTECHNICAL ENGINEER | ENGINEER

WALL HEIGHT (H) + EMBEDMENT (FT)	NUMBER OF REINFORCEMENT LAYERS*
2.5 – 4	3
4 – 5.5	4
5.5 – 7	5
7 – 8.5	6
8.5 – 10	7
10 – 11.5	8
11.5 – 13	9
13 – 14.5	10
14.5 – 16	11
16 – 17.5	12
17.5 – 19	13
19 – 20.5	14
20.5 – 22	15
22 – 23.5	16
23.5 – 25	17
25 – 26.5	18
26.5 – 28	19
28 – 29.5	20

*BASED ON VERTICAL REINFORCEMENT SPACING SHOWN ON SHEET 1.

GEOTECHNICAL ENGINEERING UNIT
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD DRAWING NO. 1801.02

STANDARD
TEMPORARY WALL
SHEET 3 OF 3

DATE: 11-19-13

MD vs. CD

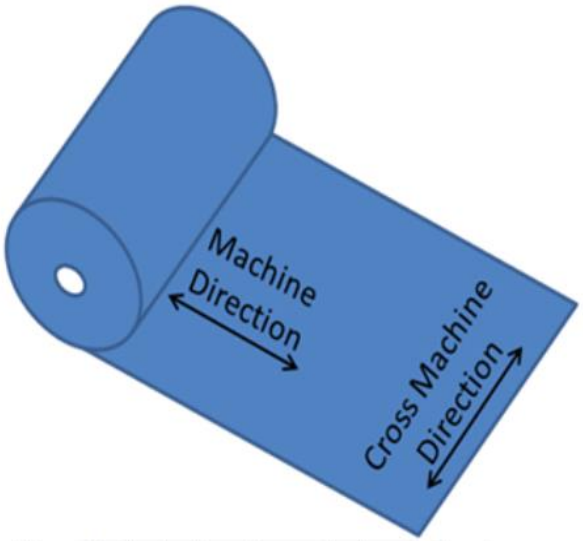
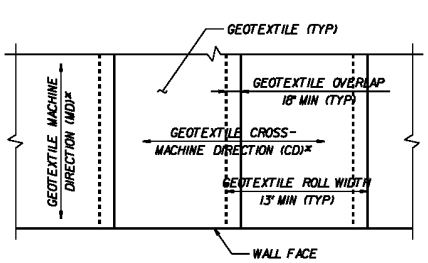
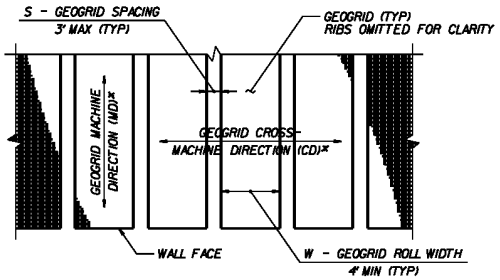


Figure 7. Illustration. Geosynthetic roll direction.



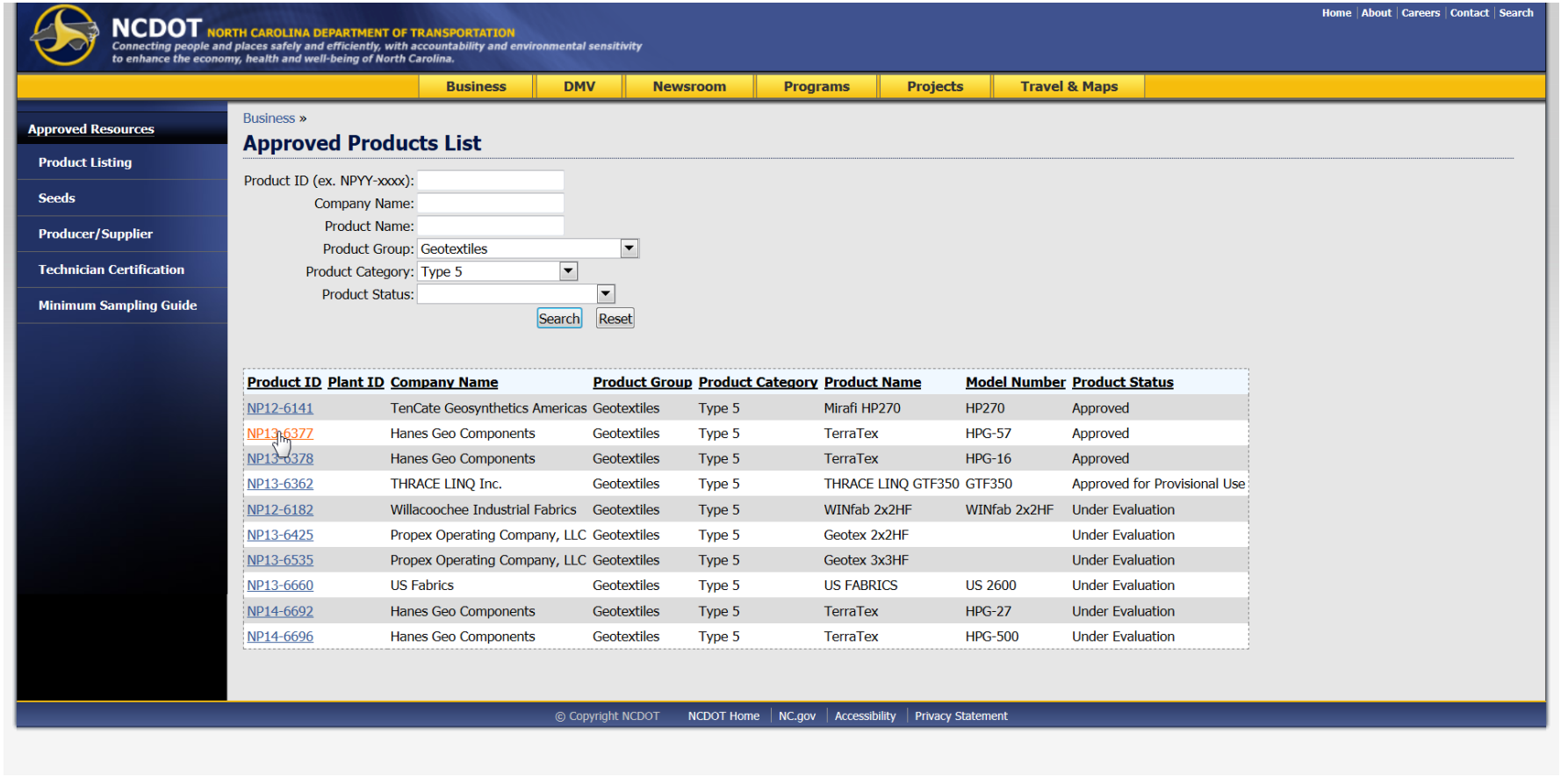
GEOTEXTILE PLACEMENT
(100% COVERAGE MIN FOR GEOTEXTILE REINFORCEMENT)



GEOGRID PLACEMENT
(80% COVERAGE MIN FOR GEOGRID REINFORCEMENT – $\frac{W}{W+S} \times 100 \geq 80\%$, SEE NOTE 11)

GEOSYNTHETIC PLACEMENT DETAILS
(PLAN VIEW)
*SEE NOTE 12.

What is the Ultimate Tensile Strength of Type 5 Geotextiles on the APL?



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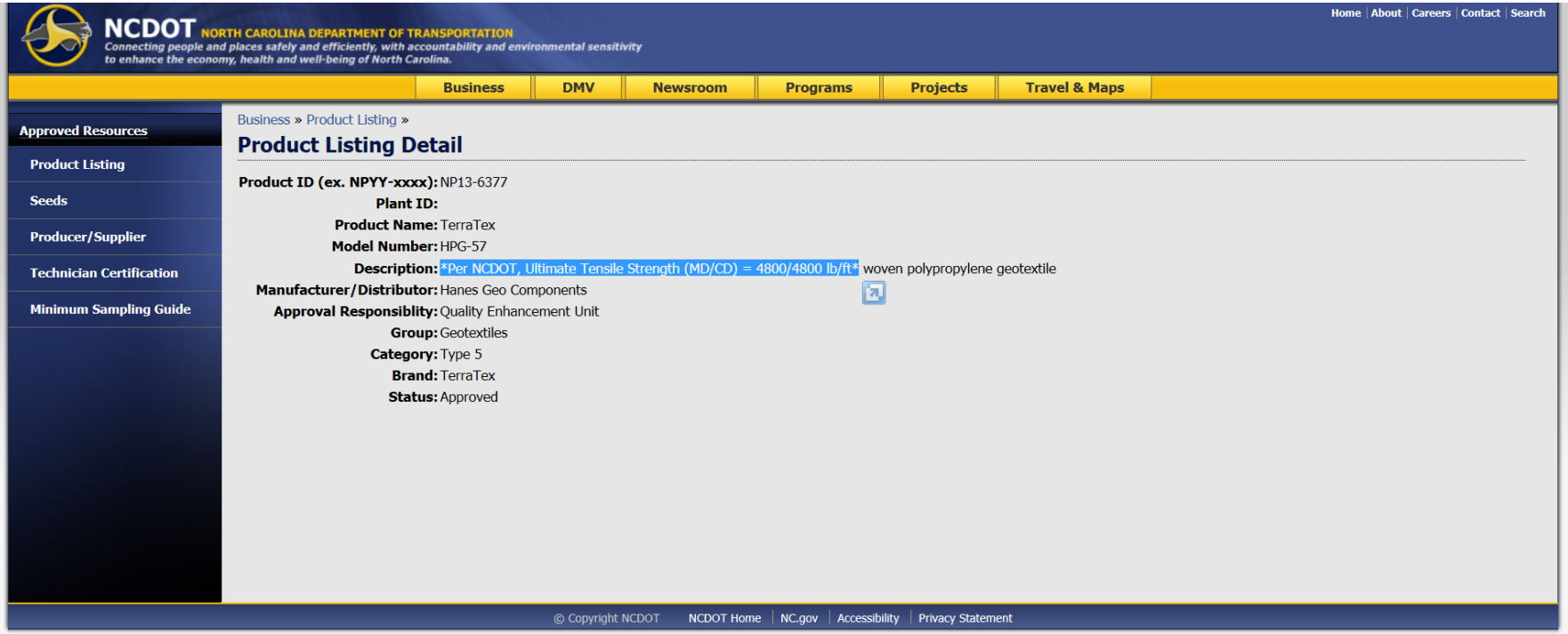

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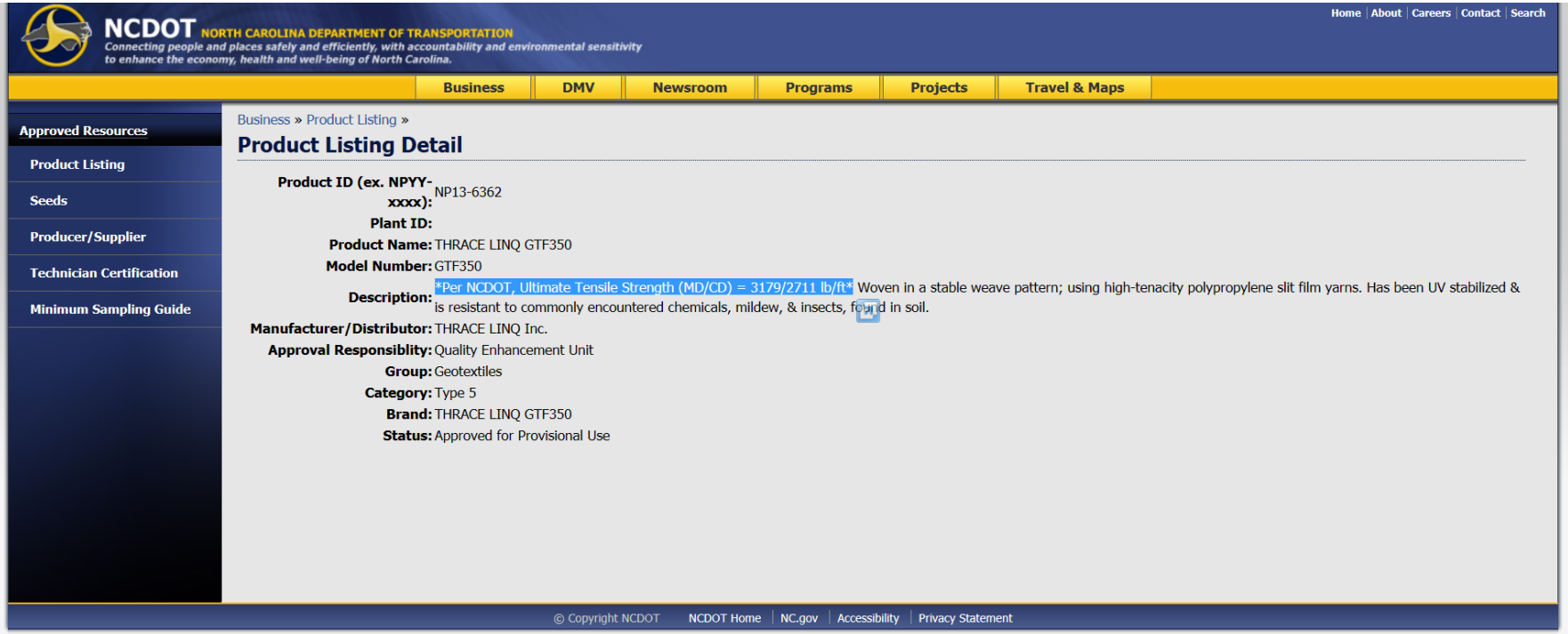

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Business » Product Listing »

Product Listing Detail

Product ID (ex. NPYY-xxxx): NP13-6362
Plant ID:
Product Name: THRACE LINQ GTF350
Model Number: GTF350
Description: *Per NCDOT, Ultimate Tensile Strength (MD/CD) = 3179/2711 lb/ft* Woven in a stable weave pattern; using high-tenacity polypropylene slit film yarns. Has been UV stabilized & is resistant to commonly encountered chemicals, mildew, & insects, found in soil.
Manufacturer/Distributor: THRACE LINQ Inc.
Approval Responsiblity: Quality Enhancement Unit
Group: Geotextiles
Category: Type 5
Brand: THRACE LINQ GTF350
Status: Approved for Provisional Use

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Questions?