SECTION 02740
GEOTEXTILE STABILIZATION

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Separation Geotextile (Subgrade CBR≥3).

1. This Section is applicable to the use of a geotextile to prevent mixing of subgrade soil and an aggregate cover material (subbase, base, select fill, etc.).
2. This Section may also apply to situations other that beneath pavements where separation of two (2) dissimilar materials is required, but where water seepage through the geotextile is not a critical function.

A. Separation Geotextile (1 <Subgrade CBR < 3).

1. This Section is applicable to the use of a geotextile in wet, saturated conditions to provide the coincident functions of separation and filtration. In some installations, the geotextile may also provide reinforcement.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Unit Price shall be by the Linear Foot.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. AASHTO – American Association of State Highway and Transportation Officials.

1. AASHTO M288-05 – Standard Specification for Geotextile Specification for Highway Applications.
2. AASHTO T88 – Standard Test Method for Particle Size Analysis of Soils.
3. AASHTO T90 – Standard Test Method for Determining the Plastic Limit and Plasticity Index of Soils.
4. AASHTO T99 – Standard Practice for Determination of Moisture Density Relations of Soils Using a 5.5 lb. hammer and 12 inch drop (Standard Proctor).

B. ASTM – American Society for Testing and Materials.

1. D123 – Standard Terminology Relating to Geotextiles.
2. D276 – Standard Test Method for Identification of Fibers in Textiles.
3. D4354 – Practice for Sampling of Geosynthetics for Testing.
4. D4355 – Test Method for Deterioration of Geotextiles from

Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).

5. D4439 – Terminology for Geotextiles.
6. D4491 – Test Method for Water Permeability of Geotextiles by Permittivity.
7. D4533 – Test Method for Index Trapezoid Tearing Strength of Geotextiles.
8. D4362 – Test Method for Grab Breaking Load and Elongation of Geotextiles.
9. D4759 – Practice for Determining the Specification Conformance of Geosynthetics.
10. D4751 – Test Method for Determining Apparent Opening Size of a Geotextile.
11. D4873 – Guide for Identification, Storage, and Handling of Geotextiles.

C. CFTS – City of Friendswood Technical Specifications.

D. FHWA – Federal Highway Administration.

1. Publication No. FHWA HI-95-038, May 1995 – Geosynthetic Design and Construction Guidelines.

E. GAI-LAP – Geosynthetic Accreditation Institute – Laboratory Accreditation Program.

1.4 DEFINITIONS

A. California Bearing Ratio (CBR): The ratio of (1) the force per unit area required to penetrate a soil mass with a three square inch (3 Sq. In.) circular piston approximately two inches (2 In.) in diameter at the rate of five hundredths of an inch per minute (0.05 In./Min.). To (2) that required for corresponding penetration of a standard material.

B. Minimum Average Roll Value (MARV): Property value calculated as typical minus two (2) standard deviations. Statistically, it yields ninety-seven and seven-tenths percent (97.7 %) degree of confidence that any sample taken during quality assurance testing will exceed value reported.

C. Typical Roll Value: Property value calculated from average of mean obtained from test data.

1.5 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Certification:

1. The Contractor shall provide the Project Manager a certificate stating the name of the geotextile manufacturer, product name, style, chemical compositions of filaments or yarns, and other pertinent information to fully describe the geotextile.
2. The Manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of this Section. Documentation describing the quality control program shall be made available upon request.

3. The manufacturer's certificate shall state that the furnished geotextile meets MARV requirements of this Section as evaluated under the manufacturer's quality control program. The certificate shall be attested to by a person having legal authority to bind the Manufacturer.

B. Manufacturing Quality Control (MQC) test results shall be provided upon request.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Geotextile labeling, shipping, and storage shall follow ASTM D4873.
B. Product labels shall clearly show the manufacturer of supplier name, style name, and roll number.
C. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.
D. Each geotextile roll shall be wrapped with material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.
E. The protective wrapping shall be maintained during periods of shipment and storage. If the wrapping is damaged prior to installation, the out wrap of geotextile material shall be discarded before installation.
F. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following:
   1. Site construction damage;
   2. extended exposure to ultraviolet (UV) radiation;
   3. precipitation;
   4. chemicals that are strong acids;
   5. chemicals that are strong bases;
   6. flames;
   7. sparks;
   8. temperatures in excess of one hundred sixty degrees Fahrenheit (160° F); and
   9. any other environmental condition that might damage the geotextile.

1.7 QUALITY ASSURANCE

A. Geotextile:
   1. Geotextiles shall be subject to sampling and testing to verify conformance with this Section. Sampling for testing shall be in accordance with ASTM D4354.
   2. Acceptance shall be in accordance with ASTM D4759 based on testing of either conformance samples obtained using Procedure A of ASTM D4354, or based on manufacturer's certifications and testing of quality control samples obtained using Procedure B of ASTM D4354.
B. Sewn Seams (if required):

1. For seams that are to be sewn in the field, the Contractor shall provide at least a six foot (6 ft.) length of sewn seam for sampling to the Project Manager before geotextile is installed.
2. For seams that are sewn in the factory, the Project Manager shall obtain samples of the factory seams at random from a roll of geotextile that is to be used on the project.
3. If seams are to be sewn in both directions, samples of seams in both directions shall be provided.
4. For seams that are field sewn, the seams sewn for sampling shall be sewn using the same equipment and procedures that will be used for production seams.
5. The seam assembly description shall be submitted by the Contractor along with the sample of the seam. The description shall include seam type, sewing thread, and stitch density.

PART II: PRODUCTS

2.1 MANUFACTURERS:
A. Propex Inc., Chattanooga, TN., or approved equal.

2.2 MATERIALS:
A. Geotextile:
1. The geotextile construction shall be woven split film polypropylene geotextile; individual slit films woven together in a manner to provide dimensional stability relative to each other including selvages.
2. Resistant to UV degradation and environmental and chemical environments normally encountered in soils.
3. Minimum Average Roll Values (MARV) used for light duty roadways and paths:
a. TABLE 4.1 – TYPE I (AASHTO CLASS 3) WOVEN GEOTEXTILE.
b. TABLE 4.2 – TYPE I (AASHTO CLASS 3) NON-WOVEN GEOTEXTILE.
4. Minimum Average Roll Values (MARV) used for paved and unpaved rural roadways and taxiways where the subgrade CBR≥3:
a. TABLE 4.3 – TYPE II (AASHTO CLASS 2) WOVEN GEOTEXTILE.
b. TABLE 4.4 – TYPE II (AASHTO CLASS 2) NON-WOVEN GEOTEXTILE.
3. Minimum Average Roll Values (MARV) used for paved urban roads where subgrade 1<CBR<3, heavy duty haul roads, and runways:
a. TABLE 4.5 – TYPE III (AASHTO CLASS 1) WOVEN GEOTEXTILE.

b. TABLE 4.6 – TYPE III (AASHTO CLASS 1) NON-WOVEN GEOTEXTILE.

2.3 QUALITY CONTROL:

A. Manufacturing Quality Control (MQC): Testing shall be performed at a laboratory accredited GAI-LAP for tests required for the geotextile, at a frequency exceeding ASTM D4354.

B. Sewing thread (if required):

1. Sewing thread shall consist of high strength polypropylene or polyester (Nylon shall not be used).
2. The thread shall be of a contrasting color to the geotextile.

PART III: EXECUTION

3.1 PREPARATION

A. Clear, grub, and excavate/fill installations site to design. Remove topsoil, vegetation, and other unsuitable materials.

B. Soft spots and unsuitable areas shall be identified during site preparation or subsequent proof rolling.

3.2 INSTALLATION

A. The geotextile shall be laid smooth without wrinkles or folds on the prepared subgrade in the direction of construction traffic.

B. Adjacent geotextile rolls shall be overlapped, sewn or joined as required in TABLE 4.7 – GEOTEXTILE OVERLAPPING.

C. When sewn seams are required, the seam strength, as measured by ASTM D4632 shall be equal to or greater than ninety percent (90%) of the specified grab strength.

D. On curves, the geotextile maybe folded or cut to conform to the curves. The fold or overlap shall be in the same direction of construction and held in place by pins, staples, or piles of fill or rock.

E. Prior to covering, the geotextile shall be inspected by a certified inspector or Project Manager to ensure that it has not been damaged during installation.

F. Damaged areas, as identified by the Project Manager, shall be repaired immediately by covering the damaged area with a geotextile patch that extends an equal amount to the required overlap beyond the damaged area.

G. The subbase shall be placed by end dumping onto the geotextile, or over previously placed subbase aggregate such that at least minimum specified lift thickness shall be between the construction equipment tires or tracks and the geotextile at all times.

H. Pretensioning Geotextile:

1. Proof roll with heavily loaded, rubber-tired vehicle. Wheel load of truck should be equivalent to maximum expected for site. Vehicle to make at least four (4) passes over first (1st) lift in each

area of site.

2. Once design aggregate has been placed, use roadway prior to paving to prestress geotextile-aggregate system in key areas.

I. If required, staple or pin geotextile overlaps to maintain position during construction activities. Use nails ten inches (10 In.) to twelve inches (12 In.) in length placed at a minimum of fifty feet (50 Ft.) on cent for parallel rolls and five feet (5 Ft.) on center for roll ends.

J. Do not place overlap along anticipated primary wheel paths. Place overlaps at end of rolls in direction of aggregate placement with previous roll on top.

K. When geotextile intersects an existing pavement area, extend geotextile to edge of old system. For widening or intersecting existing roads where geotextiles have been used, anchor geotextile at roadway edge.

L. Compact first (1st) lift of base aggregate with a tracking dozer and then compact with smooth-drum vibratory roller to obtain minimum compacted density.

M. Compaction of permeable bases shall meet specified requirements.

N. Perform construction parallel to road alignment.

O. Fill ruts formed during construction to maintain adequate cover over geotextile. Do not blade ruts down.

P. Place remaining base aggregate in lifts not exceeding ten inches (1o In.) in loose thickness and compact to specified density.

3.4 PROTECTION

A. Atmospheric exposure of the geotextile to the elements following laydown shall be limit to fourteen days (14 Ds.) to prevent damage.

B. Equipment may operate on roadway without aggregate for geotextile installation under permeable bases if subgrade is of sufficient strength.

1. For extremely soft soils, use lightweight construction vehicles for access on first (1st) lift.
2. Limit construction vehicles in size and weight to limit rutting in initial lift to three inches (3 In.).
3. If rut depth exceeds three inches (3 In.), decrease vehicle size or weight or increase lift thickness.

C. Turning not permitted on first (1st) lift of base aggregate. Construct turnouts at roadway edge to facilitate construction.

PART IV: TABLES

4.1 MINIMUM ROLL VALUES (MARV) FOR TYPE I (AASHTO CLASS 3) WOVEN GEOTEXTILE.

PROPERTY	TEST METHOD	UNITS	PROPERTY REQUIREMENT
Grab Tensile Strength	ASTM D4632	Lbs.	200
Grab Elongation	ASTM D4632	Percent	15
Puncture Strength	ASTM D4833	Lbs.	90
Mullen Burst	ASTM D3786	Psi.	400
Trapezoidal Tear	ASTM D4533	Lbs.	75
Apparent Opening Size	ASTM D4751	In.	0.0167
Permittivity	ASTM D4491	Sec-1	0.05
Water Flow Rate	ASTM D4491	gpm/ft^2	4
UV Resistance (Percent retained at 500 hours)	ASTM D4355	Percent	70

4.2 MINIMUM ROLL VALUES (MARV) FOR TYPE I (AASHTO CLASS 3) NON-WOVEN GEOTEXTILE.

PROPERTY	TEST METHOD	UNITS	PROPERTY REQUIREMENT
Grab Tensile Strength	ASTM D4632	Lbs.	120
Grab Elongation	ASTM D4632	Percent	50
Trapezoidal Tear	ASTM D4533	Lbs.	50
Apparent Opening Size	ASTM D4751	In.	0.0084
Permittivity	ASTM D4491	Sec-1	1.7
Water Flow Rate	ASTM D4491	gpm/ft^2	140
UV Resistance (Percent retained at 500 hours)	ASTM D4355	Percent	70

4.3 MINIMUM ROLL VALUES (MARV) FOR TYPE II (AASHTO CLASS 2) WOVEN GEOTEXTILE.

PROPERTY	TEST METHOD	UNITS	PROPERTY REQUIREMENT
Grab Tensile Strength	ASTM D4632	Lbs.	250
Grab Elongation	ASTM D4632	Percent	12
Puncture Strength	ASTM D4833	Lbs.	110
Mullen Burst	ASTM D3786	Psi.	500
Trapezoidal Tear	ASTM D4533	Lbs.	90
Apparent Opening Size	ASTM D4751	In.	0.0167
Permittivity	ASTM D4491	Sec-1	0.05
Water Flow Rate	ASTM D4491	gpm/ft^2	4
UV Resistance (Percent retained at 500 hours)	ASTM D4355	Percent	70

4.4 MINIMUM ROLL VALUES (MARV) FOR TYPE II (AASHTO CLASS 2) NON-WOVEN GEOTEXTILE.

PROPERTY	TEST METHOD	UNITS	PROPERTY REQUIREMENT
Grab Tensile Strength	ASTM D4632	Lbs.	160
Grab Elongation	ASTM D4632	Percent	50
Trapezoidal Tear	ASTM D4533	Lbs.	60
Apparent Opening Size	ASTM D4751	In.	0.0084
Permittivity	ASTM D4491	Sec-1	1.30
Water Flow Rate	ASTM D4491	gpm/ft^2	110
UV Resistance (Percent retained at 500 hours)	ASTM D4355	Percent	70

4.5 MINIMUM ROLL VALUES (MARV) FOR TYPE III (AASHTO CLASS 1) WOVEN GEOTEXTILE.

PROPERTY	TEST METHOD	UNITS	PROPERTY REQUIREMENT
Grab Tensile Strength	ASTM D4632	Lbs.	315
Grab Elongation	ASTM D4632	Percent	12
Puncture Strength	ASTM D4833	Lbs.	150
Mullen Burst	ASTM D3786	Psi.	600
Trapezoidal Tear	ASTM D4533	Lbs.	113
Apparent Opening Size	ASTM D4751	In.	0.0167
Permittivity	ASTM D4491	Sec-1	0.1
Water Flow Rate	ASTM D4491	gpm/ft^2	4
UV Resistance (Percent retained at 500 hours)	ASTM D4355	Percent	70

4.6 MINIMUM ROLL VALUES (MARV) FOR TYPE III (AASHTO CLASS 1) NON-WOVEN GEOTEXTILE.

PROPERTY	TEST METHOD	UNITS	PROPERTY REQUIREMENT
Grab Tensile Strength	ASTM D4632	Lbs.	205
Grab Elongation	ASTM D4632	Percent	50
Trapezoidal Tear	ASTM D4533	Lbs.	80
Apparent Opening Size	ASTM D4751	In.	0.0071
Permittivity	ASTM D4491	Sec-1	1.50
Water Flow Rate	ASTM D4491	gpm/ft^2	110
UV Resistance (Percent retained at 500 hours)	ASTM D4355	Percent	70

4.7 MINIMUM GEOTEXTILE OVERLAPING.

SUBGRADE CBR	**MINIMUM OVERLAP**
Greater than 3	12 – 18 inches
1 to 3	24 – 36 inches
0.5 to 1	36 inches or sewn
Less than 0.5	Sewn
All Roll Ends	36 inches or sewn

END OF SECTION