Section 700—Grassing

700.1 General Description

This work includes preparing the ground, furnishing, planting, seeding, fertilizing, sodding, and mulching disturbed areas within the Right-of-Way limits and easement areas adjacent to the right-of-way as shown on the Plans except as designated by the Engineer to remain natural.

700.1.01 Definitions

General Provisions 101 through 150.

700.1.02 Related References

A. Standard Specifications

Section 160—Reclamation of Material Pits and Waste Areas

Section 163—Miscellaneous Erosion Control Items

Section 718—Wood Fiber

Section 822—Emulsified Asphalt

Section 882—Lime

Section 890—Seed and Sod

Section 891—Fertilizers

Section 893—Miscellaneous Planting Materials

Section 895—Polyacrylamide

B. Referenced Documents

QPL 33

QPL 84

700.1.03 Submittals

Submit manufacturer's product expiration date along with written instructions to ensure proper application, safety, storage, and handling of Polyacrylamide products used in The Work.

700.2 Materials

Use materials that meet the requirements of the following Specifications:

Material	Section
Wood Fiber Mulch	718.2
Agricultural Lime	882.2.01
Seed	890.2.01
Sod	890.2.02
Fertilizer	891.2.01
Plant Topsoil	893.2.01
Mulch	893.2.02
Inoculants	893.2.04
Tackifiers	QPL 33
Anionic Polyacrylamide	QPL 84 & Section 895

A. Seeds

Whenever seeds are specified by their common names, use the strains indicated by their botanical names.

B. Water

Obtain the water for grassing from an approved source. Use water free of harmful chemicals, acids, alkalies, and other substances that may harm plant growth or emit odors. Do not use salt or brackish water.

C. Agricultural Lime

Agricultural lime rates will be based on a laboratory soil test report. The Contractor is responsible for ensuring the tests are performed by an approved laboratory. Provide a copy of test results to the Engineer. Refer to Section 882 Lime and GSP 18 of the Sampling and Testing Inspection manual for additional information on rates, use, handling and sampling procedures.

D. Fertilizer Mixed Grade

Fertilizer analysis and rates will be based on a laboratory soil test report. The Contractor is responsible for ensuring the tests are performed by an approved laboratory. Provide a copy of test results to the Engineer. Refer to Section 891 Fertilizer and GSP 18 of the Sampling and Testing Inspection manual for additional information on rates, use, handling and sampling procedures.

E. Mulch

Use straw or hay mulch according to Subsection 700.3.05.G.

Use wood fiber mulch in hydroseeding according to Subsection 700.3.05.F.1.

700.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

700.3 Construction Requirements

700.3.01 Personnel

General Provisions 101 through 150.

700.3.02 Equipment

Use grassing equipment able to produce the required results.

Never allow the grading (height of cut) to exceed the grassing equipment's operating range.

A. Mulch Material Equipment

Use mulching equipment that uniformly cuts the specified materials into the soil to the required control depth.

B. Hydroseeding Equipment

For hydroseeding equipment, see Subsection 700.3.05.F.

700.3.03 Preparation

General Provisions 101 through 150.

700.3.04 Fabrication

General Provisions 101 through 150.

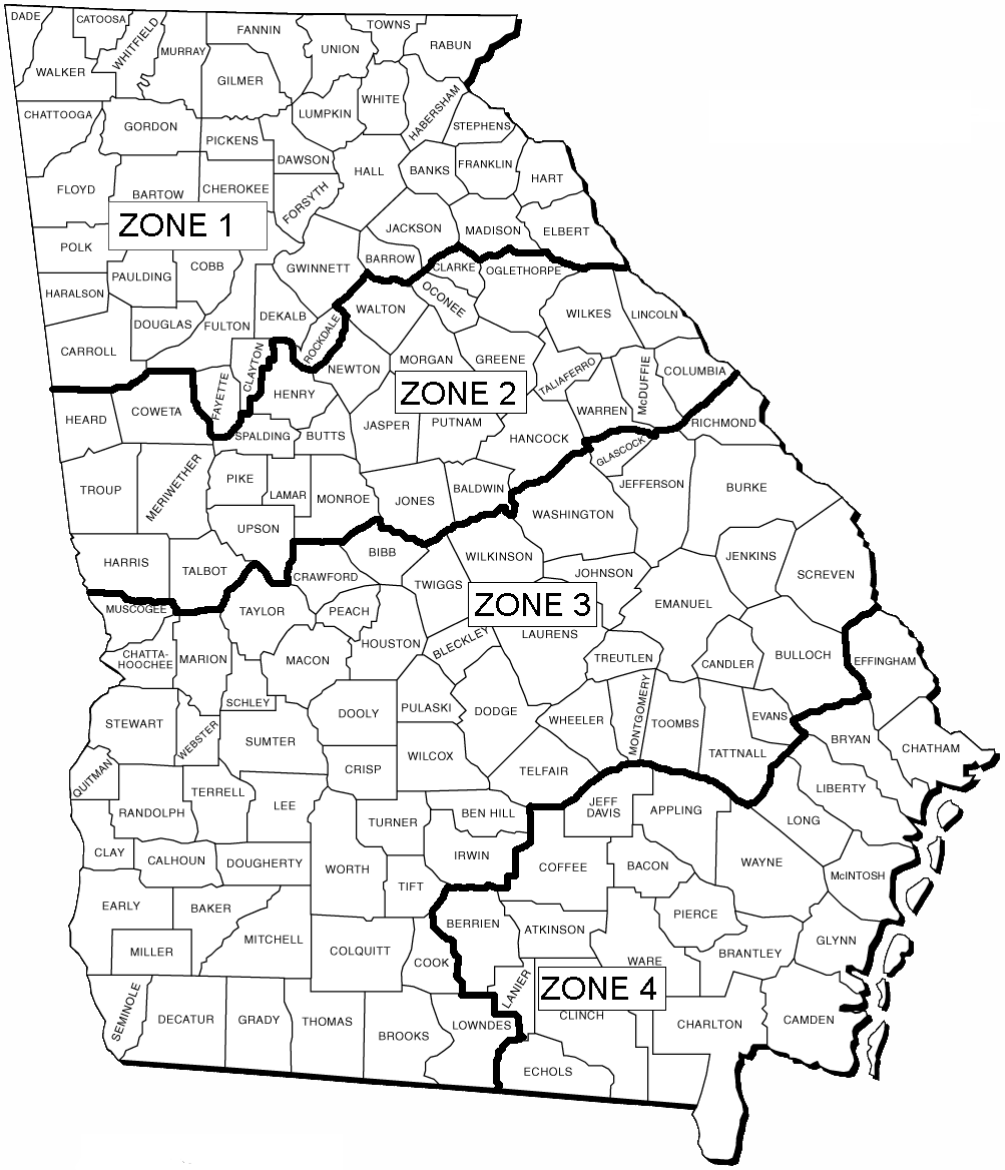
700.3.05 Construction

Follow the planting zones, planting dates, types of seed, seed mixtures, and application rates described throughout this Section. The Engineer has the authority to alter the planting dates as set forth by a period of 2 weeks. This 2-week period may be applied to either the beginning of the specified planting and/or to the end of the end of the specified planting season.

In general:

- Obtain the Engineer's approval before changing the ground cover type.
- Do not use annual rye grass seeds with permanent grassing.
- Follow the planting zones indicated on the Georgia State Planting Zone Map, below.
- Sod may be installed throughout the year, weather permitting.
- For permanent grassing, apply the combined amounts of all seeds for each time period within each planting zone and roadway location listed in the Seeding Table, below. Do not exceed the amounts of specified seed.

PLANTING ZONE MAP



NON-NATIVE GRASS SEEDING TABLE 1

(Temporary and Permanent Seed Types for Shoulders, Medians and Slopes 3:1 or Flatter)

Common Name	Botanical Name	Class/Type	Rate/Acre	Planting Zone	Planting Dates
Common Bermuda Grass (Hulled)	*Cynodon dactylon*	**Required Permanent Grass**	**10 (11)**	**1**	**April 16 – August 31**
Common Bermuda Grass (Unhulled)			**10 (11)**		
Common Bermuda Grass (Hulled)	*Cynodon dactylon*	**Required Permanent Grass**	**10 (11)**	**2,3,4**	**April 1 – October 15**
Common Bermuda Grass (Unhulled)			**10 (11)**		
Bahaia Grass	*Paspalum motatum*		**10 (11)**		
Rye Grass, Millet, Cereal Grass (Oats)	*Lolium penne spsp. Multiflorum, Echinochloa cursgalli, Avena sativa*	**Temporary Grass**	**50 (56)**	**1**	**September 1- April 15**
Rye Grass, Millet, Cereal Grass (Oats)	*Lolium penne spsp. Multiflorum, Echinochloa cursgalli, Avena sativa*	**Temporary Grass**	**50 (56)**	**2,3,4**	**October 16- March 31**

NON-NATIVE SEEDING TABLE 2

(Temporary and Permanent Seed Types

for back slopes, fill slopes and areas which will not be subject

to frequent mowing, slopes steeper than 3:1)

Common Name	Botanical Name	Class/Type	Rate/Acre	Planting Zone	Planting Dates
Interstate Lespedeza	*Lespedeza sericea*	Permanent Grass	50(56)	1,2	March 1 – August 31
Weeping Lovegrass	*Eragrostis curvula*	Temporary Grass	10(11)		
Interstate Lespedeza	*Lespedeza sericea*	Permanent Grass	75(84)	1,2	September 1- February 28
Tall Fescue	*Festuca arundinacea*	Temporary Grass	50(56)		
Interstate Lespedeza	*Lespedeza sericea*	Permanent Grass	50(56)	3,4	April 1 – October 31
Weeping Love Grass	*Eragrostis curvula*	Temporary Grass	10(11)		
Interstate Lespedeza	*Lespedeza sericea*	Permanent Grass	50(56)	3,4	November 1 – March 31
Weeping Love Grass	*Eragrostis curvula*	Temporary Grass	10(11)		

NATIVE GRASS SEEDING TABLE 3

For Non-mowable Slopes or Areas Designated as Permanent Native Grass Plots.

Plant native seed mixes on back slopes, fill slopes and areas which

will not be subject to frequent mowing (slopes steeper than 3:1).

Common Name	Botanical Name	Class/Type	Rate/Acre	Planting Zone	Planting Dates
Canada Wild Rye	*Elymus canadensis*	Cool Season	Minimum 2 (2)	1,2,3,4	October 31 - March 31
Virginia Wild Rye	*Elymus virginicus*	Cool Season	Minimum 2 (2)	1,2,3,4	October 31 - March 31
Bottle-brush Grass	*Hystrix patula*	Cool Season	Minimum 2 (2)	1,2,3,4	October 31 - March 31
Little Bluestem	*Schizachyrium scoparium* (*Andropogon scoparius*)	Warm Season	Minimum 2 (2)	1,2,3,4	March31- August 31
Indiangrass	*Sorghastrum nutans*	Warm Season	Minimum 2 (2)	1,2,3,4	March 31- August 31
Eastern Gama Grass	*Tripsacum dactyloides*	Warm Season	Minimum 2 (2)	1,2,3,41,2,3,4	March 31- August 31
Rice Cut Grass	*Leersia oryzoides*	Warm Season	Minimum 2 (2)	1,2,3,4	March 31- August 31
Deertongue	*Panicum clandestinum*	Warm Season	Minimum 2 (2)	1,2,3,4	March 31- August 31
Switchgrass	*Panicum virgatum*	Warm Season	Minimum 2 (2)	1,2,3,4	March 31- August 31
Woolgrass	*Scirpus cyperinus*	Cool Season	Minimum 2 (2)	1,2,3,4	October 31 - March 31
River Oats	*Chasmanthium latifolium*	Cool Season	Minimum 2 (2)	1,2,3,4	October 31 - March 31
Purple Top	Tridens flavus	Warm Season	Minimum 2 (2)	1,2,3,4	March 31- August 31

See plan sheets/plant lists for detailed native restoration and riparian mitigation seed mix combinations to be applied at a minimum rate total of 10 (11) lbs per acre (kg/hectare) for each combined mix. If the mix is not provided in the plan sheets, use a minimum of 3 species based on planting dates shown above.

HERBACEOUS PLANT SEEDING TABLE 4

(Approved for Riparian Mitigation or for Seed Mixes

on Slopes Steeper than 3:1-Requiring Permanent Planting)

Common name	Botanical name	Class/type	Rate/Acre	Planting Zone	Planting Dates
Joe Pye Weed	*Eupatorium fistulosum*	Herbaceous Pe	Minimum 2 (2)	1,2,3,4	September 1 – May 1
Ironweed	*Vernonia novaboracensis*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	March 1 - August 31,
White snakeroot	*Ageratina altissima* (*Eupat rugosum)*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	September 1 – May 1
Swamp milkweed	*Asclepias incarnata*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	March 1 - August 31,
Frost aster	*Aster pilosus* (*Symphyotric*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	September 1 – May 1
Partridge pea	*Chamaecrista fasciculata* (*fasciculata*)	Herbaceous Perennial	Up to 10(11)	1,2,3,4	March 1 - August 31,
Lance-leaf coreopsis	*Coreopsis lanceolata*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	September 1 – May 1
Tall coreopsis	*Coreopteris tripteris*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	September 1 – May 1
Boneset	*Eupatorium perfoliatum*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	September 1 – May 1
Sneezeweed	*Helenium autumnale*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	September 1 – May 1
Swamp sunflower	*Helianthus angustifolius*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	March 1 - August 31,
Fringed loosestrife	*Lysimachia ciliata*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	September 1 – May 1
Wild bergamot	*Monarda fistulosa*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	September 1 – May 1
Mountain mint	*Pycnanthemum tenuifolium*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	September 1 – May 1
Black-eyed susan	*Rudbeckia hirta*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	September 1 – May 1
Goldenrod	*Solidago nemoralis*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	September 1 – May 1
Butterfly Weed	*Aesclepias tuberose*	Herbaceous Perennial	Up to 10(11)	1,2,3,4	March 1 - August 31,

For native restoration and riparian mitigation seed mix combinations, use Table 4 for approved native herbaceous seed types in combination with Table 3 of native grass seeds. Native restoration and riparian seed mixes should incorporate a mix of 60% native grass types (see Table 3) and 40% native herbaceous types (see Table 4) applied at a minimum rate total of 10 (11) lbs per acre (kg/hectare) for each combined mix.

TABLE 5: TEMPORARY GRASS - SPECIES, SEEDING RATES AND PLANTING DATES

Species	Rates per 1000 sq. ft.	Rates per Acre	Planting Date By Zone		
			1 & 2	2	3 & 4
Rye (Grain)	3.9 lbs	168 lbs	8/1 - 11/30	8/15 - 12/1	9/1 - 2/28
Ryegrass	0.9 lbs	40 lbs	8/1 - 11/30	9/1 - 12/15	9/15 - 1/1
Rye & Annual Lespedeza	0.6 lbs 0.6 lbs	28 lbs 24 lbs	3/1 - 4/1	2/1 - 3/1	2/1 - 3/1
Weeping Lovegrass	0.1 lbs	4 lbs	3/15 - 6/15	3/15 - 7/15	3/15 - 7/15
Sudangrass	1.0 lbs	60 lbs	4/1 - 8/31	4/1 - 8/31	3/15 - 8/1
Browntop Millet	1.1 lbs	50 lbs	4/1 - 6/30	4/1 - 7/15	4/1 - 7/15
Wheat	3.9 lbs	168 lbs	9/1 - 12/31	9/1 - 12/31	9/15 - 1/31

When stage construction or other conditions prevent completing a roadway section continuously, apply temporary grassing to control erosion. Temporary grassing is used to stabilize disturbed areas for more than sixty (60) calendar days. Temporary grass may be applied any time of the year, utilizing the appropriate seed species and application rate as shown in the chart above. Apply mulch to areas planted in temporary grass at the rate of ¾ inch to 1.5 inches. Do not place slope mats on areas planted in temporary grass.

A. Ground Preparation

Prepare the ground by plowing under any temporary grass areas and preparing the soil as follows:

1. Slopes 3:1 or Flatter

   On slopes 3:1 or flatter, plow shoulders and embankment slopes to between 4 in and 6 in (100 mm and 150 mm) deep.

   Plow front and back slopes in cuts to no less than 6 in (150 mm) deep. After plowing, thoroughly disk the area until pulverized to the plowed depth.

2. Slopes Steeper Than 3:1

   Serrate slopes steeper than 3:1 according to Plan details when required.

   On embankment slopes and cut slopes not requiring serration (sufficient as determined by the Engineer), prepare the ground to develop an adequate seed bed using any of the following methods as directed by the Engineer:

   - Plow to a depth whatever depth is practicable.
   - Use a spiked chain.
   - Walk with a cleated track dozer.
   - Scarify.

   Disking cut slopes and fill slopes is not required.

3. All Slopes

   a. Obstructions

      Remove boulders, stumps, large roots, large clods, and other objects that interfere with grassing or may slide into the ditch.

   b. Topsoil

Spread topsoil stockpiled during grading evenly over cut and fill slopes after preparing the ground.

Push topsoil from the top over serrated slopes. Do not operate equipment on the face of completed serrated cuts.

4. Native Restoration Areas, Riparian Areas, Stream Restoration Areas, and Wetland and Stream Mitigation Areas.

   For Permanent Grassing in native restoration areas, multitrophic native planting areas, riparian areas, stream restoration areas, and wetland and stream mitigation areas, provide the minimum ground preparation necessary to provide seed to soil contact. Riparian areas may also be seeded using the no-till method. The no-till method is defined by planting permanent grass seeds using a drill-type seeder over existing vegetation without plowing or tilling soil. Ensure that existing vegetation is less than 3 inches in height (this may be achieved by mowing or using a mechanical string trimmer).

B. Grassing Adjacent to Existing Lawns

When grassing areas adjacent to residential or commercial lawns, the Engineer shall change the plant material to match the type of grass growing on the adjacent lawn. The Contract Unit Price will not be modified for this substitution.

C. Temporary Grassing

Apply temporary grassing according to Subsection 163.3.05.F. Determine lime requirements by a laboratory soil test. Refer to seeding Table 5 for species, amounts of seed and planting dates.

In March or April of the year following planting and as soon as the weather is suitable, replace all areas of temporary grass with permanent grass by plowing or overseeding using the no-till method. If the no-till method is used, ensure that temporary grass is less than 3 inches in height (this may be achieved by mowing). Additional mulch will be required only if the temporary grass does not provide adequate mulch to meet the requirements of Subsection 700.3.05.G, "Mulching".

Temporary grass, when required, will be paid for according to Section 163.

Projects that consist of asphalt resurfacing with shoulder reconstruction and/or shoulder widening: Type II Wood Fiber Blanket is used to stabilize disturbed areas, no till seeding will be used when permanent grassing is applied and the areas will not be re-disturbed.

D. Applying Agricultural Lime and Fertilizer Mixed Grade

Apply and mix lime and fertilizer as follows:

1. Agricultural Lime

   Uniformly spread agricultural lime on the ground at the approximate rate determined by the laboratory soil test.

   a. Agricultural Lime may be used as filler material in mixed grade fertilizer in lieu of inert material. The use of agricultural lime as filler material is to be shown on the fertilizer bag or invoice from the supplier. Do not deduct any amount of fertilizer when lime is used as filler.

2. Fertilizer Mixed Grade

   Uniformly spread the fertilizer selected according to Subsection 700.2.D over the ground or by use of hydroseeding.

   For bid purposes base estimated quantities on an initial application of 400 lb/acre of 19-19-19.

3. Mixing

   Before proceeding, uniformly work the lime and fertilizer into the top 4 in (100 mm) of soil using harrows, rotary tillers, or other equipment acceptable to the Engineer.

   On cut slopes steeper than 3:1, other than serrated slopes, reduce the mixing depth to the maximum practical depth as determined by the Engineer.

   Omit mixing on serrated slopes.

4. Native Restoration Areas, Multitropic Native Planting Areas, Riparian Areas, Stream Restoration Areas, and Wetland and Stream Mitigation Areas

   Omit the application of lime and fetilizer within riparian areas.

E. Seeding

Prepare seed and sow as follows:

1. Inoculation of Seed

   Inoculate each kind of leguminous seed separately with the appropriate commercial culture according to the manufacturer's instructions for the culture.

   When hydroseeding, double the inoculation rate.

   Protect inoculated seed from the sun and plant it the same day it is inoculated.

2. Sowing

   Weather permitting, sow seed within 24 hours after preparing the seed bed and applying the fertilizer and lime.

   Sow seed uniformly at the rates specified in the seeding tables. Use approved mechanical seed drills, rotary hand seeders, hydroseeding equipment, or other equipment to uniformly apply the seed. Do not distribute by hand.

   To distribute the seeds evenly sow seed types separately, except for similarly sized and weighted seeds. They may be mixed and sown together.

   Do not sow during windy weather, when the prepared surface is crusted, or when the ground is frozen, wet, or otherwise non-tillable.

3. Overseeding

   Temporary grass areas that were prepared in accordance with Subsection 700.3.05.A, may be overseeded using the no-till method. The no-till method is defined by planting permanent grass seeds using a drill-type seeder over existing temporary grass without plowing or tilling soil and in accordance with Subsection 700.3.05.C.

4. Riparian Seed Mix shall be used when specified in the Plans. A mix of at least three (3) species from Seeding Table 3 (Native Grasses) and at least two (2) species from Seeding Table 4 (Approved Riparian Mitigation - Herbaceous Plants). The seed, shall be applied as Permanent Grassing within those areas designated on the Plans. The kinds of seed, shall be used according to the appropriate Planting Dates given in the tables.

F. Hydroseeding

Hydroseeding may be used on any grassing area. Under this method, spread the seed, fertilizer, and wood fiber mulch in the form of a slurry. Seeds of all sizes may be mixed together. Apply hydroseeding as follows:

1. Use wood fiber mulch as a metering agent and seed bed regardless of which mulching method is chosen. Apply wood fiber mulch at approximately 500 lbs/acre (560 kg/ha).
2. Prepare the ground for hydroseeding as for conventional seeding in Subsection 700.3.05.A.
3. Use specially designed equipment to mix and apply the slurry uniformly over the entire seeding area.
4. Agitate the slurry mixture during application.
5. Discharge slurry within one hour after being combined in the hydroseeder. Do not hydroseed when winds prevent an even application.
6. Closely follow the equipment manufacturer's directions unless the Engineer modifies the application methods.
7. Mulch the entire hydroseeded area according to Subsection 700.3.05.F.1, above, and Subsection 700.3.05.G, below.

Native Restoration Areas, Multitropic Native Planting Areas, Riparian Areas, Stream Restoration Areas, and Wetland and Stream Mitigation Areas may be hydroseeded. When hydroseeding in these areas only use water, seed and wood fiber mulch.

G. Mulching

Except as noted in Subsection 700.3.05.B and Subsection 700.3.05.C, apply mulch immediately after seeding areas as follows:

Areas with permanent grass seed and covered with slope mats or blankets will not require mulch.

Evenly apply straw or hay mulch between 3/4 in and 1-1/2 in (20 mm and 40 mm) deep, according to the texture and moisture content of the mulch material.

Mulch shall allow sunlight to penetrate and air to circulate as well as shade the ground, reduce erosion, and conserve soil moisture. If the type of mulch is not specified on the Plans or in the Proposal, use any of the following as specified.

1. Mulch with Tackifier

   Apply mulch with tackifier regardless of whether using ground or hydroseeding equipment for seeding.

   a. Mulch uniformly applied manually or with special blower equipment designed for the purpose. When using a blower, thoroughly loosen baled material before feeding it into the machine so that it is broken up.

   b. After distributing the mulch initially, redistribute it to bare or inadequately covered areas in clumps dense enough to prevent new grass from emerging (if required).

      Do not apply mulch on windy days.

   e. Apply enough tackifier to the mulch to hold it in place. Immediately replace mulch that blows away.

      If distributing the mulch by hand, immediately apply the tackifier uniformly over the mulched areas.

      - Tackifier: Use a tackifier listed in the Laboratory Qualified Products Manual and apply at the manufacturer's recommended rates.

2. Walked-in-Mulch

   Apply walked-in-mulch on slopes ranging in steepness from 5:1 to 2:1 and treat as follows:

   a. Immediately walk it into the soil with a cleated track dozer. Make dozer passes vertically up and down the slope.

   b. Where walked-in-mulch is used, do not roll or cover the seeds as specified in Subsection 700.3.05.E.3.

3. Apply only wheat straw mulch on Riparian Areas, Stream Restoration Areas, and Wetland and Stream Mitigation Areas after they have been seeded. The wheat straw mulch is to be applied with a maximum thickness of 1 inch.

H. Sod

Furnish and install sod in all areas shown on the Plans or designated by the Engineer.

1. Kinds of Sod

   Use only Common Bermudagrass (Cyndon dactylon) or one of the following Bermudagrass varieties:

   - Tifway 419
   - Tifway II
   - Tift 94
   - Tifton 10
   - Midlawn
   - Midiron
   - GN-1
   - Vamont

   No dwarf Bermuda types shall be used. Sod shall be nursery-grown and be accompanied with a Georgia Department of Agriculture Live Plant License Certificate or Stamp. Sod shall consist of live, dense, well-rooted material free of weeds and insects as described by the Georgia Live Plant Act.

2. Type And Size Of Sod:

   Furnish either big roll or block sod. Ensure that big roll sod is a minimum of 21 inches wide by 52 feet long. Minimum dimensions for block sod are 12 inches wide by 22 inches long. Ensure all sod consists of a uniform soil thickness of not less than 1 inch.

3. Ground Preparation

   Excavate the ground deep enough and prepare it according to Subsection 700.3.05.A to allow placing of sod. Spread soil, meeting the requirements of Subsection 893.2.01, on prepared area to a depth of 4 inches.

4. Application of Lime and Fertilizer

   Apply lime and fertilizer according to Subsection 700.3.05.D within 24 hours prior to installing sod.

5. Weather Limitation

Do not place sod on frozen ground or where snow may hinder establishment.

6. Install Sod

   Install Sod as follows:

   - Place sod by hand or by mechanical means so that joints are tightly abutted with no overlaps or gaps. Use soil to fill cracks between sod pieces, but do not smother the grass.
   - Stake sod placed in ditches or slopes steeper than 2:1 or any other areas where sod slipping can occur.
   - Use wood stakes that are at least 8 in (200 mm) in length and not more than 1 in (25 mm) wide.
   - Drive the stakes flush with the top of the sod. Use a minimum of 8 stakes per square yard (meter) to hold sod in place.
   - Once sod is placed and staked as necessary, tamp or roll it using adequate equipment to provide good contact with soil.
   - Use caution to prevent tearing or displacement of sod during this process. Leave the finished surface of sodded areas smooth and uniform.

7. Watering Sod

   After the sod has been placed and rolled or tamped, water it to promote satisfactory growth. Additional watering will be needed in the absence of rainfall and during the hot dry summer months. Water may be applied by Hydro Seeder, Water Truck or by other means approved by the Engineer.

8. Dormant Sod

   Dormant Bermuda grass sod can be installed. However, assume responsibility for all sod through establishment and until final acceptance.

9. Establishment

   Sod will be inspected by the Engineer at the end of the first spring after installation and at the time of Final Inspection. Replace any sod that is not live and growing. Any cost for replacing any unacceptable sod will be at the Contractor's expense.

I. Application of Nitrogen

Apply nitrogen at approximately 50 lbs/acre (56 kg/ha) when specified by the Engineer after plants have grown to 2 inches (50 mm) in height.

One application is mandatory and must be applied before Final Acceptance.

Apply nitrogen with mechanical hand spreaders or other approved spreaders capable of uniformly covering the grassed areas. Do not apply nitrogen on windy days or when foilage is damp.

Do not apply nitrogen between October 15 and March 15 except in Zone 4.

1. Native Restoration Areas, Multitropic Native Planting Areas, Riparian Areas, Stream Restoration Areas, and Wetland and Stream Mitigation Areas

   Do not apply nitrogen to these areas.

J. Application of Polyacrylamide (PAM)

1. Prepare soil according to project Plans and Specifications prior to applying PAM.
2. Apply PAM according to manufacturer's recommendations and the requirements listed herein.
3. Apply Polyacrylamide (PAM) to all areas that receive permanent grassing.
4. Apply PAM (powder) before grassing or PAM (emulsion) to the hydroseeding operation.
5. Use only anionic PAM.
6. Ensure that the application method provides uniform coverage to the target and avoids drift to non-target areas including waters of the state.

7. Achieve > 80% reduction in soil loss as measured by a rainfall simulator test performed by a certified laboratory (1 hour storm duration, 3 inches (75 mm) rainfall per hour).
8. Ensure uniform coverage to the target area and minimize drift to non-target areas. Apply anionic PAM to all cut and fill slopes, permanently grassed or temporarily grassed, either prior to grassing or in conjunction with hydroseeding operations. Mulch will not be eliminated.
9. Use application rates in accordance with manufacturer's instructions.
10. Do not exceed 200 lbs/acre/year (224 kg/ha/year).
11. Do not include polyacrylamide when planting in Riparian Areas, Stream Restoration Areas, and Wetland and Stream Mitigation Areas

700.3.06 Quality Acceptance

The Engineer may require replanting of an area that shows unsatisfactory growth for any reason at any time.

Except as otherwise specified or permitted by the Engineer, prepare replanting areas according to the Specifications as if they were the initial planting areas. Use a soil test or the Engineer's guidance to determine the fertilizer type and application rate, then furnish and apply the fertilizer.

700.3.07 Contractor Warranty and Maintenance

A. Plant Establishment

Before Final Acceptance, provide plant establishment of the specified vegetation as follows:

1. Plant Establishment

   Preserve, protect, water, reseed or replant, and perform other work as necessary to keep the grassed areas in satisfactory condition.
2. Watering

   Water the areas during this period as necessary to promote maximum growth.
3. Mowing

   Mow seeded areas of medians, shoulders, and front slopes at least every 6 months. Avoid damaging desirable vegetation.

   In addition, mow as necessary to prevent tall grass from obstructing signs, delineation, traffic movements, sight distance, or otherwise becoming a hazard to motorists.

   Do not mow lespedezas or tall fescue until after the plants have gone to seed.
4. Do not mow riparian areas, stream restoration areas, or wetland and stream mitigation areas after planting.

B. Additional Fertilizer Mixed Grade

Apply fertilizer based on the initial soil test report at half the recommended rate each spring after initial plant establishment. For bid purposes apply 200 lbs/acre of 19-19-19. Continue annual applications until Final Acceptance. This additional fertilizer will be measured and paid for at the Contract Unit Price for fertilizer mixed grade.

Do not apply additional fertilizer to Native Restoration Areas, Multitropic Native Planting Areas, Riparian Areas, Stream Restoration Areas, and Wetland and Stream Mitigation Areas.

C. Growth and Coverage

Provide satisfactory growth and coverage, ensuring that vegetation growth is satisfactory with no bare spots larger than1 ft^2 (0.1 m^2). Bare spots shall comprise no more than 1 percent of any given area. An exception is given for seed not expected to have germinated and shown growth at that time.

D. Permissible Modifications

When all Items of the work are ready for Final Acceptance except for newly planted repaired areas or other areas with insufficient grass, the Contractor may fill the eroded areas or treat bare areas with sod obtained, placed, and handled according to Subsection 700.3.05.H.

Carefully maintain the line and grade established for shoulders, front slopes, medians, and other critical areas.

Sod as described above will not be paid for separately, but will be an acceptable substitute for the satisfactory growth and coverage required under this Specification. These areas treated with sod are measured for payment under the Item for which the sod is substituted.

700.4 Measurement

A. Permanent Grassing

Permanent Grassing will be measured for payment by the acre (hectare).

B. Mulches

Straw or hay mulch applied to permanent grassing areas will be measured by the ton (megagram). Wood fiber mulch furnished by the Contractor for permanent grassing is not measured for separate payment.

C. Quantity of Sod

Sod is measured for payment by the number of square yards (meters) , surface measure, completed and accepted.

D. Water

Water furnished and applied to promote a satisfactory growth is not measured for payment.

E. Quantity of Lime and Fertilizer Mixed Grade

Lime and fertilizer are measured by the ton (megagram). Lime used as a filler in fertilizer is measured by the ton (megagram).

F. Quantity of Nitrogen Used for Permanent Grassing

Nitrogen is measured in pounds (kilograms) based on the weight of fertilizer used and its nitrogen content.

G. Replanting and Plant Establishments

No measurement for payment is made for any materials or work required under Subsection 700.3.06 and Subsection 700.3.07.

H. Temporary Grass

Temporary grass is measured for payment by the acre (hectare) according to Section 163.

I. Seeded Native Restoration Areas, Multitropic Native Planting Areas, Riparian Areas, Stream Restoration Areas, and Wetland and Stream Mitigation Areas

Seeded Native Restoration Areas, Multitropic Native Planting Areas, Riparian areas, Stream Restoration area, and Wetland and Stream Mitigation areas will be measured by the acre (hectare). and included under the pay item “Native Restoration and Riparian Seeding”.

700.4.01 Limits

General Provisions 101 through 150.

700.5 Payment

As grassing and planting progress, the Contractor will receive full measurement and payment on regular monthly estimates provided the work complies with the Specifications.

A. Permanent Grassing

Permanent grassing will be paid for at the Contract Price per acre (hectare), complete and in place. Payment is full compensation for preparing the ground, seeding, wood fiber mulch, polyacrylamide, and providing plant establishment, soil tests and other incidentals.

B. Straw or Hay Mulch

Straw or hay mulch required for Permanent Grassing will be paid for according to Section 163.

C. Fertilizer Mixed Grade

Fertilizer mixed grade will be paid for at the Contract Price per ton (megagram). Payment is full compensation for furnishing and applying the material.

D. Lime

Lime will be paid for at the Contract Price per ton (megagram). Lime used as filler in fertilizer will be paid for per ton (megagram). Payment is full compensation for furnishing and applying the material.

E. Nitrogen

Nitrogen will be paid for at the Contract Price per pound (kilogram) of nitrogen content. Payment is full compensation for furnishing and applying the material.

F. Sod

Sod will be paid by the square yard (meter) in accordance with the following schedule of payments. Payment is full compensation for ground preparation, including addition of topsoil, furnishing and installing live sod, and for Plant Establishment.

1. 70% of the Contract Price per square yard will be paid at the satisfactory completion of the installation.
2. 20% of the Contract Price will be paid upon satisfactory review of sod which is healthy, weed free and viable at the inspection made at the end of the first spring after installation.,.
3. 10% of the contract price will be paid upon satisfactory review of sod that is healthy, weed free and viable at the Final Acceptance.

G. Temporary Grass

Temporary Grass will be paid for under Section 163.

H. Seeded Native Restoration Areas, Multitropic Native Planting Areas, Riparian Areas, Stream Restoration Areas, and Wetland and Stream Mitigation Areas

Seeded Native Restoration Areas, Multitropic Native Planting Areas, Riparian areas, Stream Restoration area, and Wetland and Stream Mitigation areas will be paid for at the Contract Price per acre (hectare), complete and in place. Payment is full compensation for preparing the ground, seeding, and providing plant establishment and other incidentals and included under the pay item "Native Restoration and Riparian Seeding".

Payment will be made under:

Item No. 700	Permanent grassing	Per acre (hectare)
Item No. 700	Agricultural lime	Per ton (megagram)
Item No. 700	Fertilizer mixed grade	Per ton (megagram)
Item No. 700	Fertilizer nitrogen content	Per pound (kilogram)
Item No. 700	Sod	Per square yard (meter)

Item No. 700	Native Restoration and Riparian Seeding	Per acre (hectare)

700.5.01 Adjustments

General Provisions 101 through 150.

Section 701—Wildflower Seeding

701.1 General Description

This work includes preparing the ground, furnishing and planting wildflower and companion grass seeds, applying fertilizer, and applying lime, if necessary, to areas designated on the Plans.

701.1.01 Definitions

General Provisions 101 through 150.

701.1.02 Related References

A. Standard Specifications

Section 882—Lime

Section 890—Seed and Sod

Section 891—Fertilizers

B. Referenced Documents

General Provisions 101 through 150.

701.1.03 Submittals

General Provisions 101 through 150.

701.2 Materials

A. General

Use materials that meet the requirements of the following Specifications:

Material	Specification
Agricultural Lime	882.2.01
Companion Grass Seed	890.2.01
Fertilizers	891.2.01

B. Wildflower Seed

Use seed from the latest season’s crop.

Use seed that meets the minimum germination rates listed in the Wildflower Seeding Table with 98 percent seed purity and 0.5 percent weed seed. Proportion seed mixture according to the Wildflower Seeding Table.

Wildflower Seeding Table

Approx. % by Weight	Botanical Name	Common Name	% Germinantion
1.5	Achillea millefolium	White Yarrow	50
5.0	Centaurea cyanus	Cornflower	60
5.0	Chamecrista fasicu lata	Partridge Pea	N/A
10.0	Coreopsis lanceolata	Lance-leaved Coreopsis	40
10.0	Coreopsis tinctoria	Plains Coreopsis	65
5.0	Delphinium ajacis	Rocket Larkspur	60
5.0	Escholzia californica	California Poppy	60
5.0	Gaillardia aristata	Perennial Gaillardia	45
10.0	Gaillardia pulchella	Annual Gaillardia	45
2.5	Monarda citriodora	Lemon Mint	40
10.0	Nemonphila men ziesii	Baby Blue Eyes	70
1.0	Oenothera speciosa	Pink Primrose	N/A
2.0	Papaver rhoeas	Corn Poppy	60
10.0	Rubeckia hirta	Black-Eyed Susan	60
5.0	Salvia farinacea	Blue Sage	40
3.0	Solidago spp.	Goldenrod	N/A
10.0	Trifolium incarnatum	Crimson Clover	80
100% total mixplant at a rate of 12 lbs/acre (13 kg/ha)			

C. Companion Grass

Apply nurse or companion grass as follows:

Planting Season	Grass	Rate per Acre (Hectare)
October 1 to February 28	Tall Fescue	5 lbs (5.5 kg)

D. Fertilizer Mixed Grade

Select fertilizer mixed grade such as 10-10-10, 6-12-12, 5-10-15, or any other analysis within the following limits:

Nitrogen 5 to 10 percent, phosphorus 10 to 15 percent, and potassium 10 to 15 percent

701.2.01 Storage, Delivery, and Handling

Use seed delivered in original sealed packages bearing the producer's guaranteed analysis for percentages of species mixture, minimum germination rates, and purity of seed.

701.3 Construction Requirements

701.3.01 Personnel

General Provisions 101 through 150.

701.3.02 Equipment

Use approved mechanical seed drills, drop spreaders, and rotary spreaders to distribute seed.

701.3.03 Preparation

A. Planting Limits

Before preparing the ground, stake planting limits according to the Plans and as approved by the Engineer.

701.3.04 Fabrication

General Provisions 101 through 150.

701.3.05 Construction

A. Ground Preparation

Prepare the ground as follows:

1. Plow between 4 in to 6 in (100 mm to 150 mm) deep.
2. After plowing, thoroughly disk the area until pulverized, then smooth the surface.
3. Remove large clods, boulders, stumps, rocks, and other foreign particles that will interfere with the work and seedling growth.
4. Wait 2 weeks after preparation, then spray new growth with 1 gal per acre (9 L per hectare)of Roundup™ herbicide.
5. Wait at least 10 days before proceeding.

B. Application of Lime and Fertilizer Mixed Grade

Apply lime and fertilizer as follows:

1. Lime

   Uniformly spread agricultural lime on the ground at the approximate rate determined by the Engineer. If the pH is 6.0 or higher, no lime is required.
2. Fertilizer Mixed Grade

   Spread the fertilizer, mixed according to Subsection 701.2.D, uniformly over the ground at approximately 200 lbs/acre (225 kg/ha).
3. Mixing

   Before doing further work on the area, blend the lime and fertilizer uniformly into the top 4 in (100 mm) of soil using harrows, rotary tillers, and other equipment approved by the Engineer.

C. Seeding

Weather permitting, sow seed within 24 hours of applying the fertilizer and lime to the seed bed as follows:

1. Sow seed uniformly according to the rate specified in Subsection 701.2.B. Use approved mechanical seed drills or mix seed with dry sand and spread it with either a drop spreader or rotary spreader.
2. Cover the seed to no more than 1/8 in (3 mm) deep.
3. After seeding, roll the area with a cultipacker or similar equipment to ensure good soil contact for seedling germination.

D. Mulching

After rolling the seed bed, apply 1 ton per acre (2 Mg per hectare) of wood fiber mulch.

701.3.06 Quality Acceptance

A. Replanting

The Engineer may require replanting an area that shows unsatisfactory growth.

Except as otherwise specified by the Engineer, prepare replanting areas the same as the initial planting with the following exception:

- Use a soil test or the Engineer's guidance to determine the fertilizer type and application rate, then furnish and apply the fertilizer.

B. Providing Growth and Coverage

Ensure that wildflower growth and coverage conforms with the intent of the Contract for the vegetation, except for seed not expected to germinate and show growth at that time.

Ensure that vegetation shows a satisfactory visible growth with no bare spots larger than 1 ft^2 (0.1 m^2). Bare spots shall be infrequent, comprising no more than 1 percent of a given area.

701.3.07 Contractor Warranty and Maintenance

A. Plant Establishment

Preserve, protect, water, reseed or replant, and perform other work as necessary to keep the wildflower areas in satisfactory condition.

B. Watering

Keep planted areas moist for 4 to 6 weeks during seedling germination and development.

Following initial growth, water the wildflower areas enough to promote maximum growth.

C. Mowing

Mow once a year in late fall after seedheads have matured. Avoid damaging desirable vegetation.

701.4 Measurement

A. Wildflower Seeding

The number of acres (hectares) completed according to the above requirements and accepted by the Engineer is measured for payment.

B. Wood Fiber Mulch

Mulch furnished and applied is not measured separately.

C. Water

Water furnished and applied to promote a satisfactory growth is not measured for payment.

D. Agricultural Lime

Lime is measured by the ton (megagram).

E. Mixed Grade Fertilizer

Fertilizer is measured by the pound (kilogram).

701.4.01 Limits

Work required under Subsection 701.3.06 and Subsection 701.3.07 is not measured for payment.

701.5 Payment

Wildflower seeded areas will be paid for as follows:

A. Wildflower Seeding

When plants are satisfactorily planted, 80 percent of the Contract Unit Price bid per acre (hectare) will be paid on the next estimate.

Until Final Acceptance, perform required maintenance according to Subsection 701.3.07 when necessary or as ordered by the Engineer.

At Final Acceptance, the remaining 20 percent will be paid. Payment is full compensation for preparing ground, providing wildflower and companion grass seed, applying seed, watering, mulching, and establishing plants.

B. Mixed Grade Fertilizer

Fertilizer will be paid for at the Contract Price per pound (kilogram). Payment is full compensation for furnishing and applying the material.

C. Lime

Lime will be paid for at the Contract Price per ton (megagram). Payment is full compensation for furnishing and applying the material.

Payment will be made under:

Item No. 701	Wildflower seeding	Per acre (hectare)
Item No. 701	Fertilizer mixed grade	Per pound (kilogram)
Item No. 701	Agricultural lime	Per ton (megagram)

701.5.01 Adjustments

General Provisions 101 through 150.

Section 702—Vine, Shrub, and Tree Planting

702.1 General Description

This work includes furnishing and planting vines, shrubs, trees and plants, treating regenerated areas, and environmental mitigation planting for riparian buffers and tidal marsh areas.

702.1.01 Definitions

General Provisions 101 through 150.

702.1.02 Related References

A. Standard Specifications

Section 108—Prosecution and Progress

Section 214—Mitigation Site Construction

Section 700—Grassing

Section 882—Lime

Section 891—Fertilizers

Section 893—Miscellaneous Planting Materials

B. Referenced Documents

Standardized Plant Names

ANSI A300 Part 1 Pruning Standards

ANSI Z60.1 American Standards for Nursery Stock

702.1.03 Submittals

A. Certificates of Inspection

Submit certificates of inspection with the invoice for each shipment of plants as required by law for transportation.

File certificates with the Engineer before the material is accepted. Plants may be rejected at the site regardless of Federal or State government inspections at the place of growth.

B. Substitutions

When both primary and alternate plants are specified, use the alternate only after providing written proof that the primary plants specified are not available. In this case a Supplemental Agreement is not required to use the alternate plants.

When a primary or an alternate plant cannot be furnished, provide the Engineer written proof that neither is available. A Supplemental Agreement is required for substitute plants in this case.

Use approved substitute plants, as designated by the Engineer, equal in value to specified plants. Request substitutions at least thirty (30) days before the end of the planting season in the area.

702.2 Materials

Ensure that materials meet the requirements of the following Specifications:

Material	Section
Water	700.2.B
Agricultural Lime	882.2.01
Fertilizers	891.2.01
Plant Topsoil	893.2.01
Landscape Mulch	893.2.02
Vines, Shrubs, Trees, and Miscellaneous Plants	893.2.03
Tree Paint	893.2.06
Prepared Plant Topsoil	893.2.07
Stakes	893.2.08
Organic Soil Additives	893.2.09

A. Plant Specifications

Furnish plants according to the plant name and Specifications included on the plan sheets.

1. Plant Names

Ensure that the botanical and common names of plants specified conform to the most current edition of Standardized Plant Names, as adopted by the American Joint Committee on Horticultural Nomenclature.

2. Plants should be clearly labeled at the nursery. Labels should remain on the plants until inspected by the engineer.
3. Grades

   Ensure that plants meet the grade requirements of the most current American Nursery and Landscape Association ANSI Z60.1 and any other requirements.

   Caliper used for establishing plant grades or trunk sizes is measured according to the American Nursery and Landscape Association ANSI Z60.1. Plant trees with straight stems and symmetrical branches according to their natural growth. Trees with broken or damaged terminal or main stems will be rejected. There shall be a single dominant leader to the top of the all large canopy shade trees. There can be a double leader in the top 10% of the tree height.

   Trees should be rooting into the root ball so that soil or media remains intact and trunk and root ball move as one when lifted, but not root bound. The trunk should bend when gently pushed and should not be loose so it pivots at or below the soil line.

   There shall be no roots greater than 1/10 diameter of the trunk circling more than one-third the way around in the top half of the root ball. Roots larger than this may be cut provided they are smaller than one-third the trunk diameter.

   The leaf-bearing crown should be full and uniform. Leaves should show no evidence of chlorosis, necrosis, disease or insect infestation.

B. Bare root seedlings

Use nursery-grown bare root seedlings which are a minimum of three (3) feet (1 meter) in height above the ground with a 1/4 inch (6.35mm) caliper, and a minimum primary root length of five inches (5) unless specified differently on the plan drawings.

Use approved substitute plants, as designated by the Engineer, equal in value to specified plants. Request substitutions at least 30 calendar days before the end of the planting season in the area. Wet swale bare root *Juncus effuses* shall be fresh divisions with a full, dense root base.

C. Nursery Plants

Unless otherwise specified, use plants stock-grown in a licensed nursery under intensive care and cultivation for at least one year. The largest branches of shade trees should be spaced at least 6 inches apart. The branch system shall be normally developed and free of disease, injurious insects, disfiguring knots, sun-scald, injuries, bark abrasions, dead or dry wood, broken terminal growth, or other disfigurements. Stems should show no evidence of die-back. Ensure that proper certificates of inspection and a complete list of the nursery growers accompany nursery grown plants. See Subsection 893.2.03.

D. Approval and Selection of Materials and Work

Select materials and execute operations required under the Specifications and drawings with the approval of the Engineer. Remove rejected materials from the site promptly.

702.2.01 Delivery, Storage, and Handling

A. Bare-Rooted Plants

Protect bare root plants from drying out until planted. Uncovered roots without moisture-loss gel coating shall be exposed to air no longer than 15 minutes.

B. Balled and Burlapped Plants (B&B)

1. Burlap shall be a natural biodegradable material. Do not use synthetic burlap.
2. Replace plants rejected because of broken or loose balls, or balls of less diameter than that specified.

3. Protect the roots of balled and burlapped plants from moisture loss, unless they are planted immediately after they are delivered.
4. Plants shall be harvested with the ball of earth in which they are growing intact.

C. Container-Grown Plants

Keep container-grown plants moist but well drained until planted. Handle plants by the container or soil ball and not by the top growth.

D. Heeled-in Plants

Properly maintain heeled-in plants until they are planted. Do not allow plants to remain heeled-in over the summer or for over 30 days without the Engineer's consent.

E. Injury Prevention

Injured plants will be rejected. Protect tops of shrubs and trees while in transit to prevent windburn.

F. Live Willow Stake Material

Live stakes shall be moistened, capable of rooting, without injury and stripped of all stems and leaves with a minimum of scarring. The stakes shall be from 5 to 8 feet (1.5m to 2.4m) in length with a basal end of 0.5 to 1.5 inches (1.27cm to 3.8cm) in diameter. The top ends shall be blunt and cut square and the butt ends angled.

702.3 Construction Requirements

702.3.01 Personnel

General Provisions 101 through 150.

702.3.02 Equipment

General Provisions 101 through 150.

702.3.03 Preparation

A. Inspect Plant Material before Digging

The Engineer will inspect trees or plants from the bidder's source for acceptability and conformity to specification requirements for approval by the Engineer. When rejecting the trees or plants, the Engineer reserves the right to pursue and examine other sources of plants to find acceptable specimens. This change will not constitute an increase in cost to the State.

B. Clear and Grub

Clear and grub the planting area before planting or beginning to prepare the plant bed, unless noted differently on the plans. See Section 201.

C. Prepare Plant Bed

Prepare for planting as follows:

1. Planting Limits

   Stake planting limits according to Plan details and the Engineer. Have the Engineer approve the method of plant identification before planting.

   For median plantings, keep any woody plant a minimum of 3 feet (1m) from the edge of the plant bed to avoid vegetative growth into the roadway.

For stream buffers identified as “Stream Buffer” or “wet swales”, on plans, the plant species shall be planted in a random, intermixed manner throughout the entire planting area. At the edges of the planting zone, keep new plants a minimum of 8 feet (2.4m) from existing trees or permanent structures.

2. Applications of Soil Additives
   a. Apply fertilizer and lime to the plant bed according to the soil test report.
   b. Spread an organic soil additive, (See Subsection 893.2.09), evenly throughout the designated area to at least 2 in (50 mm) deep. Thoroughly dig it into the soil to at least 6 in (150 mm) deep using a rotary hoe type tiller or other equipment that evenly mixes the soil, lime, fertilizer, and organic soil additive.
   c. Till the area until the surface is smooth and free of weeds, roots, rocks, and other debris, to the satisfaction of the Engineer.
   d. If the planting area lies within a multitrophic native planting area, stream buffer, wetland, wet swale, or marsh the addition of fertilizer or lime is prohibited.

702.3.04 Fabrication

General Provisions 101 through 150.

702.3.05 Construction

A. Seasonal Limitations for Planting

For geographic seasonal limitations, refer to the Planting Zones Map found in Subsection 700.3.05. Plant in Zones 1 and 2 between October 15 and March 15. Plant in Zones 3 and 4 between November 1 and January 1.

B. Planting Operations

Plant using the method called for on the details and plan sheets. Before beginning planting of each area, have available the necessary materials including prepared plant topsoil (see Subsection 893.2.07), water, stakes, and mulch. Plants shall be installed as straight/upright as possible. Any plants found to be leaning or broken will not be accepted or paid for by the engineer.

When seasonal limitations and weather conditions permit, continuously water, mulch, guy, provide tree guards, and stake as indicated on the plans and details until completing the last operation.

After completing planting, provide a method for retaining water adjacent to the plant according to the details shown on the Plans or as directed by the Engineer.

Protect marsh restoration areas from vehicles and machinery. Typical protective barriers are not to be used in tidal areas. Stakes that remain secure and are taller than the highest tide, flagged with highly visible flagging tape, are required to mark the area to be protected and off-limits for vehicles and machinery.

1. Planting By the Pit Method
   a. Placing Bare-Rooted Plants

      Plant bare-rooted plants delivered to the pit area. Protect roots from drying out until placing them in the pit.

      1. Center plants in pits and spread roots as they originally grew.
      2. Cover and prepare the topsoil according to details shown on the Plans.

   b. Placing Balled and Burlapped Plants

      Immediately plant these plants after they are delivered to the pit site.

      1. The pit diameter shall be a minimum of 3 times the diameter of the rootball. Center the ball in the prepared pit, leaving the top of the ball 1 in (25 mm) above the top of the ground for settlement.
      2. Cut away and remove the top 1/3 of burlap from the rootball. Cut all ropes and twine, pull the nails, and drop the remaining burlap to the bottom of the hole. Cut away and remove all wire from the root ball.
      3. Partially fill the pit with prepared plant topsoil and compact the soil enough to hold the ball firmly. Add mycorrhizal innoculant to plant topsoil if specified in plans.

c. Placing Container-Grown Plants

When the container is delivered to the pit site, split the container from top to bottom and carefully remove the plant.

1. The pit diameter shall be a minimum of 3 times the diameter of the rootball. Spread into the hole any major roots growing around the container or prune them to remove any circular growth.
2. Place the ball in the center of the prepared pit, leaving the top of the ball 1 in (25 mm) above the top of the ground for settlement.
3. Partially fill the pit with prepared plant topsoil and compact the soil enough to hold the ball firmly. Add mycorrhizal innoculant to plant topsoil if specified in plans.

d. Completing Pit Plantings

After placing pit plantings, water plants thoroughly the same day regardless of weather or soil moisture conditions.

1. After the water has soaked in, add prepared plant topsoil and compact firmly up to 2 in (50mm) below the adjacent ground.
2. Stop compacting when the compacted prepared topsoil is 2 in (50 mm) below the adjacent ground.
3. Fill the remainder of each pit with loose, prepared plant topsoil according to the details shown on the Plans.
4. Prepare the loose topsoil to retain water adjacent to the plant according to the Plans or as directed by the Engineer.

e. Live Stake Plantings

1. Plant live willow stakes at four (4) ft (1.2m) intervals or as indicated on the drawings with the buds facing upward.
2. Eighty (80) percent of the stake shall be installed below ground, leaving twenty (20) percent extending above ground.
3. Stakes shall be placed deep enough to reach the water table during the dry season at an angle perpendicular to the slope.
4. Pack soil firmly around the hole after installation.
5. Install live willow (*Salix spp.)* stakes only in the dormant season, according to the planting details and landscape plan notes.
6. Replace any live stakes that split during installation.

2. Planting using a Dibble, Hoedad, or Reinforced Planting Shovel for Wet Swale and Bare Root Seedlings.

Planting shall only be done when there is adequate moisture in the ground and when the ground is not frozen.

Provide proper root positioning and contact with the soil, and eliminate all air pockets around roots. Roots of seedlings shall not be pinched or bent in a sideways or upturned direction.

Each tree, division, or seedling shall be inserted into the hole such that the root collar of the tree will be at ground level after backfilling is complete. Allowance for burying the root collar below ground level shall not exceed one-half inch in depth. In no case shall planting result in the root collar remaining above ground level. The soil back-filled around the root system shall be compacted sufficiently to support the plant. Mow or use a string trimmer to a height of 1 in (25 mm) in the area designated for restoration. Do not trim wet swales or retention basins where standing water is present.

Grass the area designated for restoration with a native restoration or riparian seed mix and apply wheat straw mulch to the area before planting seedlings.

Plant within 48 hours after mowing or string trimming the site.

3. Restoration and enhancement of tidal marsh areas are subject to possible wave energy, requiring the use of a plant anchor for each plant. See planting plan sheets and details for plant anchor and anchoring descriptions.

C. Landscape Mulching

1. For Pit Plantings

Follow these requirements when mulching for pit plantings:

a. Where the distance between plants is 8 ft (2.4 m) or less, spread mulch throughout and 3 ft (900 mm) beyond the outermost plants. Where plants are more than 8 ft (2.4 m) apart, apply mulch in a circular fashion around each plant, forming a ring 5 ft (1.5 m) in the outside diameter.

b. If plant pits are greater than 5 ft (1.5 m) in diameter, ensure that the mulch extends out to cover the berm as shown in the planting details on the Plans.

c. Apply mulch within 3 days of planting at least 4 in (100 mm) in depth to obtain a compacted depth of at least 3 in (75 mm).

d. Compaction occurs naturally. Check compaction at least two months after spreading and exposing the mulch to the elements.

e. If the compacted depth is less than 3 in (75 mm), apply additional mulch to deficient areas within 1 month following notification.

f. Apply mulch to a uniform depth and remove lumps for a neat appearance. Tuck mulch neatly against all paving edges, drainage structures, and where planting beds meet grassed areas.

g. Leave a 1 in (25 mm) to 2 in (50 mm) ring of non-mulched area directly around all tree trunks.

h. Do not mulch with Cypress Mulch.

2. For Plantings using a Dibble, Hoedad, or Reinforced Shovel

   Apply landscape mulch according to Subsection 702.3.05.C.1 with the following exceptions:

   a. Apply mulch before planting.

   b. Use only wheat straw mulch in restoration areas.

   c. Ensure that the mulch coverage is open enough to allow seed germination to take place and dense enough to conserve moisture in the seed bed.

3. For Native Multitrophic or Stream Buffer Restoration Planting Areas, wheat straw shall be the only types of mulch used.

4. Do not use mulch in a tidal marsh area. Do not mulch wet swale or retention ponds where standing water is present.

D. Wrapping

Do not wrap the trucks of tree unless specified in the plans. When wrapping is specified, tightly wrap the trunks of deciduous trees over 1.25 in (32 mm) in caliper. Wrap in strip burlap or waterproof crepe tree wrapping paper or other approved materials.

1. Begin wrapping at the ground and extend spirally up and beyond the first rosette of branches with an overlap of one half the width of the wrapping material.

2. Tie the wrapping material securely with binder twine spaced every 12 in (300 mm) for the full length of the wrapping. Wrap immediately after planting.

E. Staking and Guying

1. Do not use staking and guying unless specified in the plans or details.

2. Perimeter Staking

3. Place perimeter stakes 2 in x 2 in x 36 in (50 mm x 50 mm x 900 mm). Stake the perimeter of indicated regenerated areas within specified planting dates according to the Plans or as directed by the Engineer. Keep staking for tidal marsh areas secured with supports taller than the highest tide with highly visible flagging tape to mark the area as off-limits for vehicles and machinery.

4. Vine, Shrub, and Miscellaneous Plant Staking

5. Use stakes to identify isolated vines, shrubs, and miscellaneous plants outside of solid mulched beds according to Plan details.

6. Tree Staking and Guying

7. Stake trees using a system that will prevent trees from leaning or tilting and keep the root ball stable until the roots become anchored. The system should allow the top some movement and flexibility without damaging the tree.

F. Pruning

1. Prune plants on the site before planting and after initial inspection by the Engineer as needed for the health of the plant. Never prune severely to get plants to meet Specifications.
   a. Follow ANSI A300 Part 1 standards and use approved tools designed for pruning.
   b. Lopping, topping, or shearing trees or shrubs is not permitted.
   c. Prune back damaged, scarred, frayed, split, and skinned branches, limbs, and roots to live wood nearest to the next sound, outside lateral bud, branch, limb, or root.
   d. Leave the terminal leaders or buds in trees intact.
   e. Prune roots, when necessary, as directed by the Engineer.
   f. Prune Crape Myrtles to maintain natural form only. Severely cutting back or stump pruning crape myrtles is not permitted. Remove sucker growth from Crape Myrtles.
   g. Damaged, scarred, frayed, split and skinned branches, limbs and roots shall be pruned back to live wood nearest to the next viable outside lateral bud, branch, limb or root.

G. Watering

1. Apply water in a manner to prevent erosion. Water plants deeply and thoroughly at the time of planting. Water after applying fertilizer called for in Subsection 702.3.05.H and as necessary to maintain enough moisture to promote plant growth. Use water reservoir bags if specified in plans or details.
   a. Apply enough water to wet the soil to a depth slightly below the roots. Direct the water to the ground around the plant, not the tops.
   b. Do not allow plant foliage to dry out or plants to defoliate from lack of water. Remove plants in such condition from the site immediately. Apply supplemental watering to maintain vigorous growth and to keep plants moist and as directed by the Engineer.
   c. Apply water once per week throughout the planting season in which the plants are installed. Follow Subsection 702.3.07.B and 702.3.07.C for shrub and tree watering requirements throughout the life of the project.

H. Spring Application of Fertilizer

1. Method and Rate of Application

   Follow these requirements when applying fertilizer in the spring:

   a. Trees

      Apply a slow-release fertilizer according to soil test results. Assume 8-12-12 with a rate of 1 cup (0.25 L) per caliper inch of tree for bidding purposes.

   b. Shrubs and vines

      Fertilize shrubs according to soil test results with a slow release fertilizer by spreading fertilizer around the base of the plant and working it into the soil by hand. Assume 6-12-12 with a rate of 0.5 cup (0.12 L) per foot of shrub height for bidding purposes.

      Bed Areas

      Spread fertilizer on bed areas (defined by method of planting in Subsection 702.3.05.B), over the mulch according to soil test results. Assume 3 lbs/100ft2 of 6-12-12 for bidding purposes. Thoroughly water in the plants.

   c. Native Restoration or Stream Buffer Areas

      The addition of fertilizer or lime is prohibited within the native restoration or stream buffer planting areas.

   d. Tidal March Areas

      The addition of fertilizer or lime is prohibited within marsh areas.

2. Time of Spring Fertilizer Application

Apply fertilizer in the spring in Zones 1 and 2 (with reference to the Planting Zones specified in Subsection 702.3.05.A) between April 1 and April 15. Apply between March 15 and April 1 for Zones 3 and 4.

For late plantings, do not apply fertilizer less than 30 days after the plantings.

3. Additional Fertilizer

Approximately one month after the spring fertilizer is applied; the Engineer will inspect planted areas and determine if an additional application of fertilizer is needed for any plant or group of plants.

If the Engineer determines additional fertilizer is required, apply fertilizer according to soil test results between June 15 and July 15th.

I. Tree Guards for Stream Buffer Saplings

Each planted bare root, sapling-sized plant shall be fitted with a tree guard to protect the saplings from wildlife browsing. The tree guards shall be at least 36 inches tall, with appropriately sized wooden stakes or bamboo to securely support the tree guard [i.e., a 4-foot (1.2 meter) stake for a 36 inch (914.4 mm) guard]. Mesh tube-type tree guards are required. Vexar tubes, or equivalent, are to be used. All tree guards shall be removed from the saplings at final inspection**.**

J. Restoration and Cleanup

Restore areas where existing grass has been damaged or scarred during planting operations at no expense to the Department. Restore the disturbed areas to their original conditions as directed by the Engineer. Clean up debris, spoil piles, and containers and leave the Project area clean.

Clean up and remove all debris, spoil piles, containers, water reservoirs, trash, etc. and leave the project area in an acceptable condition. Inspect all installed erosion control devices weekly and clean out or repair as required. Remove all erosion control devices at final acceptance unless otherwise instructed by the Engineer.

702.3.06 Quality Acceptance

Preserve the plants in a healthy growing condition and keep plants moist, particularly during drought conditions (no rain for any two week period). The acceptability of the plant material planted and maintained as specified will be determined at the end of an establishment period.

The plant establishment period is the period from the last planting specified in Subsection 702.3.05.B until the following October 1. Plant all plants in one planting season unless otherwise approved by Engineer.

A. First Establishment Period

At the end of the first planting season, the first establishment period begins. The Department will make the first semi-final inspection 30 days before the end of the first establishment period. Replace dead, dying, diseased, unsatisfactory, and missing plants, by January 20 of the next (second) planting season. For stream buffer areas, all replacement plants shall be tagged with 18 inch (457.2 mm) lengths of brightly-colored survey tape. Tree guards shall be placed around all replacement saplings. All costs for replanting, tagging and tree guards for replacement trees shall be included in the contract price bid for the original planting.

B. Second Establishment Period

At the end of the second planting season, the second plant establishment period begins. The Department will make the second semi-final inspection 30 days before the end of the second establishment period. Again, replace dead, dying, diseased, unsatisfactory, and missing plants, by January 20 of the next (third) planting season. For stream buffer areas, all replacement plants shall be tagged with 18 inch (457.2 mm) lengths of brightly-colored survey tape. Tree guards shall be placed around all replacement saplings. All costs for replanting, tagging and tree guards for replacement trees shall be included in the contract price bid for the original planting.

C. Final Inspection

The Department will make the final inspection of the plants during May, following any needed replacements during the previous planting season. Assume responsibility for the plants until the Final Acceptance of the Project or a portion of the Project.

702.3.07 Contractor Warranty and Maintenance

Project maintenance includes, but is not limited to, watering, cultivating, weeding, pruning, repairing, adjusting guys and stakes, and performing other work as ordered by the Engineer until final acceptance.

Promptly remove from the Project area dead plants or those that no longer conform to the requirements of Subsection 702.2.A.2.

Mow the entire right-of-way within the limits of the Project up to a maximum of four times per calendar year. Do not mow native restoration areas, wet swales, or riparian mitigation sites.

A. Leaning Trees

Straighten leaning trees as directed by the Engineer. Follow Staking and Guying requirements for replacements or repairs as per Subsection 702.3.05.E.

B. Shrub Maintenance

1. Pruning

   Prune dead or diseased limbs to provide for plant health and appearance as directed by the Engineer.

2. Landscape Mulching

   Continuously maintain shrub and tree beds with a clean, freshly mulched appearance using the mulch originally specified. See Subsection 702.3.05.C. Do not mulch shrub and tree beds within riparian mitigation sites.

   a. Apply a 2 in (50 mm) loose layer of specified mulch (top-dressing) on top of all areas, including tree pits, initially mulched, at the following times:
      1. In August, during the first plant establishment period.
      2. In April, during the second plant establishment period.
      3. In August, during the second plant establishment period.
      4. In April, prior to the final inspection.

3. Applying Fertilizer

   See Subsection 702.3.05.H.

4. Applying Pesticides

   a. Inspect all planted or seeded vegetation for insects, grubs, mites, diseases, etc., once every two weeks. Apply insecticides, fungicides, and herbicides according to the manufacturer's recommendations to effectively control or eradicate the problem.

   b. Perform all pesticide applications under the direct supervision of a trained licensed commercial pesticide operator whose license includes subcategory 27 – Right of Way Pest Control. Carry the pesticide license/certification on the work site during applications. Carry all labeling associated with the chemical being applied at the work site.

   c. Submit all product information data sheets and EPA approval numbers on all pesticides proposed to be used prior to application for approval.

   d. Notify the Engineer a minimum of 48 hours prior to any and all pesticide applications.

   e. Add a blue dye to all spray applications unless approved otherwise by the Engineer.

   f. Monitor the weather and spray under proper weather conditions. Spraying shall not occur when the weather is greater than 10 miles per hour.

   g. Wear the proper safety attire. Wear long sleeve shirts, long pants, gloves, and safety glasses. Wear or use any additional protective safety attire or gear as recommended by the product's manufacturer.

   h. Repair any damage that is a result of mishandling or misuse of materials, at no expense to the Department, to the satisfaction of the Engineer.

   i. For stream buffer and marsh restoration areas, pesticides are not to be used unless approved by the Department Ecology Manager.

5. Edging
   a. Edge all shrub pits, shrub beds, and tree pits once a month throughout the life of the project such that the vee-cut edging detail specified on the plans is maintained. Prevent grass and weeds from growing over or into the shrub beds and tree pits.
   b. Use equipment specifically designed for edging. Line trimming equipment shall not be used.
6. Watering
   a. Check all planted material once a week throughout the contract for dryness by removing the mulch from their base and "sampling the soil" approximately 4 in (100mm) deep. Water if the soil is not moist.
   b. Water all planted material if a drought (no rain for two weeks) occurs. Provide the water required to meet the watering requirements.
   c. Water each plant thoroughly until the ground is saturated to a depth slightly below the root ball. Apply water in a manner to prevent erosion.
7. Weed Control

   Perform weed control throughout the project, a minimum of once every two weeks, in all areas within the project limits to maintain tree pits, shrub beds, sidewalks, curb and gutter, walkways, ditch paving, concrete medians, and other pavement weed free. Meet the following conditions:
   a. Perform weed control to prevent weeds from becoming established, setting seed, or from becoming visible in the planting beds.
   b. Completely remove all undesirable plants (weeds) by hand pulling. Removal of weeds may be accomplished using herbicides if approved by the Engineer. However, the use of herbicides is prohibited in stream buffer areas unless approved by the Department Ecology Manager.
   c. Apply an approved pre-emergent herbicide twice each year, once in the spring and once in the fall, throughout the contract. The use of pre-emergent herbicides is prohibited in stream buffer areas. Apply pre-emergent to all shrub beds and tree pits. Notify the Engineer 48 hours prior to spraying. Use a blue dye in all applications unless approved otherwise by the Engineer.
   d. Eradicate all invasive exotic pest plants found within the project limits throughout the life of the project, including stream buffer and marsh areas. Volunteer, non-invasive plant material within stream buffer restoration areas is acceptable.
   e. Dispose off site on a daily basis all weed, exotic plants, clippings, litter, and debris generated.
8. Policing

   Remove debris such as paper, broken limbs, bottles, cans, etc., a minimum of the first and third week of each month from all areas within the project limits while maintaining the site.
9. Mitigation Areas

   Pruning, mulching, edging, and applying spring fertilizer are not required within wet swales, native restoration areas, stream buffers and regenerated forest areas.

C. Tree Maintenance

1. Watering

   See Subsection 702.3.07.B.6
2. Landscape Mulch

   See Subsection 702.3.07.B.2
3. Fertilizer

   See Subsection 702.3.05.H.
4. Abnormal Conditions

   Periodically (once every two weeks) observe trees and shrubs for abnormal conditions such as insects, borers, web worms, red spiders, etc., and immediately treat.
5. Sucker Growth

Remove sucker growth once a month. Sucker growth is the shoots that sprout out around the base of the tree trunk.

6. Pruning and Deadwood

   Remove deadwood at least two times a year. Prune dead branches. Paint cuts, and wounds or scars with tree paint only when specified in the plans. Do not top Crape Mrytles. See Subsection 702.3.05.F.

7. Pesticide Control

NOTE: Apply pesticides as necessary to control harmful insects and diseases. Follow the manufacturer's instructions. See Subsection 702.3.07.B.4**. NOTE: Use chemicals according to Federal, State and county directives on environmental control that carry an EPA approval number.**

8. Weed Control

   See Subsection 702.3.07.B

9. Staking and Guying

   Remove all support guy wires, strapping and stakes from plants which have gone through one complete growing season.

702.4 Measurement

A. Plants

Plants of the name and size specified are measured for payment according to the number planted that are still living and viable and in an acceptable condition at the time of Final Acceptance. A viable plant must have a minimum of 75 percent of the leaf-bearing crown with healthy foliage.

B. Fertilizer

Spring application fertilizer applied to planted and regenerated areas will be the actual number of pounds (kilograms) placed and accepted. Fertilizer, lime, and plant topsoil used in prepared plant topsoil or plant bed preparation are not measured for separate payment. For stream buffer and marsh areas, the addition of fertilizer or lime is prohibited.

C. Perimeter Stakes

Perimeter stakes is not measured for payment unless such item is shown as a separate Pay Item in the Proposal.

D. Clearing and Grubbing

Clearing and grubbing is not measured for payment unless the Item is shown as a separate Pay Item in the Proposal.

E. Landscape Mulch

The quantity of landscape mulch and top-dressing measured for payment will be the actual number of square yards (meters) completed as specified and accepted. The presence of weeds or other growth, or foreign material, will be cause for rejection.

702.4.01 Limits

General Provisions 101 through 150.

702.5 Payment

A. Plants

Plants measured for payment will be paid for as follows:

1. After planting satisfactorily, the Department will pay 50 percent of the Contract Unit Price bid per each on the next estimate.

2. Until Final Acceptance, perform all required maintenance according to Subsection 702.3.07 when necessary or as ordered by the Engineer.

   If the Contractor fails to properly maintain the landscaping, daily charges shall be assessed against any money due or that may become due the Contractor in accordance with the schedule of deductions shown in Subsection 108.08, but not less than $150 per calendar day, and will continue until project maintenance is approved by the Engineer.

   The charges are in addition to those specified for delay or failure in completing the Work within the specified time.
3. After the first semi-final inspection, the Department will pay 15 percent of the Contract Unit Price bid per each of the live, viable plants.
4. After the second semi-final inspection, the Department will pay 15 percent of the Contract Unit Price bid per each of the live, viable plants.
5. At Final Acceptance, the Department will pay the remaining 20 percent less the Full Contract Unit Price bid per each plant not accepted.

   Payments are full compensation for furnishing, planting, replanting as required, pruning, staking, guying, soil conditioning, and preparing plant beds, including applying additives, digging plant pits, preparing plant topsoil and mulch, disposing of waste material, and maintaining the plants during the plant-establishment period.

B. Fertilizer

All grades of fertilizer applied in the spring, measured as specified above, are paid for at the Contract Price per pound (kilogram) or per ton (megagram), whichever is indicated in the Proposal. Payment is full compensation for furnishing and applying and for watering regenerated areas.

For native restoration, stream buffer and marsh restoration areas, the addition of fertilizer or lime is prohibited.

C. Perimeter Stakes

Perimeter stakes will not be measured for payment. The cost will be included in the overall contract price.

D. Landscape Mulch

Landscape mulch measured for payment will be paid for as follows:

1. After mulching satisfactorily, the Department will pay 40% of the Contract Unit Price bid per square yard (meter).
2. After satisfactorily completing mulch (topdressing) in August of the first plant establishment period, the Department will pay 15% of the Contract Unit Price bid per square yard (meter).
3. After satisfactorily completing mulch (topdressing) in April of the second plant establishment period, the Department will pay 15% of the Contract Unit Price bid per square yard (meter).
4. After satisfactorily completing mulch (topdressing) in August of the second plant establishment period, the Department will pay 15% of the Contract Unit Price bid per square yard (meter).
5. After satisfactorily completing mulch (topdressing) in April of the final planting season, (a month before the Final Inspection), the Department will pay 15% of the Contract Unit Price bid per square yard (meter). Such payment shall be full compensation for furnishing, installing, topdressing, and maintaining mulch as required.
6. Do not mulch marsh restoration areas.
7. Do not apply additional applications of mulch after the initial application in stream buffer restoration areas.

Payment will be made under:

Item No. 702	Plant Name and Size	Per each
Item No. 702	Fertilizer, Spring Application	Per ton (megagram)
Item No. 702	Landscape Mulch	Per square yard (meter)
Item No. 702	Spring Application Fertilizer	Per pound (kilogram)

Item No. 702	Live Stakes and Planting	Per each
Item No. 702	Perimeter Stakes	Per each
Item No. 702	Bare Root Seedling Planting	Per each

702.5.01 Adjustments

General Provisions 101 through 150.

Section 703—Tree Wells, Tree Walls, and Root Protection

703.1 General Description

This work includes protecting the root systems of selected trees and shrubs with retaining walls, tree wells, and porous material.

703.1.01 Definitions

General Provisions 101 through 150.

703.1.02 Related References

A. Standard Specifications

Section 607—Rubble Masonry

Section 834—Masonry Materials

Section 842—Clay Pipe

Section 893—Miscellaneous Planting Material

B. Referenced Documents

General Provisions 101 through 150.

703.1.03 Submittals

General Provisions 101 through 150.

703.2 Materials

Use materials that meet the requirements of the following Specifications:

Material	Section
Mortar and Grout	834
Masonry Stone	834
Clay Underdrain Pipe	842.2
Clay Drain Tile	842.2
Porous Material	893.2.05
Tree Paint	893.2.06

703.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

703.3 Construction Requirements

703.3.01 Personnel

General Provisions 101 through 150.

703.3.02 Equipment

General Provisions 101 through 150.

703.3.03 Preparation

General Provisions 101 through 150.

703.3.04 Fabrication

General Provisions 101 through 150.

703.3.05 Construction

A. Excavating and Filling Foundations

Avoid unnecessarily injuring root systems when excavating for tree wells and tree walls.

Excavate and fill foundations to these requirements:

- To the elevations shown on the Plans or as directed
- To the full widths and lengths of footings shown on the Plans

Where the soil under tree wells or tree walls is unstable, backfill the foundation area with broken stone, coarse gravel, or other approved material and firmly tamp it.

Ensure that foundations firmly and uniformly support masonry.

B. Constructing Masonry

Build the tree wells and tree walls from rubble masonry according to Plan details. Use rubble masonry according to Section 607.

C. Providing Drainage

Provide adequate well drainage using weep holes, pipe drains, drain tile, or porous material as shown on the Plans.

D. Protecting Tree Roots

Where tree root protection is required, spread porous material loosely to the extent and depths indicated on the Plans, or as directed by the Engineer. Before spreading porous material, clean the tree root protection area of vegetation. Before backfilling over a tree or plant that will be preserved, place porous material above its roots.

E. Damaging Plants

Avoid cutting roots or damaging trees and shrubs while building tree wells and tree walls and placing the porous material to protect the roots.

When making necessary cuts, use sharp tools and cut cleanly according to the best horticultural practices. Immediately cover with tree paint, all scarred or cut surfaces 1 in (25 mm) or more in diameter.

703.3.06 Quality Acceptance

General Provisions 101 through 150.

703.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

703.4 Measurement

A. Tree Well and Tree Wall

Tree well and tree wall masonry completed and accepted is measured for payment in cubic yards (meters).

B. Porous Material

Porous material for tree root protection, placed and accepted, is measured for payment in cubic yards (meters) as measured loose in the vehicle at the point of dumping.

C. Drain Pipe or Tile

Drain pipe or drain tile is measured for payment in linear feet (meters) along the center of each line, lateral, or riser from ends-to-center or center-to-center of junctions and fittings.

D. Excavation, Paint, and Replacement or Disposal of Material

No measurement or payment is made for excavation, tree paint, replacement of unsuitable material, or disposal of surplus material. These are considered a part of the Pay Item to which each pertains.

703.4.01 Limits

General Provisions 101 through 150.

703.5 Payment

Rubble masonry for tree wells and walls and porous material for tree root protection will be paid for at the Contract Unit Price per cubic yards (meters).

Clay drain pipe or drain tile will be paid for by the linear foot (meter).

Payment will be made under:

Item No. 703	Rubble masonry for tree wells and walls	Per cubic yard (meter)
Item No. 703	Porous material for tree root protection	Per cubic foot (meter)
Item No. 703	Drain pipe_____ in (mm)	Per linear foot (meter)
Item No. 703	Drain tile_____ in (mm)	Per linear foot (meter)

703.5.01 Adjustments

General Provisions 101 through 150.

Section 705—Transplanting Trees

705.1 General Description

This work includes transplanting existing trees at new locations as shown on the Plans and as directed by the Engineer.

705.1.01 Definitions

General Provisions 101 through 150.

705.1.02 Related References

A. Standard Specifications

Section 700—Grassing

Section 891—Fertilizers

Section 893—Miscellaneous Planting Material

B. Referenced Documents

General Provisions 101 through 150.

705.1.03 Submittals

General Provisions 101 through 150.

705.2 Materials

Use materials that meet the requirements of the following Specifications:

Material	Section
Plant Topsoil	893.2.01
Fertilizer	891.2.01
Mulch	893.2.02
Stakes	893.2.08
Staking Wire	(See planting details)
Rubber Hose	(See planting details)
Tree Paint	893.2.06
Water for Plant Growth	700.2

705.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

705.3 Construction Requirements

705.3.01 Personnel

Have skilled workers transplant according to the best horticultural practices.

705.3.02 Equipment

Have tree transplanting equipment as detailed in the Plans and Specifications on the project site and in satisfactory condition before construction begins.

Excavate trees and tree pits with the Vermeer-type tree spade or tree mover or equivalent approved mechanized equipment.

705.3.03 Preparation

General Provisions 101 through 150.

705.3.04 Fabrication

General Provisions 101 through 150.

705.3.05 Construction

A. Transplanting Operations

Follow these procedures when transplanting trees:

1. Trunk and Branch Protection

   Protect trunks and branches from breaks or bruises. Spray trees in leaf with an approved antidesiccant before digging.

2. Pruning

   Prune trees before transplanting as directed by the Engineer. Remove broken or badly bruised branches with a clean cut.

3. Securing Roots

   Dig trees to secure as many roots as possible. Maintain a tight, firm ball during the moving operations.

4. Excavating

   Excavate trees and tree pits. Use the excavated material to backfill the pits from which the existing trees were removed.

5. Placing Trees in Pits

   Place transplanted trees into new pits. Backfill voids between the ball and the pit with clean, washed sand and tamp. Thoroughly water the sand in with a root feeder or water needle.

6. Applying Topsoil and Mulch

   Apply plant topsoil to the transplanted tree according to Plan details. Mulch a minimum 6-foot diameter tree pit with 3 in (75 mm) of mulching material.

7. Staking and Anchoring Trees

   Stake or anchor trees according to planting details or as directed by the Engineer.

705.3.06 Quality Acceptance

Replace severely damaged or disfigured trees that the Engineer determines were damaged by operations. Replace with trees of approximately the same size, genus, species, variety, and quality at the Contractor's expense.

705.3.07 Contractor Warranty and Maintenance

A. Watering

After the initial watering, make four additional waterings at two-week intervals.

B. Guarantee Period

A guarantee period is not required for the transplanting work.

705.4 Measurement

The quantity of transplanted trees paid for under this Item is the number transplanted.

Size is determined by tree caliper (diameter) measurement at a point 12 in (300 mm) above the natural ground surface. Where tree caliper exactly coincides with a break point in the Pay Item size intervals, that tree is classed in the lower size interval.

705.4.01 Limits

General Provisions 101 through 150.

705.5 Payment

Transplanting trees will be paid for at the Contract Unit Price. Payment is full compensation for the work and materials including plant topsoil, fertilizer, mulch, stakes, staking wire, rubber hose, tree paint, water, and incidentals necessary to complete the Item.

Payment will be made under:

Item No. 705	Transplanting trees,_____ in (mm) to_____ in (mm) caliper	Per each

705.5.01 Adjustments

General Provisions 101 through 150.

Section 706—Turf Establishment

706.1 General Description

This work includes providing a hardy and permanent ground cover at designated locations. The cover is subject to the Engineer's approval.

706.1.01 Definitions

General Provisions 101 through 150.

706.1.02 Related References

A. Standard Specifications

Section 700—Grassing

B. Referenced Documents

General Provisions 101 through 150.

706.1.03 Submittals

General Provisions 101 through 150.

706.2 Materials

Select a viable ground cover according to Section 700.

706.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

706.3 Construction Requirements

706.3.01 Personnel

General Provisions 101 through 150.

706.3.02 Equipment

General Provisions 101 through 150.

706.3.03 Preparation

General Provisions 101 through 150.

706.3.04 Fabrication

General Provisions 101 through 150.

706.3.05 Construction

General Provisions 101 through 150.

706.3.06 Quality Acceptance

Refer to Subsection 700.3.06 "Quality Acceptance" and Subsection 700.3.07 "Contractor Warranty and Maintenance" for acceptance of a viable ground cover.

706.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

706.4 Measurement

No field measurements are required. Measurement is calculated from known dimensions as follows:

A. Type A—Grading and Drainage Projects

[Project length (PL) minus bridge and exception* length (BL)] times [right-of-way width or Engineer-specified width (RW) minus roadbed width (RBW)] equals _____ square feet divided by 43,560 ft²/acre equals pay quantity in acres.

[Project length (PL) minus bridge and exception* length (BL)] times [right-of-way width or Engineer-specified width (RW) minus roadbed width (RBW)] equals _____ square meters divided by 10,000 m² equals pay quantity in hectares.

(PL – BL) x (RW – RBW) = ____ft² ÷ 43,560 ft²/acre = pay quantity in acres

(PL – BL) x (RW – RBW) = ____m² ÷ 10,000 m² = pay quantity in hectares

B. Type B: Base and Paving Projects

[Project length (PL) minus bridge and exception* length (BL)] times [unpaved shoulder width (SW) plus 6 ft for each roadway side (RS)] = ___ square feet divided by 43,560 ft²/acre= pay quantity in acres.

[Project length (PL) minus bridge and exception* length (BL)] times [unpaved shoulder width (SW) plus 1.8 m for each roadway side (RS)] = ___ square meters divided by 10,000 m² = pay quantity in hectares.

(PL – BL) x (SW + 6RS) = ___ ft² ÷ 43,560 ft²/acre = pay quantity in acres

(PL – BL) x (SW + 1.8RS) = ___ m² ÷ 10,000 m² = pay quantity in hectares

C. Type C: Complete Project

[Project length (PL) minus (bridge and exception* length (BL)] times [right-of-way width or Engineer-specified width (RW) minus plan paved surface width (PPW)] equals square feet divided by 43,560 ft²/acre= pay quantity in acres.

[Project length (PL) minus (bridge and exception* length (BL)] times [right-of-way width or Engineer-specified width (RW) minus plan paved surface width (PPW)] equals square meters divided by 43,560 ft²/acre= pay quantity in hectares.

(PL – BL) x (RW – PPW) = ____ft² ÷ 43,560 ft²/acre = pay quantity in acres

(PL – BL) x (RW – PPW) = ____m² ÷ 10,000 m² = pay quantity in hectares

*Exception means major road intersections and Plan exceptions, not side roads, drives, etc.

706.4.01 Limits

General Provisions 101 through 150.

706.5 Payment

The turf establishment area will be paid for at the Contract Price per acre (hectare). Payment is full compensation for equipment, labor, seed, fertilizer, and any other materials necessary to complete the Item.

Payment will be made under:

Item No. 706	Turf establishment, type_____	Per acre (hectare)

706.5.01 Adjustment

General Provisions 101 through 150.

Section 708—Plant Topsoil

708.1 General Description

This work includes furnishing and applying approved plant topsoil at the locations shown on the Plans or as directed by the Engineer and according to these Specifications.

708.1.01 Definitions

General Provisions 101 through 150.

708.1.02 Related References

A. Standard Specifications

Section 104—Scope of Work

Section 106—Control of Materials

Section 107—Legal Regulations and Responsibility to the Public

Section 893—Miscellaneous Planting Materials

B. Referenced Documents

General Provisions 101 through 150.

708.1.03 Submittals

General Provisions 101 through 150.

708.2 Materials

A. Plant Topsoil Materials

Use plant topsoil that meets the requirements of Subsection 893.2.01.

B. Sources of Material

Except as modified in this Section, furnish plant topsoil material according to Section 106.

1. Plant Topsoil Obtained from the Work

   The requirements of Subsection 104.06, "Right in and Use of Material Found on the Work" are in effect for plant topsoil obtained from the Work.

   a. Obtain the quantity of plant topsoil called for on the Plans.
   b. Use plant topsoil material present on the Project as long as the topsoil meets the Specifications applying to the Item.
   c. Excavate for topsoil only within the construction limits of the Project. Obtain topsoil from embankment areas, excavation areas, or borrow excavation pits.
   d. When obtaining plant topsoil from borrow excavation pits or the roadway, cross section the excavated areas a second time before beginning regular excavation.

2. Plant Topsoil Furnished by the Contractor

   When insufficient material is obtainable from the Work, obtain additional topsoil offsite.

   The Contract Price will include the costs necessary to locate, purchase, and deliver the required amount of acceptable material to the Work.

708.2.01 Delivery, Storage, and Handling

For the purpose of measurement, the Contractor may haul plant topsoil in any type of vehicle, provided the vehicle when loaded to capacity and traveling over public roads and streets meets the provisions of Subsection 107.14, "Load Restrictions."

When using pans or scrapers, the capacity will be the manufacturer's rated capacity.

708.3 Construction Requirements

708.3.01 Personnel

General Provisions 101 through 150.

708.3.02 Equipment

General Provisions 101 through 150.

708.3.03 Preparation

General Provisions 101 through 150.

708.3.04 Fabrication

General Provisions 101 through 150.

708.3.05 Construction

A. General Requirements

Unless otherwise specified in the Plans, uniformly spread plant topsoil to at least 2 in (50 mm) loose depth.

1. Erosion Control

   Only use plant topsoil on slopes where the gradient is 3:1 or flatter.

   To reduce loss of plant topsoil by erosion, place the soil shortly before and in conjunction with grassing operations.

   Place topsoil and complete grassing within specified seasonal limits.

2. Spreading Procedure

   Before applying plant topsoil, scarify the designated areas 6 in to 8 in (150 mm to 200 mm) deep.

   Mix the plant topsoil, lime when required, and the first application fertilizer with the underlying soil when preparing the soil for grassing. Spread and smooth the topsoil uniformly.

B. Plant Topsoil Obtained From The Work

1. Stockpiling

   When obtaining topsoil from the work site, strip and stockpile the topsoil in suitable locations in advance of grading operations.

   Just before grassing, remove the plant topsoil from the stockpile and spread it over the designated areas.

   If grassing is started before grading operations are finished, if feasible, haul the topsoil from undisturbed areas before grading begins directly to the areas designated for the topsoil, eliminating the cost of stockpiling and removing the stockpile.

2. Surplus Material

   When stockpiling more material than specified in the Contract, use the surplus material as additional plant topsoil material if directed by the Engineer.

   After constructing the Item, use the surplus material left in the stockpiles to maintain the Item or to fill washes that occur within a reasonable haul distance.

   Otherwise, remove or dress down the remaining material as directed by the Engineer, without additional compensation.

C. Plant Topsoil Furnished by Contractor

When locating, obtaining, and paying for plant topsoil from pits outside the right-of-way, excavate the topsoil and haul it directly to the designated areas just before the planting begins.

Notify the Engineer, according to Subsection 893.2.01, "Plant Topsoil," of the source of the material. The Engineer will inspect the topsoil. If the material is suitable, the Engineer will specify the permissible excavation depth. If the permissible excavation depth is exceeded, the material obtained from the areas will be rejected.

708.3.06 Quality Acceptance

After placing the plant topsoil, replace material lost by erosion at no expense to the Department.

708.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

708.4 Measurement

Accepted plant topsoil for this Item is measured by the cubic yard (meter) of material delivered in vehicles to the designated areas for plant topsoil. Only vehicles loaded to full capacity are measured for payment. No payment will be made for material delivered in partially filled vehicles.

Plant topsoil is not measured for payment when it is used for an Item that includes the cost of the plant topsoil in the price bid per Unit for the Item.

708.4.01 Limits

General Provisions 101 through 150.

708.5 Payment

Plant topsoil, eligible for payment, will be paid for at the Contract Unit Price per cubic yard (meter). Payment is full compensation for furnishing the material, removing objectionable matter from the material, loading and unloading, stockpiling and removing from the stockpile, hauling, spreading, preparing the ground, pulverizing, mixing, remixing, and for all maintenance.

Payment will be made under:

Item No. 708.	Plant topsoil	Per cubic yard (meter)

708.5.01 Adjustments

General Provisions 101 through 150.

Section 711— Turf Reinforcement Matting

711.1 General Description

This section includes the requirements for furnishing and placing turf reinforcement matting (TRM) over prepared areas according to the Plans or as directed by the Engineer.

711. 1.01 Definitions

General Provisions 101 through 150.

711.02 Related References

A. Standard Specifications

Section 700—Grassing

B. Referenced Documents

QPL 49

711.02 Submittals

General Provisions 101 through 150.

711.2 Materials

Use materials listed on QPL 49. TRM is designated Types 1, 2, 3, 4, 5, and 6 and ranges in allowable hydraulic shear stress from Type 1 to Type 6, Type 6 being the highest. Use a TRM type equal to or higher than the TRM type specified by the designer. All TRM types require permanent grass be sown concurrently with installation.

Alternatively, in special cases dependent upon the soil's vegetative-support quality and the growing season, the designer may specify only grass and mulch or grass and a biodegradable rolled erosion control product for 0-3 psf (0-143 N/m^2) shear stress conditions.

Allowable Hydraulic Shear Stress Ranges With Vegetation[1]

Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
0-2 psf (0-96 N/m^2)	0-4 psf (0-191 N/m^2)	0-6 psf (0-287 N/m^2)	0-8 psf (0-382 N/m^2)	0-10 psf (0-478 N/m^2)	0-12 psf (0-574 N/m^2)

[1]Allowable hydraulic shear stress in the unvegetated condition = 2.0 psf (96 N/m^2).

Determine the allowable vegetated and unvegetated hydraulic shear stress for the TRM by using either of the independent laboratories of the Texas Transportation Institute (TTI) or the National Transportation Product Evaluation Program (NTPEP). Use the following large-scale test methods:

ASTM D 6459 – 07 Standard Test Method for Determination of Rolled Erosion Control Product (RECP) Performance in Protecting Hillslopes from Rainfall-Induced Erosion

ASTM D 6460 – 07 Standard Test Method for Determination of Rolled Erosion Control Product (RECP) Performance in Protecting Earthen Channels from Stormwater-Induced Erosion

Ensure materials meet the following requirements.

A. Preformed TRM

Use TRM with a web of mechanical or melt-bonded polymer nettings, monofilaments, or entangled fibers to form a dimensionally stable matrix. Bond the TRM with one of the following:

- Polymer welding
- Thermal fusion
- Polymer fusion
- Fibers placed between two high-strength, biaxially oriented nets bound by parallel-lock stitching with polyolefin, nylon, or polyester threads

Use TRM with enough strength and elongation to limit stretching and maintain its shape before, during, and after installation under dry or wet conditions. Provide TRM with stabilized components that avoid ultraviolet degradation and are inert to chemicals normally encountered in a natural soil environment. Ensure the TRM conforms to the following minimum-value physical properties:

Category	Grab Tensile Strength lb/ft (kN/m)[1,2]	UV Stability[3]	Allowable Hydraulic Shear Stress[4] lb/ft^2 (N/m^2)
	ASTM D 6818	ASTM D 4355[5]	HEC 15, 2005
Type 1	125 (1.82)	80%	0-2 (0-96)
Type 2	125 (1.82)	80%	0-4 (0-191)
Type 3	125 (1.82)	80%	0-6 (0-287)
Type 4	150 (2.19)	80%	0-8 (0-382)
Type 5	175 (2.55)	80%	0-10 (0-478)
Type 6	200 (2.92)	80%	0-12 (0-574)

[1]Machine direction, ASTM D6818

[2]In field conditions requiring high loading and/or high survivability requirements (e.g., the TRM having to bear heavy-equipment loading), tensile strength of 3,000 lb/ft (44 kN/m) or greater may be required

[3]Percentage of strength of an unexposed sample retained

[4]As calculated in accordance with the methods detailed in the FHWA HEC 15, 2005, document

[5]Exposure in carbon arc light in accordance with ASTM D 822 and ASTM G 152 is required.

B. Stakes or Staples

Use 1 in. by 3 in. (25 mm by 75 mm) wooden stakes made from sound stock cut in a triangular shape. Cut stakes 12 in. to 18 in. (300 mm to 450 mm) long depending on soil compaction. Use metal staples with the following characteristics:

- 11- gauge steel

- U shape
- Legs at least 8 in. (200 mm) long
- Crown 2 in. (50 mm) across

When the construction plans specify deep anchors be used along with stakes or staples for zones of shear stress greater than 12 psf (574 N/m2) as an alternative to using riprap, follow the TRM manufacturer's guidelines for anchor selection and installation procedures and provide the Engineer with the details of the recommended procedure. Use anchors listed on the QPL 49.

711.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

711.3 Construction Requirements

711.3.01 Personnel

General Provisions 101 through 150.

711.3.02 Equipment

General Provisions 101 through 150.

711.3.03 Preparation

A. Site Preparation

Before protecting areas with TRM, prepare the area according to Section 700 with the following steps:

1. Bring the area to final grade.
2. Plow the area.
3. Lime the area.
4. Fertilize the area.
5. Grass the area.

Provide a smooth, firm, and stable surface free of rocks, clods, roots, or other obstructions preventing the TRM from fully contacting the soil.

711.3.04 Fabrication

General Provisions 101 through 150.

711.3.05 Construction

A. Installing TRM

Do not use TRM in areas where rock crops out. Install the TRM either in ditches or on slopes according to the manufacturer's instructions and provide the Engineer with the details of the recommended procedure. In the absence of specific instructions from the manufacturer, install the TRM according to the following requirements:

1. Ditches

   To install the TRM in ditches:

   a. Cut a transverse trench 6 in. wide by 9 in. deep (150 mm wide by 225 mm deep) at the ends of the TRM.

   b. Cut longitudinal, 4 in. (100 mm) deep anchor slots along each side of the TRM along the full length of the ditch and bury the TRM edges. The Engineer will require additional or deeper anchor slots or deep anchors for large volumes of water that cause high shear stress.

c. Roll out the center strip of TRM, starting at the lower end of the ditch.

d. Roll out each adjacent strip of TRM to overlap the preceding strip at least 3 in. (75 mm).

e. Overlap the ends of each TRM roll 3 ft (1 m) with the upslope mat on top. Stretch the TRM to the bottom of the slot, folding it back and staking through two layers of material.

f. Stake each strip of TRM at 1 ft (300mm) intervals in each anchor slot, with one stake serving the overlapped edges of adjoining strips.

g. Backfill and compact the slot.

h. Fold the TRM back over the slot and continue in the upstream direction (closed anchor slot).

i. Stake the TRM snugly in the longitudinal slots and at intervals a maximum of 5 ft (1.5 m) along the ditch (open anchor slot).

j. Backfill and dress the longitudinal anchor slots.

711.3.06 Quality Acceptance

General Provisions 101 through 150.

711.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

711.4 Measurement

TRM completed and accepted is measured for payment by the square yard (meter) of surface measured.

711.4.01 Limits

Overlaps and anchor slots are incidental to the work and are not measured for payment.

711.5 Payment

This work will be paid for at the Contract Price per square yard (meter) for TRM completed, in place, and accepted. Payment is full compensation for furnishing and installing the TRM according to this Specification.

Preparation of the area and grassing will be paid for according to Section 700.

Payment will be made under:

Item No. 711	Turf reinforcement matting, Type ___	Per square yard (meter)

711.5.01 Adjustments

General Provisions 101 through 150.

Section 712—Fiberglass Blanket

712.1 General Description

This work includes furnishing and placing fiberglass blankets over previously prepared and grassed areas according to the Plans or as directed by the Engineer.

712.1.01 Definitions

General Provisions 101 through 150.

712.1.02 Related References

A. Standard Specifications

Section 106—Control of Materials

Section 700—Grassing

Section 822—Emulsified Asphalt

B. Referenced Documents

General Provisions 101 through 150.

712.1.03 Submittals

Submit certification according to Subsection 106.05 stating that materials conform to the requirements of this Section.

712.2 Materials

A. Fiberglass Mat or Blanket

Fiberglass mat is a machine-produced blanket consisting of a uniform layer of continuous, randomly oriented glass fiber strands. Use a mat that is at least 48 in (1.2 m) wide and weighs the following:

- At least 0.2 lbs/yd² (105 g/m²) when used on slopes
- At least 0.4 lbs/yd² (215 g/m²) when used in waterways

B. Anchoring Staples

Use staples made of cold-drawn wire no smaller than 14 gauge (2 mm) in diameter, formed into a U shape with 6 in (150 mm) long legs and a 1 in (25 mm) wide crown.

C. Asphalt

Use asphalt emulsion for tying down the blanket that is grade SS-1h or SS1, conforming to Section 822.

712.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

712.3 Construction Requirements

712.3.01 Personnel

General Provisions 101 through 150.

712.3.02 Equipment

General Provisions 101 through 150.

712.3.03 Preparation

Before placing the fiberglass mat, complete grassing, smooth the area, and clear it of stones, lumps, roots, or other material that would prevent the mat from laying snugly on the underlying soil.

712.3.04 Fabrication

General Provisions 101 through 150.

712.3.05 Construction

A. Placing Mat

Place the fiberglass mat or blanket within 24 hours after the area has been planted but before any rain or watering. Place the mat as follows:

1. Dig a 9 in (225 mm) deep anchor slot across the upgrade end of the site.
2. Place the initial 12 in (300 mm) of blanket in the anchor slot.
3. Backfill and solidly tamp the slot.
4. Unroll the blanket in the direction of water flow, keeping the blanket in contact with the soil over the entire area.
5. Overlap adjacent strips at least 2 in (50 mm). Overlap adjoining ends at least 6 in (150 mm) with the upstream section on top.

B. Stapling

Drive staples vertically into the ground approximately 1 yd (1 m) apart on each side of the blanket.

Drive one row in the center alternately spaced between each side staple.

Place the edge staples in the 2 in (50 mm) overlap. At the end of each mat, place staples in a row spaced approximately 12 in (300 mm) apart.

C. Steep Slopes

The Engineer may specify additional staples or check slots in waterways where slopes are steep or large water volumes or velocities are anticipated.

D. Asphalt Emulsion

The Contractor may apply an asphalt emulsion instead of staples to anchor the blanket.

Apply the bituminous material uniformly over the mat at approximately the following rates:

- 0.12 gal to 0.15 gal/yd² (0.5 L to 0.7 L/m²) for slopes
- 0.24gal to 0.30 gal/yd² (1 L to 1.4 L/m²) or waterways

After the emulsified asphalt has broken and becomes tacky, apply a light layer of sand or pulverized soil to the treated areas, if directed by the Engineer. This application prevents the treated area from sticking to anything that contacts it. Do not apply sand or soil in quantities that would damage the newly planted areas.

712.3.06 Quality Acceptance

General Provisions 101 through 150.

712.3.07 Contractor Warranty and Maintenance

Maintain treated areas to the Engineer’s satisfaction until Final Acceptance.

712.4 Measurement

The quantity of fiberglass blanket being paid for is the number of square yards (meters), surface measured, completed and accepted. The 2 in (50 mm) side laps and the blanket in the anchor slot are not included in the measurement, but are considered incidental to the work. Treated slopes and treated waterways are measured separately.

712.4.01 Limits

General Provisions 101 through 150.

712.5 Payment

This work will be paid for at the Contract Price per square yard (meter) for fiberglass blanket, complete in place and accepted. Payment is full compensation for furnishing and installing the blanket according to this Specification and maintaining the blanket. Preparing the area and grassing will be paid for according to Section 700.

Payment will be made under:

Item No. 712	Fiberglass blanket, (slopes)	Per square yard (meter)
Item No. 712	Fiberglass blanket, (waterways)	Per square yard (meter)

712.5.01 Adjustments

General Provisions 101 through 150.

Section 713—Organic And Synthetic Material Fiber Blanket

713.1 General Description

This work includes furnishing and placing straw, excelsior, coconut fiber, wood fiber, or synthetic blankets over previously prepared and permanently grassed areas as shown on the Plans or as directed by the Engineer.

713.1.01 Definitions

- Straw Blanket: A machine-produced blanket of clean, weed-free, consistently thick straw from agricultural crops. The straw is evenly distributed over the entire area of the blanket.
- Excelsior Blanket: A machine-produced mat of curled wood excelsior. Eighty percent consists of 6 in (150 mm) or longer fiber evenly distributed over the entire blanket.
- Coconut Fiber Blanket: A machine-produced blanket of 100 percent coconut fiber evenly distributed over the entire blanket.
- Wood Fiber Blanket:

  Type I—A machine-produced blanket manufactured with reprocessed wood fibers to a consistent thickness.

  Type II—A hydraulically applied bonded fiber matrix which upon drying, adheres to the soil in the form of a continuous 100 percent coverage, biodegradeable erosion control blanket
- Synthetic Fiber Blanket—A machine produced uniform blanket of ultraviolet degradable polypropylene staple fibers reinforced with ultraviolet degradable polypropylene netting.

713.1.02 Related References

A. Standard Specifications

General Provisions 101 through 150.

B. Referenced Documents

General Provisions 101 through 150.

713.1.03 Submittals

Use approved materials from QPL 62 without further testing. Otherwise, submit materials for testing before use.

713.2 Materials

Use blankets that meet the following requirements for placement on slopes and waterways. For a list of organic material fiber blankets, see QPL 62.

A. Straw Blanket

Use blankets at least 48 in (1.2 m) wide and at least 3/8 in (9 mm) thick with a minimum dry weight of 0.5 lb/yd² (270 g/m²) and a stitch pattern and row spacing of no more than 2 in (50 mm). Have the top side covered with a photo-degradable plastic mesh having a maximum mesh size of 5/16 by 5/16 in (8 mm by 8 mm). The mesh will be sewn to the straw with biodegradable thread.

Use this blanket on slopes only.

B. Excelsior Blanket

Use a smolder-resistant blanket with the top side clearly marked. Use a blanket at least 48 in (1.2 m) wide and 1/4 in (6 mm) thick with a minimum dry weight of 0.8 lb/yd² (430 g/m²) and a stitch pattern and row spacing of no more than 2 in (50 mm).

Slopes: Have the top side covered with a photo-degradable plastic mesh having a maximum mesh size of 1-1/2 by 3 in (38 by 75 mm).

Waterways: Have the top and bottom sides of the blanket covered with a photodegradable plastic mesh having a maximum mesh size of 1 ½ x 3 in (38 x 75 mm), sewn to the fiber with biodegradable thread or otherwise bonded as approved by the Engineer.

C. Coconut Fiber Blanket

Use a blanket at least 48 in (1.2 m) wide and 1/4 in (6 mm) thick with a minimum dry weight of 0.5 lb/yd² (270 g/m²) and a stitch pattern and row spacing of no more than 2 in (50 mm). Use the blanket in waterways only.

Ensure that both sides of the blanket are covered with a photo-degradable plastic mesh with a maximum of 5/8 by 5/8 in (19 by 19 mm). Have the mesh sewn to the fiber with a breakdown-resistant synthetic yarn.

D. Wood Fiber Blanket

Type I

- Use a machine produced blanket manufactured to a consistent thickness using reprocessed wood fibers.
- Use a blanket at least 48 in (1.2 m) wide with a minimum dry weight of 0.35 lb/yd². (190 g/m²). Use the blanket on slopes only.
- Ensure that the top side of the blanket is covered with a photo-degradable plastic mesh with a maximum mesh size of 5/8 by 3/4 in (16 by 19 mm) securely bonded to the mat.
- Ensure that the fibers do not contain a growth that inhibits germination.

Type II

- Ensure the bonded fiber matrix is composed of long strand wood fibers or cellulosic-based fibers held together by a bonding agent, which, upon drying, becomes insoluble and non-dispersible.
- Apply the matrix at the following rates:

Application Rate	Slope
3,000 lbs/acre (3.4 Mg/ha)	4:1
3,600 lbs./acre (4.1 Mg/ha)	2:1
4,000 lbs./ acre (4.5 Mg/ha	1:1

- Do not apply the bonded matrix on saturated soils or immediately before, during or after rainfall. Allow the matrix to dry for at least 24 hours after installation. After drying period, ensure that the bonded fiber matrix does not inhibit the germination or growth of plants beneath and through the formed matrix blanket and that it does not form a water insensitive crust.
- If bonded fiber matrix is to be used, the application of straw mulch for grassing operations is not required.

E. Synthetic Fiber Blanket

Use a blanket having a minimum net size of 5/8 x 3/4 inch (16 x 19 mm). Ensure the netting is securely bonded to the blanket and that the blanket conforms to the following physical properties:

PROPERTY	MINIMUM VALUE	TEST METHOD
Weight	1 oz/sq. yd (34 g/m^2)	
Roll Width	48 inch (1.2 m	
Tensile Strength Length	6 lbs./in	ASTM D 1682 [6” (150 mm) strip)]

Use Synthetic fiber blanket on slopes only.

F. Anchoring Staples

Use anchoring staples made from minimum 11-gauge wire, formed into a U shape. The legs will be at least 6 in (150 mm) long and the crown at least 1 in (25 mm) wide. Use staples rigid enough to penetrate the soil without distortion.

713.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

713.3 Construction Requirements

713.3.01 Personnel

General Provisions 101 through 150.

713.3.02 Equipment

General Provisions 101 through 150.

713.3.03 Preparation

Before placing the blanket, complete the grassing operations, smooth the area, and remove stones, lumps, roots, or other material that would prevent the blanket from laying snugly on the soil.

713.3.04 Fabrication

General Provisions 101 through 150.

713.3.05 Construction

A. Placing Blanket

Place blankets or mats vertically on slopes, beginning at the top of the slope and extending to the bottom of the slope. Horizontal installation of the blankets is not permitted.

Place the blanket within 24 hours after planting and before rain or watering. Place the blanket on slopes and waterways as follows:

1. On Slopes

   Unroll the blanket with the netting on top and the fibers contacting the soil over the entire slope. When using two or more blankets to cover an area, overlay the joint 4 in (100 mm) and staple through the joint. Overlap the ends of the blanket at least 6 in (150 mm) with the upgrade section on top and staple through the overlap.

2. In Waterways

   In waterways, ditches, flumes, and channels unroll the blanket with netting sewn on both sides and place in contact with the soil beginning at the downstream terminal and progressing upstream of the blanket according to the Construction Detail for Permanent Soil Reinforcing Mat.

   Allow a longitudinal seam only if the blankets overlap at least 6 in (150 mm) and are securely stapled. Overlap ends of the blanket at least 6 in (150 mm) with the upgrade section on top.

   Insert 12 in (300 mm) of the upslope end of the first row of blankets into a 6 in (150 mm) deep anchor slot. Staple the blanket in the slot bottom, backfill the slot, and solidly tamp.

B. Stapling

Drive staples vertically into the ground to anchor the plastic mesh. Place the staples approximately 2 yd (2 m) apart on each side of the blanket and add one row in the center alternately spaced between each side staple.

Where blankets lay side to side, place each staple so that half of the staple anchors mesh from each blanket.

At the beginning of a blanket, space staples approximately 12 in (300 mm) apart in a row.

C. Steep Slopes

The Engineer may specify additional staples or check slots in waterways where slopes are steep or large water volumes and/or velocities are anticipated.

713.3.06 Quality Acceptance

General Provisions 101 through 150.

713.3.07 Contractor Warranty and Maintenance

Maintain the blanket installation throughout the life of the Contract. If before Final Acceptance any staples become loose or lift up or if the blanket becomes loose, torn, or undermined, then fix the problem by reshaping, regrassing, refertilizing, or replacing damaged areas. Repairs are done without additional compensation.

713.4 Measurement

Straw blanket excelsior blanket, coconut fiber blanket, wood fiber blanket, or synthetic blanket, installed and accepted is measured for payment by the square yard (meter). Laps and blanket in the anchor slots are not measured. They are considered incidental to the work.

713.4.01 Limits

General Provisions 101 through 150.

713.5 Payment

The preliminary preparation of the areas on which the blanket is to be placed, including seeding or sodding, will be paid for under the appropriate Contract Items.

Straw blanket excelsior blanket, coconut fiber blanket, wood fiber blanket or synthetic fiber blanket will be paid for at the Contract Unit Price per square yard (meter). Payment is full compensation for the construction of the Item including all laps, materials, equipment, tools, labor, incidentals, and maintenance.

Payment will be made under:

Item No. 713	Straw blanket (slopes)	Per square yard (meter)
Item No. 713	Excelsior blanket (slopes)	Per square yard (meter)
Item No. 713	Excelsior blanket (waterways)	Per square yard (meter)
Item No. 713	Coconut fiber blanket (waterways)	Per square yard (meter)
Item No. 713	Wood fiber blanket (slopes)	Per square yard (meter)
Item No. 713	Synthetic fiber blanket (slopes)	Per square yard (meter)

713.5.01 Adjustments

General Provisions 101 through 150.

Section 714—Jute Mesh Erosion Control

714.1 General Description

This work includes furnishing and placing jute mesh over previously prepared grassed areas according to the Plans or as directed by the Engineer.

714.1.01 Definitions

Jute Mat: A mesh matting made of jute yarn.

714.1.02 Related References

A. Standard Specifications

Section 106—Control of Materials

B. Referenced Documents

General Provisions 101 through 150.

714.1.03 Submittals

Provide a materials certification according to Subsection 106.05 that the materials meet the Specifications.

714.2 Materials

Ensure that materials conform with Subsection 106.05 and meet the requirements below.

A. Jute Mat

Use jute mat made of unbleached, undyed, and loosely-twisted yarn. The unit yarn weight shall be from 0.90 to 1.50 lb/yd² (488 to 814 g/m²). A 48 in (1.2 m) width shall show between 76 and 80 warpings, and a 36 in (900 mm) length shall show between 39 and 43 weftings. Furnish woven mesh strips of at least 45 in (1.1 m).

B. Anchoring Staples

Cold-drawn wire14 gauge (2 mm) or wider in diameter, formed into a U shape from a wire 12 in (300 mm) or longer.

714.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

714.3 Construction Requirements

714.3.01 Personnel

General Provisions 101 through 150.

714.3.02 Equipment

General Provisions 101 through 150.

714.3.03 Preparation

Before placing jute mesh, complete grassing and leave the area in the following condition:

- Smooth
- Uniform
- Free of stones, lumps, or roots
- Free of other material that prevents mesh from snugly contacting the underlying soil

If erosion occurs after attaining the required surface area and contour, repair the area before placing mesh.

714.3.04 Fabrication

General Provisions 101 through 150.

714.3.05 Construction

A. Placing Mesh

After grassing, place jute mesh in an area indicated on the Plans or as directed by the Engineer.

Place mesh according to the Plans and the following requirements:

1. Roll the mesh out in the direction of flow unless the downstream end section connects to a drainage structure or paved ditch. In this case:
   a. Anchor the mesh in a 6 in (150 mm) deep trench adjacent to the structure.
   b. Roll the mesh upstream and use a junction slot to connect it to the mesh that has been rolled downstream.
2. Overlap adjacent strips by at least 6 in (150 mm).
3. Overlap adjoining ends by at least 6 in (150 mm).
4. For all overlaps, place the upstream section on top.
5. Use a Type 2 check slot at the downstream end of the jute mesh that does not connect to a structure.
6. Apply jute mesh without stretching. Lay it evenly but loosely on the soil surface.
7. To keep the area smooth, do not allow workers to walk directly on the seedbed before or after applying mesh.
8. Bury the up-channel end of each installation in a narrow, 6 in (150 mm) deep trench.
9. After burying the mesh, backfill, tamp, and staple the trench as shown on the Plans.
10. Where one roll of jute mesh ends and a second begins, use a junction slot to make the connection as shown on the Plans.
11. Space between the check or anchor slots is no more than 50 ft (15 m) on grades of 3 percent or less. On grades of more than 3 percent, ensure that the space between the check or anchor slots is no more than 25 ft (7.5 m).

B. Stapling

Hold matting strips firmly in place with one row of staples as follows:

1. Staple along each edge.
2. Staple each row along the middle.
3. Space staples no more than 3 ft (1 m) apart in each row.
4. Space the staples in the middle row alternately with those at the edges.

5. For strips wider than 60 in (1.5 m), space staples no more than 3 ft (1 m) apart.
6. At the ends of the covered area and at overlapping joints, space staples no more than 18 in (450 mm) apart.
7. Ensure that staples remain flush with the ground.

C. Rolling

After placing and stapling the jute mesh:

1. Firmly embed it in the soil by tamping or rolling.
2. Secure mesh that bridges over soil surface irregularities with extra staples to provide overall contact with the soil.

714.3.06 Quality Acceptance

General Provisions 101 through 150.

714.3.07 Contractor Warranty and Maintenance

Maintain jute mesh installation during the life of the Contract. Before acceptance of the Project, reshape, regrass, or refertilize if:

- Staples become loose or raised
- Mesh becomes loose, torn, or undermined

Repair or replace jute mesh without additional compensation.

714.4 Measurement

Jute mesh, complete in place and accepted, will be measured for payment by the square yard (meter), surface measure. Laps will not be measured but will be included in the overall area.

714.4.01 Limits

General Provisions 101 through 150.

714.5 Payment

Preparing areas to be meshed, including seeding or sodding, will be paid for under the appropriate Contract Items.

Jute mesh will be paid for at the Contract Unit price per square yard (meter), which is full compensation for constructing the Item and providing materials, equipment, tools, labor, maintenance, and incidentals.

Payment will be made under:

Item No. 714	Jute mesh	Per square yard (meter)

714.5.01 Adjustments

General Provisions 101 through 150.

Section 716—Erosion Control Mats (Slopes)

716.1 General Description

This work includes furnishing and placing erosion control mats (blankets) made of fiberglass, excelsior, jute mesh, bituminous treated roving, and straw, synthetic, or coconut over grass areas prepared according to Section 700 for permanent grass. Place according to the Plans or as directed by the Engineer. This specification is not applicable for waterways.

716.1.01 Definitions

General Provisions 101 through 150.

716.1.02 Related References

A. Standard Specifications

Section 712—Fiberglass Blanket

Section 713—Organic and Synthetic Material Fiber Blanket

Section 714—Jute Mesh Erosion Control

B. Referenced Documents

General Provisions 101 through 150.

716.1.03 Submittals

General Provisions 101 through 150.

716.2 Materials

General Provisions 101 through 150.

716.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

716.3 Construction Requirements

716.3.01 Personnel

General Provisions 101 through 150.

716.3.02 Equipment

General Provisions 101 through 150.

716.3.03 Preparation

General Provisions 101 through 150.

716.3.04 Fabrication

General Provisions 101 through 150.

716.3.05 Construction

The contractor may elect to use either Section 712 – Fiberglass Blanket, Section 713 – Organic and Synthetic Material Fiber Blanket (except do not use Type II Wood Fiber Blanket), or Section 714 – Jute Mesh Erosion Control on slopes. All of the materials, construction and measurement portions of the noted sections apply to the type mat (blanket) selected for use.

Place blankets or mats vertically on the slopes beginning at the top of the slope and extending to the bottom of the slope. Horizontal installation of the blankets or mats is not permitted.

The application of mulch is not required for permanent grassing when one of the above noted mats or blankets is placed on the previously prepared and grassed slopes with 24 hours.

716.3.06 Quality Acceptance

General Provisions 101 through 150.

716.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

716.4 Measurement

Erosion control mats (Slopes) are measured according to the Specification sections referenced in Subsection 716.3.05.

716.4.01 Limits

General Provisions 101 through 150.

716.5 Payment

Erosion control mats (Slopes), measured as specified in Section 712, Section 713, or Section 714 will be paid for at the Contract Unit Price per square yard (meter).

This payment is full compensation for constructing the mat (blanket) and providing materials, equipment, tools, labor, and incidentals needed to maintain mats (blankets) for the life of the Contract or until a stand of grass has developed enough to prevent erosion.

Payment will be made under:

Item No. 716	Erosion control mats (slopes)	Per square yard (meter)

716.5.01 Adjustments

General Provisions 101 through 150.

Section 718—Wood Fiber

718.1 General Description

This work includes furnishing and placing wood cellulose fiber or wood pulp fiber in hydroseeding operations according to the Plans and Specifications, and as directed by the Engineer.

718.1.01 Definitions

General Provisions 101 through 150.

718.1.02 Related References

A. Standard Specifications

Section 106—Control of Materials

Section 700—Grassing

B. Referenced Documents

QPL 25

718.1.03 Submittals

Provide a materials certification according to Subsection 106.05 that the materials meet the Specifications.

718.2 Material

Use wood fibers that do not contain germination or growth-inhibiting factors and that meet the requirements of Subsection 106.05 and the following:

- When mixed with water, they disperse and suspend evenly
- After application, their color contrasts with the soil color to assist in identifying the area to be seeded
- When sprayed uniformly on the soil surface, they form an absorbent cover to distribute water to the underlying soil

- On an equilibrium air-dried basis, they contain a maximum of 15 percent water.
- They maintain a pH range of 4.5 to 8.5.

For a list of sources, see QPL 25.

718.2.01 Delivery, Storage, and Handling

Package wood fibers in moisture-resistant bags. Plainly mark the net weight of the packaged material on each bag.

718.3 Construction Requirements

718.3.01 Personnel

General Provisions 101 through 150.

718.3.02 Equipment

General Provisions 101 through 150.

718.3.03 Preparation

General Provisions 101 through 150.

718.3.04 Fabrication

General Provisions 101 through 150.

718.3.05 Construction

Apply enough materials to cover the ground evenly and thoroughly, as directed by the Engineer. Use hydraulic equipment to apply a homogenous water slurry that includes the proper amounts and kind of seed and fertilizer specified in Section 700. Mix the slurry during application.

718.3.06 Quality Acceptance

General Provisions 101 through 150.

718.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

718.4 Measurement

Wood fiber is not measured for separate payment.

718.4.01 Limits

General Provisions 101 through 150

718.5 Payment

This Work will not be paid for separately, but will be included in the payment for Permanent Grassing. (See Subsection 700.5.)

718.5.01 Adjustments

General Provisions 101 through 150.

Section 719—Silt Filter Bag

719.1 General Description

This Specification provides the requirements for furnishing and installing a silt filter bag to trap dissolved silt when pumping accumulated water from sediment basins or other areas where water may accumulate.

719.1.01 Definitions

General Provisions 101 through 150.

719.1.02 Related References

A. Standard Specifications

General Provisions 101 through 150.

B. Referenced Documents

ASTM D 3776

ASTM D 4632

ASTM D 4833

ASTM D 4491

ASTM D 3786

ASTM D 4991

ASTM D 4355

ASTM D 4751

ASTM D 4884

719.1.03 Submittals

General Provisions 101 through 150.

719.2 Materials

Ensure that all materials meet the requirements of the following:

A. Fabric

The silt filter bag fabric shall be a non-woven geotextile conforming to the following properties:

Property	Minimum Value	Test Method
Weight	10 oz/yd^2 (340 g/m^2)	ASTM D 3776
Tensile strength (minimum average of 5 specimens)	270 lb (1100 N)	ASTM D 4632
Puncture Resistance,	150 lb (730 N)	ASTM D 4833
Initial Flowrate	70 gal/min-ft^2 (3500 L/min- m^2)	ASTM D 4491
Bursting Strength	550 psi (3800 kPa)	ASTM D 3786
Permitivity	1.3 sec^{-1}	ASTM D 4991
UV Stability, 70% of initial Tensile Strength	173 lb (770 N)	ASTM D 4355
AOS Retained	100%	ASTM D 4751

B. Seams

All seams shall be sewn with a double needle machine using a high strength thread. The seams shall have a minimum average wide-width strength of 100 lb/in (17.5 N/mm) when tested according to ASTM D 4884.

C. Opening

Provide a silt filter bag with an opening to accommodate a 6” (150 mm) hose.

719.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

719.3 Construction Requirements

719.3.01 Personnel

General Provisions 101 through 150.

719.3.02 Equipment

General Provisions 101 through 150.

719.3.03 Preparation

General Provisions 101 through 150.

719.3.04 Fabrication

General Provisions 101 through 150.

719.3.05 Construction

1. Place the silt filter bag on a #57 stone gravel bed sloped to ensure that the filtered water will exit at the desired location. Chose the exit location to prevent erosion.
2. Extend the pump hose past the inlet opening to ensure that the silt-laden water will discharge in the center of the bag. Ensure that the seal between the inlet and hose is watertight.
3. When the filter bag is full of silt and cannot readily pass any more water, use a new filter bag. If approved by the Engineer, bury the full filter bag on site or remove the top section of fabric and seed the exposed filtrate.

   The size and number of silt filter bags will be shown on the Plans or determined by the Engineer.

719.3.06 Quality Acceptance

General Provisions 101 through 150.

719.3.07 Contractor Warranty and Maintenance

Continue water filtration as directed by the Engineer.

719.4 Measurement

Silt filter bags measured for payment will be the actual number of bags used for filtration, complete and accepted.

719.4.01 Limits

General Provisions 101 through 150.

719.5 Payment

Payment will be made under:

Item No. 719.	Silt filter bag	Per each

719.5.01 Adjustments

General Provisions 101 through 150.

Section 720—Triangular Silt Barrier

720.1 General Description

The work covered by this section consists of furnishing, installing, and removing water-permeable triangular silt barriers used to remove suspended particles from drainage water.

720.1.01 Definitions

General Provisions 101 through 150.

720.1.02 Related References

A. Standard Specifications

Section 700

B. Referenced Documents

General Provisions 101 through 150.

720.1.03 Submittals

General Provisions 101 through 150.

720.2 Materials

A. General

Triangular silt barriers shall have a water-permeable urethane foam core surrounded by a woven geotextile fabric. The foam core shall have a triangular cross-section with a minimum height of 8 in (200 mm) in the center and a minimum base length of 16 in (400 mm). The other two cross-sectional sides shall be of equal length.

The fabric shall be wrapped around the foam core and shall extend beyond both sides of the triangle at least 24 in (600 mm).

B. Filter Fabrics

Filter fabrics shall be composed of strong rot-proof synthetic fibers formed into a woven fabric. The fabric shall be free of treatment or coating that might significantly alter its physical properties after installation.

The fabric shall contain stabilizers or inhibitors to make the filaments resistant to deterioration from exposure to sunlight or heat. The fabric shall be a pervious sheet of synthetic fibers oriented into a stable network so that the fibers retain their relative position to each other under normal handling, installation, and service conditions. Edges of the fabric shall be finished to prevent the outer yarn from pulling away from the fabric.

Fabrics shall be free of defects or flaws that would significantly affect its physical or filtering properties.

The fabric shall not be exposed to temperatures greater than 140 °F (60 ºC).

The fabric shall meet the following physical requirements:

Tensile Strength – Pounds (newtons (Min.) (ASTM D-4632) (1)	Warp – 260 (1155) Fill – 180 (800)
Elongation (% Max.) (ASTM D-4632)	40
AOS (Apparent Opening Size) (Max. Sieve Size) (ASTM D-4751)	#30 (600 µm)
Flow Rate gal/ min/ft^2 (Liters/min./m^2) (GDT 87)	175 (2850)

Ultraviolet Stability (2) (ASTM D-4632 after 300 hours weathering in accordance with ASTM D-4355)	80
Bursting Strength psi (kPa) (ASTM D-3786 Diaphragm Bursting Strength Tester)	175 (1200)
(1) Minimum roll average of five specimens. (2) Percent of required initial minimum tensile strength.	

C. Wire Staples

Fix the triangular silt barriers to the ground with wire staples. The staples shall be made of 11-gage wire with legs at least 6 in (150 mm) long.

720.2.01 Delivery, Storage, and Handling

During shipment and storage, protect the silt barrier with a heavy-duty covering that will protect the barrier from sunlight, mud, dust, dirt and debris.

720.3 Construction Requirements

720.3.01 Personnel

General Provisions 101 through 150.

720.3.02 Equipment

General Provisions 101 through 150.

720.3.03 Preparation

General Provisions 101 through 150.

720.3.04 Fabrication

General Provisions 101 through 150.

720.3.05 Construction

Install triangular silt barriers according to this Specification, as shown on the Plans or as directed by the Engineer.

1. Excavate a trench 4 to 6 in (100 to 150 mm) deep using equipment such as a trenching machine or motor grader; or, if equipment cannot be operated on site, by hand.
2. Secure the edge of the fabric into the trench with wire staples.
3. Install the fabric in the trench so that 4 to 6 in (100 to 150 mm) of fabric is against the side of the trench with 2 to 4 in (50 to 100 mm) of fabric across the bottom in the upstream direction.
4. Backfill the trench and compact it so that no flow can pass under the barrier.
5. Where the individual sections of triangular silt barrier meet, fix the fabric to the ground with wire staples at each joint location and at each end of the barrier.

The location and quantity of triangular silt barrier to be installed will be affected by the conditions that occur during the construction of the project.

The Engineer may increase, decrease or eliminate the quantity of triangular silt barrier. Do not consider these variations in quantity as alterations in the details of construction or a change in the character of the Work.

Triangular silt barrier may be substituted for baled straw.

720.3.06 Quality Acceptance

The Engineer will reject the barrier at the time of installation if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

720.3.07 Contractor Warranty and Maintenance

Maintain the silt barrier until the Project is accepted or until the silt barrier is removed, and remove and dispose of silt accumulations. Maintenance and sediment removal is covered in Section 165. Remove and replace triangular silt barrier sections whenever effectiveness is reduced due to deterioration.

Remove triangular silt barrier unless the Engineer directs that it be retained. Barriers that have been removed will remain Contractor property and may be used at other locations if its condition is acceptable to the Engineer. When the silt barrier is removed, dress the area to give a pleasing appearance and seed and mulch the area according to Section 700.

720.4 Measurement

The quantity of triangular silt barrier to be paid for will be the actual number of linear feet (meters) of triangular silt barrier, measured in place from end to end of each separate installation, which has been completed and accepted.

720.4.01 Limits

General Provisions 101 through 150.

720.5 Payment

Triangular silt barrier measured as defined above will be paid for at the Contract Unit Price bid per linear foot (meter). Payment shall be full compensation for furnishing all materials; erecting and maintaining the barrier; removing accumulated silt except as described in Subsection 720.3.07; for all dressing and grassing, and for removing the barrier.

Payment for this Item will be made as follows:

75% of the Contract Price bid per linear meter will be paid when each barrier is complete in place.

25% will be paid at removal or acceptance.

Payment will be made under:

Item No. 720.	Triangular silt barrier	Per linear foot (meter)

720.5.01 Adjustments

General Provisions 101 through 150.

Section 721—Fabric Formed Concrete Rip Rap

721.1 General Description

Specifications for this work will be included elsewhere in the contract.

Section 725—Weed Control

725.1 General Description

This work includes furnishing and applying a bare ground herbicide under base or paving site(s) only, unless otherwise noted on the Plans or directed by the Engineer to prevent grass and other objectionable vegetation from growing.

725.1.01 Definitions

General Provisions 101 through 150.

725.1.02 Related Specifications

General Provisions 101 through 150.

725.1.03 Submittals

General Provisions 101 through 150.

725.2 Materials

Use an herbicide with the active ingredient: Indaziflam 19.05%.

725.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

725.3 Construction Requirements

725.3.01 Personnel

General Provisions 101 through 150.

725.3.02 Equipment

General Provisions 101 through 150.

725.3.03 Preparation

General Provisions 101 through 150.

725.3.04 Fabrication

General Provisions 101 through 150.

725.3.05 Construction

Apply the following herbicide with 25 gallons per acre(hectare) of water under base or paving site(s)only, unless otherwise noted on the Plans or directed by the Engineer.

Indaziflam	7 oz./acre(207ml/ha) (active)

Follow all herbicide label recommendations when using this product.

725.3.06 Quality Acceptance

General Provisions 101 through 150.

725.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

725.4 Measurement

Weed Control using bare ground herbicide applied and accepted is measured by the square yard (meter). When weed control is required but not shown on the Plans as a Pay Item, the cost is included in the overall Contract Price.

725.4.01 Limits

General Provisions 101 through 150.

725.5 Payment

Payment when applicable will be made under:

Item No. 725	Weed Control	Per square yard (meter)

725.5.01 Adjustments

General Provisions 101 through 150.

Section 750—Rest Room Building

750.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 751—Water Supply System

751.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 752—Pneumatic Ejector Lift Station

752.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 753—Waste Water Treatment Plant

753.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 754—Outdoor Furniture

754.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 755—Electrical Work

755.1 General Description

Only an approved Electrical Contractor may perform this work. This specification describes electrician qualifications, and does not apply to fiber optic cable or connections.

755.1.01 Definitions

Qualified Electrician: Either an electrician with a Class II license, issued by the Georgia State Construction Industry Licensing Board, or an electrician who has completed an approved four-year apprenticeship training program and is classified as a Journeyman Electrician.

755.1.02 Related References

A. Standard Specifications

Section 529—Navigation Lighting

Section 631—Permanent Changeable Message Signs

Section 632—Portable Changeable Message Signs

Section 637—Illuminated Sign System

Section 647—Traffic Signal Installation

Section 670—Water Distribution System

Section 680—Highway Lighting

Section 681—Lighting Standards and Luminaires

Section 682—Electrical Wire, Cable, and Conduit

Section 683—High Level Lighting Systems

Section 690—Static Scale System

Section 691—Weigh-in-Motion Scale System

Section 750—Rest Room Building

Section 751—Water Supply System

Section 752—Pneumatic Ejector Lift Station

Section 753—Waste Water Treatment Plant

Section 755—Electrical Work

Section 757—Well Pumps

Section 759—Water Storage Tanks

Section 760—Welcome Station Building

Section 761—Information Center Building

Section 762—Truck Weighing Station Building

Section 766—Irrigation System

Section 768—Truck Weigh Station Control Signs

Section 770—Truck Weigh Station Height Checking Device

Section 772—Truck Weigh Station Length Estimating Device

Section 774—Mobile Operations Office

Section 776—Check Point Shelter

Section 777—Truck Weigh Station Communication System

Section 795—Vehicle Maintenance Building

Section 796—Sewage Pumping Station

Section 797—Buildings

Section 936—Closed Circuit Television (CCTV)

B. Referenced Documents

General Provisions 101 through 150.

755.1.03 Submittals

General Provisions 101 through 150.

755.2 Materials

General Provisions 101 through 150.

755.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

755.3 Construction Requirements

755.3.01 Personnel

Ensure the qualified electrician carries evidence of classification and presents it to the Engineer in charge of the construction.

Ensure a qualified electrician is present when any of the sections referred to under Subsection 755.1.02 are part of the Contract. Ensure electrical connections are being made or wire is being pulled.

755.3.02 Equipment

General Provisions 101 through 150.

755.3.03 Preparation

General Provisions 101 through 150.

755.3.04 Fabrication

General Provisions 101 through 150.

755.3.05 Construction

General Provisions 101 through 150.

755.3.06 Quality Acceptance

General Provisions 101 through 150.

755.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

755.4 Measurement

This work is not measured separately for payment.

755.4.01 Limits

General Provisions 101 through 150.

755.5 Payment

This work will not be paid for separately.

755.5.01 Adjustments

General Provisions 101 through 150.

Section 756—Drilled Wells

756.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 757—Well Pumps

757.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 758—Travel Trailer Sanitary Disposal Station

758.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 759—Water Storage Tanks

759.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 760—Welcome Station Building

760.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 761—Information Center Building

761.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 762—Truck Weighing Station Building

762.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 763—Bus Pavilion

763.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 765—Flag Pole

765.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 766—Irrigation System

766.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 767—Sprinkler System

767.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 768—Truck Weigh Station Traffic Control Signs

768.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 770—Truck Weigh Station Height Checking Device

770.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 772—Truck Weigh Station Length Estimating Device

772.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 774—Mobile Operations Office

774.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 776—Check Point Shelter

776.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 777—Truck Weigh Station Communications System

777.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 778—Solar Application

778.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 791—Water Intake Structure

791.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 792—Display and Interior Furnishings

792.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 795—Vehicle Maintenance Building

795.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 796—Sewage Pumping Station

796.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 797—Buildings

797.1 General Description

Specifications for this work will be included elsewhere in the Contract.

Section 798—Building Equipment

798.1 General Description

Specifications for this work will be included elsewhere in the contract.

Section 800—Coarse Aggregate

800.1 General Description

This section includes requirements for coarse aggregate. All aggregate shall be the specified type, class, and grade, and shall meet the requirements for the intended use.

800.1.01 Related References

A. Standard Specifications

Section 424—Bituminous Surface Treatment

B. Referenced Documents

AASHTO	ASTM
T 11	C 295
T 27	E 30
T 96	G 23
T 104	
T 303	