SECTION 31 36 00 – STREAMBANK CONSTRUCTION

1. GENERAL
	1. SECTION INCLUDES
		* + 1. Fabric Encapsulated Soil (FES) Lifts
				2. Fabric Slope Protection
			1. REFERENCE STANDARDS
				1. American Society for Testing and Materials (ASTM).

ASTM D 6525 - Test for Measuring Nominal Thickness of Permanent Rolled Erosion Control Products

ASTM D 1117 - Standard Guide for Evaluating Nonwoven Fabrics

ASTM D 6475 - Test for Measuring Mass Per Unit Area of Erosion Control Blankets

ASTM D 1388 - Test for Stiffness of Fabrics

ASTM D 6818 - Test for Ultimate Tensile Properties of Turf Reinforcement Mats

ASTM D 1777 - Test for Thickness of Textile Materials

ASTM D 4595 - Test for Tensile Properties of Geotextiles by the Wide-Width Strip Method

ASTM D 3776 - Test for Mass Per Unit Area (Weight) of Fabric

* + - * 1. Erosion Control Technology Council (ECTC)

Standard Specification for Rolled Erosion Control Products.

* + - 1. SUBMITTALS

The CONTRACTOR shall submit the following information and gain acceptance from the Engineer prior to importing materials to the project site.

* + - * 1. Submit Product Data, Material Certificates, and CONTRACTOR’S acknowledgement that products meet specification requirements for coir fabrics (woven and nonwoven), wood staples, and wood stakes proposed for use in construction of the FES Lifts and Surface Fabric. If alternative “or equal” products are submitted, material samples shall be submitted as well.
				2. Submit at minimum two (2) photographs or two (2) sketches of proposed forms to be used for FES lift construction, showing section and orthogonal views.
			1. DELIVERY, STORAGE, AND HANDLING
				1. Delivery and Acceptance Requirements

Each roll of fabric and blanket shall be packaged individually in a suitable sheet, wrapper, or container to protect the fabric from damage to ultraviolet light, moisture, and mud during normal storage and handling.

Each roll of fabric and blanket shall be identified with a tag or label securely affixed to the outside of the roll on one end. The label shall include the manufacturer or supplier, the style number, and the roll and lot numbers.

* + - * 1. Storage and Handling Requirements

Store all fabrics and blankets elevated off the ground and ensure that they are adequately covered to protect the material from damage, submerging, and freezing. Protect fabrics and blankets from sharp objects which may damage the fabric.

Fabrics and blankets damaged during transport, storage or placement shall be replaced by the CONTRACTOR at no additional cost to the Owner.

1. PRODUCTS
	* + 1. WOVEN AND NON-WOVEN COIR FABRICS
				1. The non-woven coir fabric shall be North American Green (NAG) style C125BN 100% biodegradable coconut fiber mat or accepted equal. The fabric shall meet or exceed the following criteria:

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| --- | --- | --- |
| **Property** | **Test Method** | **Criterion** |
| Thickness | ASTM D 6525 | 0.23 in (5.84 mm) |
| Resiliency | ECTC Guidelines | 85% |
| Water Absorbency | ASTM D 1117 | 365% |
| Mass/Unit Area | ASTM D 6475 | 9.79 oz/yd2 (333 g/m2) |
| Swell | ECTC Guidelines | 40% |
| Smolder Resistance | ECTC Guidelines | Yes |
| Stiffness | ASTM D 1388 | 0.11 oz-in |
| Light Penetration | ECTC Guidelines | 16.2% |
| Tensile Strength -MD | ASTM D 6818 | 206 lb/ft (3.06 kN/m) |
| Elongation - MD | ASTM D 6818 | 15.3% |
| Tensile Strength -TD | ASTM D 6818 | 145.2 lb/ft (2.15 kN/m) |
| Elongation - TD | ASTM D 6818 | 12.9% |
| Roll Width | Measured | 1. ft. (minimum)
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* + - * 1. The woven coir fabric shall be **high strength 700 weight,100% biodegradable coconut fiber, continuously woven mat (i.e., without seams) with the following minimum average roll properties.**

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| **Parameter** | **Test Method** | **Criterion** |
| Thickness (min.) | ASTM D1777 | 0.35 inches |
| Tensile Strength, Dry (min.) | ASTM D4595 | 1,500 x 1,000 lb/ft |
| Tensile Strength, Wet (min.) | ASTM D4595 | 900 x 650 lb/ft |
| Mass/Unit Area (min.) | ASTM D3776 | 20 oz./yd2 |
| Open Area (max.) | Measured | 50%, maximum |
| Roll Width – Top and Bottom Lifts (min.) | Measured | 13 feet  |
| Roll Width – Middle Lifts (min.) | Measured | 9.8 feet |

* + - * 1. Each roll of fabric shall be packaged individually in a suitable sheet, wrapper, or container to protect the fabric from damage to ultraviolet light, moisture, and mud during normal storage and handling.
				2. The Engineer may randomly select and obtain samples from rolls of fabric after arrival on the site and prior to installation to compare to previously submitted samples.
				3. Woven coir fabrics with seams are not acceptable.
				4. Coir fabrics shall consist of 100% biodegradable mats. Nylon, plastic, or other non-biodegradable fiber material in any of the coir fabrics is not acceptable. Plastic or nylon mesh that is classified as photodegradable is not acceptable. Only those coir fabrics specified or indicated by an accepted material submittal will be allowed.
			1. WOOD STAPLES
				1. Wood Staples shall be 12-inch in length, untreated, solid, and free of knots or defects as shown in the image below. Wood Staples shall be North American Green 12-inch Eco-stakes or accepted equal.



* + - 1. WOOD STAKES
				1. Stakes shall be wooden stakes solid and free of knots or defects. Stakes shall be minimum 18 inches in length. Stakes shall be wedge shaped with a minimum equivalent diameter equal to 1.5 inches at the top and should come to a point at the bottom. Stakes should be constructed by cutting a standard grade stud (2" x 4") lumber lengthwise along the diagonal to create wedge shaped stakes, or by some other method resulting in a stake of dimensions accepted by the Engineer.
			2. SEEDING AND PLANTING
				1. Material requirements for seeds and plants to be installed underneath and through coir fabrics are specified in Section 32 90 10 Revegetation and shown in the Drawings.
			3. LIVE STAKES
				1. Material requirements for Live Stake are specified in Section 32 90 10, Revegetation.
			4. TOPSOIL
				1. Topsoil salvaged during Earthwork operations (see Section 31 23 00) shall be utilized in the construction of the FES Lifts. Salvaged Topsoil shall be placed in the front three feet of all FES Lifts. Salvaged Topsoil shall be accepted by the Engineer prior to construction of FES Lifts.
			5. GRADE CONTROL RIFFLE STONE
				1. Grade Control Riffle Stone material detailed in Section 31 05 16, Aggregates for Streambed Construction, shall be installed in the bottom two layers of FES Lifts adjacent to the Grade Control Riffles. Grade Control Riffle Stone shall be mixed with Salvaged Fill or Salvaged Streambed Material to a uniform mixture with a volumetric ratio of 1:1.
1. EXECUTION
	* + 1. FES LIFT INSTALLATION
				1. Perform all shaping of the subgrade to the elevations, lines and grades shown on the Drawings. Care shall be taken to remove all objects that would interfere with application or damage to the coir fabric.
				2. Install FES Lifts as indicated on the Drawings. FES Lift height shall be as accepted by the Engineer in the field at the time of construction.
				3. Seed shall be applied as shown in the Drawings and in accordance with Section 32 90 10, Revegetation.
				4. Cutting of the coir fabrics to facilitate wood stakes or wood staple placement is not allowed. It is not required to anchor the nonwoven and woven fabrics individually. After installation, wood staples shall be installed such that the top-notch points upstream and the notch is flush with the finished grade. After installation, wood stakes shall protrude 2-4” from the finished grade.
				5. Install stakes and staples as shown in the Drawings. Additional stakes and staples shall be installed as directed by the Engineer to address loose fabric after initial staking and stapling.
				6. Broken or damaged wood staples and wood stakes shall be removed and replaced at the CONTRACTOR’S expense.
				7. Fabric shall be handled with care such that the fabric is not damaged. Fabric shall be installed such that it is even, smooth, and taut, such that the fabric is in direct contact with the underlying soil in all areas.

See Section 31 23 00 Earthwork for FES Lift backfill requirements.

See Section 32 90 10 Revegetation for seed and rhizome requirements.

* + - * 1. Damaged coir fabric shall be repaired or replaced. If damaged coir fabric has a tear of 6 inches or less, scrap fabric may be placed beneath damaged coir fabric such that it extends 24 inches beyond the damaged area in all directions. Staple around the tear with a minimum 6 wooden staples on maximum 12-inch centers. Coir fabrics with tears greater than 6 inches shall be replaced at the CONTRACTOR’S expense.
				2. Finished FES lifts shall have no loose coir fabric. Areas with loose coir fabric shall be staked with tapered wood stakes to hold coir fabrics firmly to underlying soil.
				3. See Section 32 90 10 Revegetation for specifications for planting vegetation through the finished FES Lifts.
			1. FABRIC SLOPE PROTECTION INSTALLATION
				1. Fabric Slope Protection is an OPTIONAL item to be placed in the project site as needed at the discretion of the Engineer.
				2. Install according to manufacturer's instructions and as shown on the Drawings and indicated herein. Install woven (outer) coir fabrics over nonwoven (inner) coir fabric in installation of the work.
				3. The area to be covered by the coir fabrics shall be graded to a smooth condition free from depressions and protruding rocks, sticks, and other debris which may prevent a smooth application or that may damage the fabric. Care shall be taken to remove all objects that would interfere with application or damage the coir fabrics.
				4. Following surface preparation, install Floodplain Seed as indicated herein prior to placement of coir fabrics.
				5. The coir fabrics shall be placed and anchored as indicated on the Drawings and herein using wood stakes. Wood stakes may be placed through both layers of coir fabrics. It is not required to anchor the nonwoven and woven fabrics individually. Wood stakes shall be placed between the fibers of the woven (outer) coir fabric. Cutting of the coir fabrics to facilitate wooden stake placement will not be allowed.
				6. Damaged coir fabric shall be repaired or replaced. If damaged coir fabric has a tear of 6 inches or less, scrap fabric may be placed beneath damaged woven coir fabric such that it extends 24 inches beyond the damaged area in all directions. Stake around the tear with 4 wooden stakes on 12-inch centers. Coir fabrics with tears greater than 6 inches shall be replaced at the Contractor's expense.

END OF SECTION 31 36 00