

SECTION 146

EROSION TREATMENT MATERIAL

146.1 DESCRIPTION

A. General

This work consists of shaping slope drains, ditches, medians or other waterway channels and applying erosion treatment material.

B. Related Work Items

Section 11	Utility Excavation and Backfill
Section 12	Roadway and Drainage Excavation
Section 14	Embankment
Section 17	Salvaging, Stockpiling and Placing Topsoil
Section 18	Erosion and Water Pollution Control
Section 65	Riprap
Section 66	Slope Protection
Section 68	Bank and Channel Protection Rock Filled Wire Baskets
Section 69	Bank Protection Gabions
Section 70	Seeding
Section 71	Fertilizing
Section 72	Mulching
Section 109	Riprap and Slope Materials
Section 202	Engineering Fabric

146.2 MATERIALS

A. Fiberglass Roving

Fiberglass roving shall be formed from continuous fibers drawn from molten glass, coated with a chrome-complex sizing compound, collected into strands and lightly bound together into roving without the use of clay, starch or like deleterious substances.

The roving shall be wound into a cylindrical package approximately one foot high in such a manner that the roving can be continuously fed from the center of the package, through an ejector driven by compressed air and expanded into a mat of glass fiber on the soil surface.

The material shall contain no petroleum solvents or other agents known to be toxic to plant or animal life.

B. Erosion Control Blankets or Turf Reinforcement Mats (TRMs)

Description

Erosion-control blankets are biodegradable, open-weave blankets used for establishing and reinforcing vegetation on slopes, ditch bottoms and shorelines. Erosion-control blankets and TRMs, are especially useful in critical areas such as swales, long channels and slopes steeper than 3:1.

Design**Erosion Control Blankets**

Several categories are provided with different service application and specific uses as shown in the **Erosion Control Blanket Fabric Category Table** below.

Erosion Control Blanket Fabric Category Table

Category	Service Application	Use	Acceptable Types
1	Very Temporary	Flat areas, shoulder drain outlets, roadway shoulders, lawns, mowed areas.	Straw, wood fiber, rapidly degradable netting on one side
2	One Season	Slopes 3:1 and steeper less than 50 ft long, ditches with gradients 2% or less, flow velocities less than 5.0 fps.	Straw, wood fiber, netting on one side
3	One Season	Slopes 3:1 and steeper, more than 50 ft long, ditches with gradients 3% or less, flow velocities less than 6.5 fps.	Straw, wood fiber, netting on one side
4	Semipermanent	Ditches with gradients 4% or less, flow velocities less than 8.0 fps, flow depth 6 inches or less.	Straw/coconut, wood fiber, netting on two sides
5	Semipermanent	Ditches with	Coconut fiber,

		gradients 8% or less, flow velocities less than 15.0 fps and flow depth less than 8 inches, watercourse banks within the normal flow elevation.	netting on two sides
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Erosion-control blankets shall consist of a uniform web of interlocking fibers with net backing. The blanket shall be of uniform thickness, with the material fibers being evenly distributed over the area of the blanket. The blankets shall be porous enough to promote plant growth yet shield the underlying soil surface from erosion. All material shall have been properly cured to achieve curled and barbed fibers. All blankets shall be smolder resistant.

The net backing on each blanket shall consist of polypropylene mesh. For Category 1 blankets, the net backing should start to decompose after one month with 80% breakdown occurring within three months. For Category 2 and 3 blankets, the netting should contain sufficient UV stabilization for breakdown to occur within a normal growing season. For Category 4 and 5 blankets, the netting should be UV stabilized to provide a service life of two to three years.

Install erosion-control blankets per manufacturer’s recommendations.

Turf-Reinforcement Mats (TRMs)

Turf-reinforcement mats are synthetic, non-degradable mats that are usually buried to add stability to soils. They come in a wide range of designs and have been proven to be valuable on slopes and in channel-lining applications.

TRMs consisting of non-degradable , three-dimensional matrix materials should be used with expected velocities of 15 fps and shear stress of 8lbs/sf. Beyond these velocities and shears, vegetated structures such as articulated block, cable concrete and cribwalls, should be considered.

Install TRMs per manufacturer’s recommendations.

Maintenance

Inspect erosion-control blankets and TRMs periodically, and after rainstorms to check for rill erosion, dislocation or failure. Where erosion is observed, repair or replace fabric.

Continue inspections until vegetation is established.

If washout occurs, repair the slope grade, reseed and reinstall fabric.

C. Staples

Staples shall be U-shaped and shall be approximately six inches long and one inch wide. Staples shall be 11 gage or heavier ungalvanized steel wire. Where 11 gage staples cannot be driven without bending, 9 gage or heavier ungalvanized steel wire staples will be required.

D. T-pins

T-pins shall be #6 bright wire T-pins consisting of a 12-inch long top bar and a minimum 9-inch leg. The top bar may be welded to the top at the side of the 9-inch leg or the T-pins may be machine bent to the proper configuration.

E. Erosion Bales

Erosion bales shall consist of hay or straw bales substantially free of weeds and a nominal size of 15 inches x 18 inches x 4 feet.

F. Erosion Bale Anchors

Erosion bales shall be anchored with #4 rebar 3 feet long or with 2 inch x 2 inch x 3 feet wood pegs.

G. G. Silt Fence

Description

A silt fence is a temporary barrier designed to retain sediment on the construction site. It consists of a geotextile attached to supporting posts that are trenched into the ground. The fence retains sediment primarily by retarding flow and promoting deposition on the uphill side of the fence. Runoff is also filtered as it passes through the geotextile.

Design

Install silt fences on the contour and construct so that flow cannot bypass the ends.

Ensure that the drainage area is no greater than $\frac{1}{4}$ acre per 100 feet of fence.

The use of silt fence as a sediment barrier shall not be used in areas of concentrated flow, such as ditches.

Ensure that the depth of impounded water does not exceed 2 feet at any point along the fence.

The fence must be tied into the slope so that the base of the fence is above the design storage depth.

When plastic mesh is used on the heavy duty silt fence, the mesh backing shall be joined to the geotextile at the top with two rows of stitching.

A 1 foot high by 2 foot wide berm of compost can be placed at the base of the sediment fence over the fabric lip. Placing the compost over the fabric fence lip eliminates the need to trench and bury the fabric. The compost particle sizes shall be the following: 3 inch-100% passing, 1 inch-90% to 100% passing, ¾ inch-70% to 100% passing, ¼ inch-30% to 75% passing, maximum particle length of 6 inches.

Alternately, a compost berm may be placed in lieu of silt fence. The berm shall be a minimum of 2 feet high by 4 feet wide. The particle sizes shall be the following: 3 inch-100% passing, 1 inch-90% to 100% passing, ¾ inch-70% to 100% passing, ¼ inch-30% to 75% passing, maximum particle length of 6 inches.

Maximum allowable slope lengths contributing runoff to a silt fence are listed in the **Silt Fence Slope Criteria Table**.

Silt Fence Slope Criteria Table

Constructed Slope	Maximum Slope Length (feet)
2H:1V	50
3H:1V	75
4H:1V	125
5H:1V	175
Flatter than 5H:1V	200

Types

The following three types of silt fences are designated for use based on conditions. For details on each type of fence see the **Silt Fence Specifications Table**.

Heavy Duty: Use at locations where extra strength is required, such as near water bodies; on areas with unstable wetland soils, steep slopes, highly erodible soils or high runoff; and on areas that are inaccessible to equipment.

Preassembled: For light-duty applications, to protect temporary construction or to supplement the other types of silt fence. This type is installed with plow-type equipment with pre-attached stakes spread at 6 to 8 foot intervals.

Machine-Sliced Installation: Appropriate for general use during site grading and to protect critical areas.

Silt Fence Specifications Table

	Heavy Duty		Machine Sliced	Preassembled
Description	Composite of mesh backing, posts, geotextile and fasteners, assembled		Machine installed geotextile fastened to posts on site	Ready-to-install geotextile attached to driveable posts
Geotextile				
Type	Woven		Woven Monofilament	Woven
Width	48 inches		36 inches	36 inches
Grab Tensile ASTM C4632	100 lb. minimum		130 lb. minimum	100 lb. minimum
Apparent Opening Size ASTM D4751	#20-70 sieve		#30-40 sieve	#20-70 sieve
UV Stability ASTM D4355 500 hours	70 percent minimum		70 percent minimum	70 percent minimum
Flow Rate ASTM D4491 gal/min/sf	NA		100 gal/min/sf	NA
Top Fastening Component	6-inch overlap, top of mesh backing		Selvaged edge	Sewn-in cord
Net Backing				
Material	Woven wire mesh	Plastic mesh	NA	NA
Steel Wire Gauge	14 min.	NA	NA	NA
Max. Mesh Opening	6 inches	2 inches	NA	NA
Rope for Ditch Check				
Type	NA		Polyethylene	NA
Diameter	NA		5/8-inch minimum	NA
Posts				
Material	Steel T-post		Steel T-post with welded plate	Wood
Minimum Size	1.26 lbs/in/ft		1.26 lbs/in/ft	2 x 2 inch
Minimum Length	5 feet		5 feet	5 feet

Min. Embedment	24 inches	24 inches	18 inches
Maximum Spacing	8 feet	6 feet	6 feet
Post Fastener	U-shaped clips	Plastic zip ties, 50 lb. tensile strength	Gun staples
Minimum Fasteners per post	3(for both woven wire and mesh)	3	5
Minimum Fastener Spacing on post	2 foot	1 foot	1 foot

See the **Silt Fence Detail 146-1**.

Maintenance

Inspect silt fences at least once a week and after each rainfall, or as required by the NPDES permit. Make any required repairs immediately. Repair scoured areas on the back side of the fence at this time to prevent future problems.

Replace silt fence fabric that has torn, collapsed, decomposed or otherwise become ineffective within 24 hours of discovery.

Remove silt deposits once they reach 30 percent of the height of the fence to provide storage volume for the next rain and to reduce pressure on the fence.

Silt fences are to be removed upon stabilization of the contributing drainage area. Accumulated sediment may be spread to form a surface for turf or other vegetation establishment, or disposed of elsewhere. The area should be reshaped to permit natural drainage.

146.3 CONSTRUCTION REQUIREMENTS

A. General

This work shall be done as soon as possible after finish grading and topsoiling is completed and, if practical, prior to seeding, fertilizing and mulching of adjacent areas.

Seasonal limitations on the installation of erosion treatment materials shall be as described in Section 70.3.

The Contractor is responsible for inspecting the erosion control materials and measures on a regular basis and after every runoff event during the construction period to insure proper function. The Contractor shall maintain areas where erosion materials and measures have been used until work on the project has been

completed and accepted. Prior to final acceptance of work, the Contractor shall repair and replace any damaged areas to the satisfaction of the Engineer.

At the end of the 2-year warranty period, the Engineer and Contractor shall inspect the erosion control devices and will determine whether or not erosion control should be removed. Removal will be at the Contractors expense. If vegetated areas are disturbed by the removal, they shall be restored at the Contractors expense. If the Engineer determines that erosion control should remain, then the City shall remove the erosion control when vegetation adequately established.

B. Preparation of Areas to be treated

1. Shaping

Ditches and drainages shall be reshaped to their typical section or to the ditch liner material. Material shall be laid in ditches and drainages to the widths specified.

When watercourses leading out of ditches are shallow or not well defined, special channels shall be constructed and undercut to allow for placement of topsoil.

The material shall be placed below edges of channels and excavated material drifted back away from the edges of the material to direct flow directly into the treated waterway.

2. Top soiling

Topsoil shall be spread to the depths specified over reshaped areas in accordance with Section 17 - Salvaging, Stockpiling and Placing Topsoil.

3. Condition Of Finished Surface

Rocks or clods over 1 1/2 inches in diameter and other foreign material shall be removed prior to placing material.

C. Seeding, Fertilizing and Mulching

Immediately after the area to be treated has been shaped and smoothed and prior to placing, the areas to be treated shall be seeded and fertilized as prescribed in Sections 70 - Seeding, 71 - Fertilizing, and 72 - Mulching.

Broadcasting, raking or dragging in of seed and fertilizer will be permitted on areas where a drill cannot operate satisfactorily.

D. Application of Erosion Control Blanket or Turf Reinforcement Mat (TRM)

Install erosion control blankets and turf reinforcement mats per manufacturers recommendations.

E. Application Of Fiberglass Roving

Fiberglass roving shall be applied over the designated area within 24 hours after normal seeding operations have been completed. Fiberglass roving shall be spread uniformly over the designated area to form a random mat of continuous glass fibers at the rate of 0.25 to 0.35 pound per square yard. This rate may be varied as directed by the Engineer.

Fiberglass roving shall be anchored to the ground with an emulsified asphalt Type SS-1 or CS-1 applied uniformly over the glass fibers at the rate of 0.25 to 0.35 gallon per square yard. This rate may be varied as directed by the Engineer.

Placement of asphalt will not be permitted when the air temperature is lower than 40°F.

The upgrade end of the lining shall be buried to a depth of one foot to prevent undermining.

F. F. Erosion Bales

Erosion bales shall be located as specified or as determined by the Engineer.

Each erosion bale shall be anchored in place with two anchor devices.

G. Silt Fence

Silt fence intended to limit soil migration due to precipitation runoff shall be installed perpendicular to ground slope and at intervals necessary to prevent excessive soil migration by capturing the majority of waterborne soil particles and reducing the velocity of the runoff water. Such installation may include excavation of silt traps upstream of the fence as called for on the contract documents. (See the Silt Fence Slope Criteria Table, Silt Fence Specifications Table, and Standard Detail 146-1).

146.4 METHOD OF MEASUREMENT

- A. Excelsior blanket will be measured to the nearest square yard. Measurement of the overlap and top and bottom folds will not be made. Contractors shall replace excelsior blanket that is damaged from causes beyond their control and they shall add the replacement quantity to the original quantities used. Excelsior blanket damaged by actions taken by the Contractor shall be replaced by the Contractor at no additional cost.
- B. Fiber mulching will be measured to the nearest one-tenth ton of satisfactory mulch applied. Contractors shall replace fiber mulching that is damaged from causes beyond their control and the replacement quantity shall be added to the original

quantities used. Fiber mulching damaged by actions taken by the Contractor shall be replaced by the Contractor at no additional cost.

- C. Fiberglass roving with the asphalt anchor will be measured to the nearest square yard (surface measurement) complete in place and accepted. Contractors shall replace fiberglass roving that is damaged from causes beyond their control and the replacement quantity shall be added to the original quantity used. Fiberglass roving damaged by actions taken by the Contractor shall be replaced by the Contractor at no additional cost.
- D. Erosion bales will be measured by the actual count of the bales placed.
- E. Silt fence will be measured by the lineal foot, inclusive of silt traps as required.

146.5 BASIS OF PAYMENT

- A. Excelsior blanket will be paid for at the contract unit price per square yard. Payment will be full compensation for shaping and finishing ditches and channels, which are not specifically addressed with the item "Ditch Shaping", installing material and the furnishing of labor, equipment, staples, material and incidentals necessary.
- B. Fiber mulching will be paid for at the contract unit price per ton for fiber mulching. Payment shall be full compensation for furnishing and placing, and for all labor, equipment and incidentals necessary.
- C. Fiberglass roving with the asphalt anchor will be paid for at the contract unit price per square yard. Payment will be full compensation for furnishing, installing and all labor, equipment and incidentals necessary.
- D. Erosion bales will be paid for at the contract unit price per bale. Payment will be full compensation for furnishing, installing and all labor, equipment and incidentals necessary.
- E. Topsoil will be paid for as provided in Section 11 and Section 14.
- F. Seed and fertilizer will be paid for as provided in Section 70 and Section 71.
- G. Silt fence will be paid by the lineal foot.

END OF SECTION