

## 21 EROSION CONTROL

### 21-1.01 GENERAL

#### 21-1.01A Summary

Section 21 includes specifications for applying permanent erosion control measures to the soil surface.

The Engineer designates the extent of erosion control areas by directing the placement of stakes or other suitable markers in increments of 1 acre or less. Furnish tools, labor, materials, and transportation required to mark areas receiving erosion control treatments.

Move-in/move-out for erosion control includes (1) moving onto the project when the Engineer determines an area is ready to receive erosion control materials, (2) setting up all required personnel and equipment, and (3) moving out all personnel and equipment when work in that area is complete.

#### 21-1.01B Submittals

Submit a certificate of compliance for tackifier, bonded fiber matrix, and polymer-stabilized fiber matrix at least 5 business days before application. Certificates of compliance must include:

1. *Material Safety Data Sheet*
2. Product label
3. List of applicable nonvisible pollutant indicators for soil amendment and stabilization products as shown in the table titled "Pollutant Testing Guidance Table" in the Caltrans *Construction Site Monitoring Program Guidance Manual*
4. Report of acute and chronic toxicity tests on aquatic organisms conforming to EPA methods
5. List of ingredients, including chemical formulation
6. Properties of polyacrylamide in tackifier including (1) percent purity by weight, (2) percent active content, (3) average molecular weight, and (4) charge density

Submit a certificate of compliance for straw, fiber, RECP, and fasteners before application.

At least 60 days before seed application, submit proof that the order for seed required for the Contract has been placed and accepted by the seed vendor. Include the seed's botanical names, quantity ordered, and the anticipated date of delivery.

Submit the compost producer's *Compost Technical Data Sheet* including test results and *Seal of Testing Assurance* certificate before application.

Submit a copy of the *Analysis Report* for each seed species before application.

Submit quality control records for hydraulically applied erosion control materials that indicate (1) compliance with the specified application rates, (2) areas treated and quantity of materials applied, and (3) application date and time.

#### 21-1.01C Quality Control and Assurance

Obtain seed from lots that have been tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Tests must be performed not more than 12 months before application.

Seed must not contain prohibited noxious weed seed or more than 1.0 percent total weed seed by weight.

Provide seed labels from the seed supplier that indicate:

1. Seed variety including botanical name and common name
2. Lot number or other lot identification
3. Origin
4. Net weight
5. Percent pure live seed
6. Percent total viability, which is equal to the sum of the percent germination, percent hard seed, and the percent dormant seed
7. Percent by weight inert matter
8. Percent by weight other crop seed
9. Percent by weight weed seed

10. Name of restricted noxious weed seed by number per pound of seed
11. Name and address of the supplier or grower responsible for the analysis

Compost producers must be permitted by the California Department of Resources Recycling and Recovery, Local Enforcement Agencies, and any other State and local agencies that regulate solid waste facilities. If exempt from State permitting requirements, the composting facility must certify it complies with the guidelines and procedures for production of compost under the environmental health standards of CA Code of Regs §§ 17868.1–17868.4.

Compost producers must be participants in the United States Composting Council's Seal of Testing Assurance program.

### **21-1.02 MATERIALS**

#### **21-1.02A General**

Reserved

#### **21-1.02B Delivery, Storage, and Handling**

Deliver seed to the job site in unopened, separate containers with the seed tag attached.

The Engineer takes a sample of approximately 1 ounce or 1/4 cup of seed for each seed lot greater than 2 pounds. At the time of seed sampling, provide the Engineer with a glassine-lined bag and custody seal tag for each seed lot sample.

Deliver fertilizer in labeled containers showing weight, chemical analysis, and name of the manufacturer.

Furnish RECP in suitable wrapping to protect against moisture and extended ultraviolet exposure occurring before placement. Label RECP to provide identification sufficient for inventory and quality control purposes.

#### **21-1.02C Duff**

Duff must consist of vegetation removed and collected from clearing and grubbing activities. Vegetation may include trees, shrubs, ground cover, grasses, bark, leaves, and roots with attached soil.

Process vegetation into duff by tub grinding or chipping it into pieces not exceeding 6 inches in any dimension.

Stockpile duff until work area to receive duff is complete. Duff stockpiles must not exceed 5 feet in height.

#### **21-1.02D Topsoil**

Obtain topsoil from sources within or outside the job site as shown.

Topsoil must comply with the following requirements:

1. Local topsoil must conform to the requirements for selected material in section 19 and consists of (1) excavating topsoil, including organic material and leaf litter, in designated areas to the depth indicated, (2) stockpiling the soil on site, and (3) maintaining the stockpile until the material is reused in the work.
2. Imported topsoil must consist of fertile, friable soil of loamy character that contains organic matter in amounts natural to the region and be capable of sustaining healthy plant life. Imported topsoil must be free from deleterious substances such as litter, refuse, toxic waste, stones larger than 1 inch in size, coarse sand, heavy or stiff clay, brush, sticks, grasses, roots, noxious weed seed, weeds, and other substances detrimental to plant, animal, and human health.

#### **21-1.02E Fiber**

Fiber must be wood fiber, cellulose fiber, alternate fiber, or a combination of these fibers.

Wood fiber must be a long strand, whole wood fiber thermomechanically processed from clean whole wood chips.

Celullose fiber must be made from natural or recycled pulp fiber, such as wood chips, sawdust, newsprint, chipboard, corrugated cardboard, or a combination of these materials.

Alternate fiber must be a long strand, whole natural fiber made from clean straw, cotton, corn, or other natural feed stock.

Fiber must:

1. Disperse into a uniform slurry when mixed with water.
2. Contain 3/4-inch fiber strands for at least 25 percent by total volume.
3. Have at least 40 percent retained when passed through a no. 25 sieve.
4. Have an initial moisture content of no more than 15 percent of its dry weight when tested under CA Test 226. The moisture content must be marked on the packaging.
5. Have a water holding capacity, by weight, of at least 1,200 percent when tested under the procedure designated in the Department's Final Report, CA-DOT-TL-2176-1-76-36, "Water Holding Capacity for Hydromulch," available from METS.
6. Be nontoxic to plants and animal life.
7. Be free of synthetic or plastic materials, lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, and chlorine bleach.
8. Contain less than 250 ppm of boron.
9. Contain less than 7 percent ash when tested under Technical Association of the Pulp and Paper Industry, TAPPI Standard T 413.
10. Be colored to contrast with the area on which the fiber is to be applied. The coloring agent must be biodegradable, nontoxic, and free from copper, mercury and arsenic and must not stain concrete or painted surfaces.

Fiber for temporary hydraulic mulch must be at least 50 percent wood fiber. The remaining percentage must be cellulose fiber, alternate fiber, or a combination.

Fiber for temporary bonded fiber matrix and bonded fiber matrix must be 100 percent wood fiber and comply with the requirements for fiber except the sieve requirement must be at least 50 percent retained on a no. 25 sieve.

Fiber for polymer stabilized fiber matrix must be at least 50 percent wood fiber. The remaining percentage must be cellulose fiber, alternate fiber, or a combination.

#### **21-1.02F Tackifier**

##### **21-1.02F(1) General**

Tackifier must be (1) free from growth or germination inhibiting factors, (2) nonflammable, (3) nontoxic to aquatic organisms, and (4) functional for a minimum of 180 days.

General purpose tackifier may be either a plant based product or a polymeric emulsion blend as follows:

1. Plant based tackifier must be a natural high molecular weight polysaccharide, a high viscosity hydrocolloid that is miscible in water, and labeled as either guar, psyllium, or starch, as follows:
  - 1.1. Guar gum based product must be derived from the ground endosperm of the guar plant, *Cyamopsis tetragonolobus*. It must be treated with dispersing agents for easy mixing. It must be able to be diluted at the rate of 1 to 5 pounds per 100 gallons of water.
  - 1.2. Psyllium based product must be manufactured from the finely ground, mucilloid coating of *Plantago ovata* or *Plantago ispaghula* seeds and able to dry and form a firm but rewettable membrane.
  - 1.3. Starch based product must be a nonionic, water-soluble, granular material derived from corn, potato, or other plant-based source.
2. Polymeric emulsion blend tackifier must be a prepackaged liquid or dry powder, anionic formulation with a residual monomer content not exceeding 0.05 percent by weight. The tackifier must contain and be labeled with one of the following as the primary active ingredients:
  - 2.1. Acrylic copolymers and polymers.
  - 2.2. Polymers of methacrylates and acrylates.
  - 2.3. Copolymers of sodium acrylates and acrylamides.
  - 2.4. Polyacrylamide and copolymer of acrylamide.
  - 2.5. Hydrocolloid polymers.

**21-1.02F(2) Polymer Stabilized Fiber Matrix Tackifier**

Tackifier for polymer stabilized fiber matrix must be:

1. A liquid formulation with polyacrylamide as the primary active ingredient with the following requirements:
  - 1.1. Linear, anionic copolymer of acrylamide and sodium acrylate.
  - 1.2. Anionic with a residual monomer content that is at most 0.05 percent by weight.
2. Formulated and labeled as one of the following:
  - 2.1. Water-in-oil emulsion containing at least 2.6 pounds of pure polyacrylamide per gallon. Pure polyacrylamide must be at least 30 percent active.
  - 2.2. Liquid dispersed polyacrylamide containing at least 4.4 pounds pure polyacrylamide per gallon. Pure polyacrylamide must be at least 35 percent active.

**21-1.02F(3) Bonded Fiber Matrix Tackifier**

Tackifier for bonded fiber matrix must:

1. Be bonded to the fiber or prepackaged with the fiber by the manufacturer
2. Contain a minimum of 10 percent of the combined weight of the dry fiber, activating agents, and additives
3. Be an organic, high viscosity colloidal polysaccharide with activating agents or a blended hydrocolloid-based binder

**21-1.02G Seed**

Seed with a germination rate lower than the minimum rate shown may be used if authorized.

Measure and mix individual seed species in the presence of the Engineer before applying seed.

**21-1.02H Fertilizer**

Fertilizer must comply with the material specifications for fertilizer in section 20-7.02D(1).

**21-1.02I Straw**

Straw must be stalks from wheat, rice, or barley furnished in air-dry condition with a consistency compatible for application with commercial straw-blowing equipment. Wheat and barley straw must be derived from irrigated crops.

Straw must be free of plastic, glass, metal, rocks, and refuse or other deleterious material.

Straw must not have been used for stable bedding.

**21-1.02J Polymer Stabilized Fiber Matrix**

Polymer stabilized fiber matrix must be a hydraulically applied material composed of fiber and tackifier and may also include seed and fertilizer as shown.

**21-1.02K Bonded Fiber Matrix**

Bonded fiber matrix must be a hydraulically-applied material composed of fiber and tackifier and may also include seed and fertilizer as shown.

**21-1.02L Hydraulically Applied Erosion Control Products**

Reserved

**21-1.02M Compost**

Compost must be derived from one or a combination of the following types of materials:

1. Green material consisting of chipped, shredded, or ground vegetation or clean, processed, recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

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Compost must not be derived from mixed, municipal solid waste and must not contain paint, petroleum products, pesticides or other chemical residues harmful to plant or animal life. Materials must be composted to reduce weed seeds, pathogens, and deleterious materials under 14 CA Code of Regs §17868.3.

Metal concentrations in compost must not exceed the maximum listed under 14 CA Code of Regs §17868.2.

Compost must comply with the requirements shown in the following table:

<b>Compost</b>			
Property	Test method <sup>a</sup>	Requirement	
pH	TMECC 04.11-A Elastomeric pH 1:5 slurry method pH	6–8.5	
Soluble salts	TMECC 04.10-A Electrical conductivity 1:5 slurry method dS/m (mmhos/cm)	0–10	
Moisture content	TMECC 03.09-A Total solids & moisture at 70 ± 5 °C % wet weight basis	30–60	
Organic matter content	TMECC 05.07-A Loss-on-ignition organic matter method (LOI) % dry weight basis	40–100	
Maturity	TMECC 05.05-A Germination and vigor	--	
	Seed emergence	80 or above	
	Seedling vigor	80 or above	
	% relative to positive control		
Stability	TMECC 05.08-B Carbon dioxide evolution rate mg CO <sub>2</sub> -C/g OM per day	8 or below	
Particle size: fine compost	TMECC 02.02-B Sample sieving for aggregate Size classification % dry weight basis	min	max
	Pass 5/8-inch sieve	95%	--
	Pass 3/8-inch sieve	70%	--
	Maximum particle length: 6 inches		
Particle size: medium compost	TMECC 02.02-B sample sieving for aggregate Size classification % dry weight basis	min	max
	Pass 2-inch sieve	95%	--
	Pass 1-inch sieve (minimum 70% retained)	--	30%
	Maximum particle length: 6 inches		
Particle size: coarse compost	TMECC 02.02-B sample sieving for aggregate Size classification % dry weight basis	min	max
	Pass 2-1/2-inch sieve	99%	--
	Pass 3/8-inch sieve (minimum 60% retained)	--	40%
	Maximum particle length: 6 inches		
Pathogen	TMECC 07.01-B Salmonella < 3 MPN per 4 grams, dry weight basis	pass	
Pathogen	TMECC 07.01-B Fecal coliform bacteria < 1,000 MPN per gram, dry weight basis	pass	
Physical contaminants	TMECC 02.02-C Man-made inert removal and classification: Plastic, glass, and metal % > 4 mm fraction	combined total: < 1.0	
Physical contaminants	TMECC 02.02-C Man-made inert removal and classification:	none detected	

	Sharps (sewing needles, straight pins and hypodermic needles) % > 4mm fraction	
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<sup>a</sup> TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

### 21-1.02N Reserved

### 21-1.02O Rolled Erosion Control Products

#### 21-1.02O(1) General

RECP must be a long-term, degradable, open-weave textile manufactured or fabricated into rolls designed to reduce soil erosion and assist in the growth, establishment, and protection of vegetation. RECP must conform to the classification system established by the Erosion Control Technology Council.

#### 21-1.02O(2) Jute Mesh

Jute mesh must be made of processed natural jute yarns woven into a matrix. Jute mesh must comply with the requirements shown in the following table:

**Jute Mesh**

Property	Requirements	Test method
Classification	ECTC Type 3B	--
Minimum strands per foot in each direction	14–20	--
Minimum roll width	48 inches	--
Matrix	Unbleached and undyed woven jute	--
Universal soil loss equation (USLE) C-Factor for a 1.5:1 (H:V) unvegetated slope.	≤ 0.25	--
Maximum shear stress	2.0 psf	ASTM D 6460
Minimum tensile strength	100 psf	ASTM D 5035
Functional longevity	12 months	--
Average open area	65 ± 5%	--
Minimum weight of fabric	14.4–19.2 oz/sq yd	ASTM D 3776

#### 21-1.02O(3) Netting

Netting must be made of coconut fiber woven into a matrix. Netting must comply with the requirements shown in the following table:

**Netting**

Property	Type	Requirements	Test method
Classification	--	ECTC Type 4	--
Minimum thickness	A, B, C	0.30 inch	--
Roll width	A, B, C	72–158 inches	--
Matrix	A, B, C	100% woven coir (coconut fiber)	--
Universal Soil Loss Equation (USLE) C-Factor for a 1:1 (H:V) unvegetated slope	A, B, C	≤ 0.25	--
Maximum shear stress	A B C	2.25 psf 4.4 psf 4.6 psf	ASTM D 6460

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Minimum tensile strength	A, B, C	125 psf	ASTM D 5035
Functional longevity	A, B, C	36 months	--
Average open area	A B C	63 ± 5% 48 ± 5% 38 ± 5%	--
Minimum weight of fabric	A B C	11.8 oz/sq yd 20 oz/sq yd 26 oz/sq yd	ASTM D 3776

**21-1.020(4) Erosion Control Blankets**

Erosion control blanket must be made of processed natural fibers that are mechanically, structurally, or chemically bound together to form a continuous matrix that is surrounded by 2 natural nets. The erosion control blanket must comply with the requirements shown in the following table:

**Erosion Control Blanket**

Property	Type	Requirements	Test Method
Classification	--	ECTC Type 2D	--
Net type	A, B, C	Natural	--
Number of nets	A, B, C	Double	--
Minimum roll width	A, B, C	72 inches	--
Matrix	A B C	70/30% (straw/coconut fiber) 100% woven coir (coconut fiber) Wood excelsior (80 percent of the fiber 6 inches or longer)	--
Universal soil loss equation (USLE) C-Factor for a 2:1 (H:V) unvegetated slope.	A, B, C	≤ 0.20	--
Maximum shear stress	A, B, C	1.75 psf	ASTM D 6460
Minimum tensile strength	A, B, C	75 psf	ASTM D 5035
Functional longevity	A, B, C	12 months	--

**21-1.020(5) Turf Reinforcement Mats**

Turf reinforcement mat must be a nondegradable, open-weave textile made of synthetic fibers, filaments, nets, wire mesh or other elements, processed into a permanent, three-dimensional matrix. Turf reinforcement mat must comply with requirements shown in the following table:

**Turf Reinforcement Mat**

Property	Type	Requirements	Test Method
Classification	--	ECTC Type 5	--
Net type	A, B, C	Synthetic	--
Number of nets	A, B, C	Per manufacturer's specifications	--
Minimum thickness	A, B, C	0.25 inch	ASTM D 6525

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Minimum roll width	A, B, C	72 inches	--
Matrix	A, B, C	Per manufacturer's specifications	--
Universal soil loss equation (USLE) C-Factor for a 1.5:1 (H:V) unvegetated slope.	A, B, C	≤ 0.25	--
Maximum shear stress	A B C	6 psf 8.4 psf 10 psf	ASTM D 6460
Minimum tensile strength	A B C	125 psf 150 psf 175 psf	ASTM D 5035
Functional longevity	A, B, C	36 months	--
UV stability	A, B, C	80% at 500 hours	ASTM D 4355

**21-1.02P Fiber Rolls**

Fiber roll must have a minimum functional longevity of 1 year and comply with the following requirements:

1. Type A fiber roll must be fabricated from an erosion control blanket rolled along its width. Secure with natural fiber twine at 6-foot intervals, and 6 inches from each end. Fiber roll size must comply with either one of the following:
  - 1.1. 8 to 10 inches in diameter, 10 to 20 feet long, and at least 0.5 lb/ft
  - 1.2. 10 to 12 inches in diameter, at least 10 feet long, and at least 2 lb/ft
2. Type B fiber roll must be a premanufactured roll filled with rice or wheat straw, wood excelsior, or coconut fiber. Rolls must be covered with biodegradable jute, sisal, or coir fiber netting secured tightly at each end. Fiber roll size must comply with either one of the following:
  - 2.1. 8 to 10 inches in diameter, 10 to 20 feet long, and at least 1.1 lb/ft
  - 2.2. 10 to 12 inches in diameter, at least 10 feet long, and at least 3 lb/ft

**21-1.02Q Compost Socks**

Compost sock must be a mesh tube 12 inches in diameter filled with compost and must have a functional longevity of 1 year.

The mesh tube must be composed of a natural biodegradable product such as cotton, jute, sisal, burlap, or coir. The mesh tube must be clean, evenly woven, and free of encrusted concrete or other contaminating materials, cuts, tears, broken or missing yarns, and thin, open, or weak places.

Compost particle size for compost sock must comply with the material specification for coarse compost in the table titled "Compost Properties" specified in section 21-1.02M.

**21-1.02R Fasteners**

Wood stakes must be untreated fir, redwood, cedar, or pine and cut from sound timber. The ends must be pointed for driving into the ground. Notched stakes must be at least 1 by 2 by 24 inches in size. Stakes without notches must be at least 1 by 1 by 24 inches.

Metal stakes must be at least 1/2 inch in diameter and have tops bent at 90-degree angles or capped with an orange or red plastic safety cap that fits snugly onto the metal stake.

Steel staples must be a minimum of 11-gauge, 6-inch, U-shaped staples with a 1-inch crown. Provide heavier gauge and greater length if required by the site conditions. You may use an alternative attachment device such as a 100 percent biodegradable fastener to install RECP instead of staples.

Rope to fasten fiber rolls and compost socks must be 1/4 inch in diameter and biodegradable, such as sisal or manila.

**21-1.02S Water**

Water must be of a quality that promotes germination of seeds and growth of plants.

**21-1.03 CONSTRUCTION****21-1.03A General**

Before applying erosion control measures, verify that finished grades meet the requirements for grade, compaction and finish as specified in section 19.

Apply erosion control materials within 24 hours after the final preparation of the erosion control areas. Do not apply hydraulically applied materials under the following conditions:

1. Precipitation
2. Water is standing on or moving across the soil surface
3. Soil is frozen
4. Air temperature is below 40 degrees F during the tackifier curing period unless allowed by the tackifier manufacturer and authorized

**21-1.03B Site Preparation**

Remove and dispose of trash, debris, and weeds in areas to receive erosion control materials.

Remove and dispose of loose rocks larger than 2-1/2 inches in maximum dimension unless otherwise authorized.

Protect the traveled way, sidewalks, lined drainage channels, and existing vegetation from overspray of hydraulically-applied material.

**21-1.03C Duff**

Upon completion of the earthwork in an area, spread duff to a uniform thickness. Do not apply duff within 10 feet of the pavement edge. Roadway and adjacent areas must be left in a neat and finished appearance.

Trackwalk duff with tracked equipment run perpendicular to slope contours. Water may be used to assist this process but must not cause erosion.

**21-1.03D Topsoil**

Place topsoil after all other earthwork in an area is complete.

Spread topsoil to a uniform thickness.

Trackwalk topsoil with tracked equipment run perpendicular to slope contours. Water may be used to assist the process but must not cause erosion.

**21-1.03E Hydromulch and Hydroseed**

Apply hydromulch with hydraulic spray equipment that mixes fiber, tackifier, fertilizer, and other erosion control materials specified. If applying hydroseed, add seed to hydromulch. Seed may be dry applied to small areas not accessible by hydroseeding equipment if authorized.

Add water to hydromulch and hydroseed materials as recommended by the manufacturer and mix sufficiently to ensure an even application. A dispersing agent may be added to the mixture if authorized.

Equipment must utilize a built-in continuous agitation and discharge system capable of producing a homogeneous mixture and a uniform application rate. The tank must have a minimum capacity of 1,000 gallons. You may use a smaller tank if authorized.

Apply materials in locations, rates, and number of applications shown and as follows:

1. Begin application within 60 minutes after adding seed to the tank.
2. Apply in successive passes as necessary to achieve the required application rate.
3. Apply all hydromulch or hydroseed materials indicated for a single area within 72 hours.

When hydromulch or hydroseed materials are applied to areas covered by RECP, apply hydromulch and hydroseed materials to the rolled product as follows:

1. Verify the RECP is in uniform contact with the slope surface.
2. Spray materials into the RECP perpendicular to the slope and integrate well.
3. Do not displace or damage the RECP.

After the final application, do not allow pedestrians or equipment onto the treated areas.

#### **21-1.03F Dry Seed**

Apply dry seed and fertilizer at the rates shown after site preparation. Scarify areas to a minimum depth of 1 inch. Apply and incorporate materials into the soil to a maximum depth of 1/4 inch by dragging or raking.

#### **21-1.03G Drill Seed**

Drill-seeding equipment must be a rangeland drill seeder with a ring roller attached. The seeder must be equipped with a fluffy seed box with agitators to prevent bridging and clogging. The seed box must have metal row dividers and individual box adjustments to meter the seed flow.

Apply drill seed as follows:

1. Drill seed in rows no greater than 8 inches apart and to a depth of 1/4 inch.
2. Make a minimum of 3 passes in different directions with seeding equipment to reduce any uniform row appearance.
3. Do not apply seed within 8 feet of the pavement edge.

#### **21-1.03H Straw**

Apply straw by spreading it uniformly without clumping or piling at the rates shown, based upon slope measurements. Once straw work is started in an area, apply all materials for that area in the same working day.

#### **21-1.03I Polymer Stabilized Fiber Matrix**

Apply polymer stabilized fiber matrix materials from multiple directions and angles to ensure complete coverage in the locations, application rate, and number of applications shown.

#### **21-1.03J Bonded Fiber Matrix**

Apply bonded fiber matrix materials in the locations, rates, and number of applications shown and as follows:

1. Apply in successive passes as necessary to achieve the required application rate.
2. Form a continuous uniform mat with no gaps between the mat and the soil surface as follows:
  - 2.1. Apply in 2 or more directions if necessary.
  - 2.2. Apply in layers as necessary to avoid slumping and aid drying.

#### **21-1.03K Hydraulic Erosion Control Products**

Reserved

#### **21-1.03L Compost**

Apply compost to a uniform thickness in the locations shown. If compost and seed are applied simultaneously, mix and apply together with equipment suitable for the application such as a pneumatic blower truck.

#### **21-1.03M Reserved**

#### **21-1.03N Incorporate Materials**

Incorporate topsoil, duff, compost, and mulch to the depth shown until well mixed. Materials may be mixed together before incorporation if authorized.

Do not incorporate materials within 2 feet of the pavement edge.

Incorporate straw with a roller made of approximately 7/8-inch steel plate equipped with straight studs placed approximately 8 inches apart and staggered. Studs must not be less than 6 inches long nor more than 6 inches wide and must be rounded to prevent the straw withdrawing from the soil. The roller weight

must be sufficient to incorporate the straw into the soil to a depth that will not support combustion and result in a uniform surface.

Compact the area to a relative compaction between 82 percent and 90 percent except as otherwise specified in section 19-5.

#### **21-1.03O Rolled Erosion Control Products**

Before placing RECP, ensure the subgrade has been graded smooth and has no depressed voids. The subgrade must be free from obstructions, such as tree roots, projecting stones, or foreign matter greater than 1 inch in diameter.

Fasten RECP to the surface with staples and anchor as shown.

Do not drive vehicles upon RECP following placement.

#### **21-1.03P Fiber Rolls**

Before installing fiber roll remove obstructions from the ground, including rocks, clods, and debris greater than 1 inch in diameter.

Install fiber roll approximately parallel to the slope contour. For any 20-foot section of fiber roll, prevent the fiber roll from varying more than 5 percent from level. Install fiber roll on slopes at the following spacing unless shown otherwise:

1. 10 feet apart for slopes steeper than 2:1 (horizontal:vertical)
2. 15 feet apart for slopes from 2:1 to 4:1 (horizontal:vertical)
3. 20 feet apart for slopes from 4:1 to 10:1 (horizontal:vertical)
4. 50 feet apart for slopes flatter than 10:1 (horizontal:vertical)

Type 1 fiber roll installation consists of placing and fastening as follows:

1. Place in a furrow that is from 2 to 4 inches deep.
2. Fasten with wood stakes every 4 feet along the length of the fiber roll.
3. Fasten the ends of the fiber roll by placing a stake 6 inches from the end of the roll.
4. Drive the stakes into the soil so that the top of the stake is less than 2 inches above the top of the fiber roll.

Type 2 fiber roll installation consists of placing and fastening as follows:

1. Fasten with notched wood stakes and rope.
2. Drive stakes into the soil until the notch is even with the top of the fiber roll.
3. Lace the rope between stakes and over the fiber roll. Knot the rope at each stake.
4. Tighten the fiber roll to the surface of the slope by driving the stakes further into the soil.

Maintain fiber roll in a manner that provides sediment holding capacity and reduces runoff velocities as follows:

1. Remove sediment from behind the fiber roll when sediment is 1/3 of fiber roll height above ground.
2. Repair or adjust the fiber roll when rills or other evidence of concentrated runoff occur beneath the fiber roll.
3. Repair or replace the fiber roll when they become split, torn, or unraveled.
4. Add stakes when the fiber roll slumps or sags.
5. Replace broken or split wood stakes.
6. Remove sediment deposits, trash, and debris from fiber roll as needed or when ordered. If removed sediment is deposited within project limits, it must be stabilized and not exposed to erosion by wind or water.

#### **21-1.03Q Compost Socks**

Before installing compost sock remove obstructions from the ground including rocks, clods, and debris greater than 1 inch in diameter.

Install and maintain compost sock following the procedures for fiber rolls and the following:

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1. Place mesh tube, secure the end, and fill uniformly with compost. Secure the remaining end.
2. Fasten compost sock to soil surface following the procedures for Type 1 and Type 2 installation of fiber roll.
3. Remove sock when ordered. Cut sock and empty contents in place. Dispose of sock.

### **21-1.04 PAYMENT**

Items paid for by area or length are measured parallel to the ground surface excluding overlaps.

A move-in followed by a move-out counts as 1 unit. The Department does not adjust the unit price for an increase or decrease in the move-in/move-out quantity.

Collecting, processing, and stockpiling of duff is paid for as clearing and grubbing as specified in section 16. Spreading duff is paid for as duff. Local topsoil is paid for as roadway excavation as specified in section 19-2.

Imported topsoil is measured in the vehicle at the point of delivery.