Chapter 4 Construction Details

Section 21 Erosion Control

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4-2101 General

Erosion control is covered in Section 21, “Erosion Control,” of the *Standard Specifications*. Erosion control materials are applied to roadside and median areas where sediment control is necessary and where planting may be installed in the future. Landscaping involves preparing areas for planting, installing plants, and performing erosion control establishment work. Landscaping is sometimes combined with erosion control on a project. Landscaping is covered in Section 20, “Landscape,” of the *Standard Specifications*. Section 4-20, “Landscape,” of this manual supplies additional information.

For questions about the acceptability of materials and work for erosion control, resident engineers may consult with landscape architects and landscape specialists in the district.

Properly applied erosion control is critical for preventing water pollution. The success of erosion control work often depends on the time of year of application. Consult with the project landscape architect and landscape specialists before changing the order of work and the dates specified for erosion control.

4-2102 Materials

The following provides general information on materials used for erosion control.

4-2102A Imported Topsoil

Topsoil requires a balance of organic matter, sand, clay, and nutrients necessary to support healthy plant life. Refer to Section 21-2.02C, “Imported Topsoil,” of the *Standard Specifications* for technical details. Topsoil that contains too large a percentage of sand or clay may be deficient in organic matter and be a poor medium for growing plants. High sand content tends to promote dry soil. High clay content limits aeration and drainage, promoting water-logged roots.

For good plant growth, the pH, or measure of acidity or alkalinity, should be 6.0 to 7.0 and the soluble salt content of topsoil should not exceed 500 parts per million. If the topsoil’s composition is questionable, a soil test can determine the pH and salt content.

Reject any topsoil if it has too much clay, sand or lacks enough organic matter. Evidence of poor weed growth is a good indicator that the topsoil will not support healthy plant growth. If the topsoil is questionable, consider obtaining a soil test.

4-2102B Fertilizer

Section 20-3.01B(4), “Fertilizers,” of the *Standard Specifications*, and the special provisions provide the requirements for fertilizer, which is expressed as percentages of nitrogen, phosphoric acid, soluble potash, and sulfur. Fertilizer may be spread

with other materials using hydroseeding equipment. Fertilizer may also be applied for highway planting.

4-2102C Straw

Straw has proved to be an effective method of controlling slope erosion.

Straw provides the following benefits:

- Protects soil from wind, rain, sun, and birds that eat the seed.
- Conserves surface moisture and maintains uniform soil surface temperatures, promoting seed germination and early growth.
- Slows the velocity of water runoff.

4-2102D Fiber

Fiber is derived from wood, paper, or other natural products.

When properly used, fiber provides the following benefits:

- Protects and cushions seed within hydroseeding equipment from the action of pumps and discharge through the nozzle.
- Enables more uniform seed distribution by minimizing clumping.
- Enhances a visual inspection of seed coverage when dye is added.
- Covers and anchors seed to the slope.
- Enables seed, stabilizing emulsion, and commercial fertilizer to be applied in one application.
- Is applied by means of a hose to slopes not accessible by other mulching equipment.

The most common method of applying fiber is with hydroseeding equipment.

4-2102E Seed

Sections 21-2.01B, “Definitions”; 21-2.01C(3), “Seed”; 21-2.01D(3), “Seed”; and 21-2.02F, “Seed,” of the *Standard Specifications*, provide the requirements. Minimum seed purity and germination are usually specified for seed on the project plans. The purity of seed is defined as the percentage of a specified seed in relation to the total quantity, which includes inert matter, weed seed, and dead seed. Seed germination is the percentage of pure seed that will grow when tested under laboratory conditions. The percentage of pure live seed is the percentage of purity multiplied by the percentage of germination. Pure live seed is expressed as a percentage.

4-2102F Tackifier

Section 21-2.02E, “Tackifier,” of the *Standard Specifications*, provides the requirements for tackifier. Tackifier serves as a glue or binder for the other erosion control materials that it is mixed with it. Tackifier is often applied with fiber and

fertilizer. Tackifier increases the amount of fiber, seed, and fertilizer that a slope will hold, improving the opportunity for the seeds to germinate.

The tackifier will normally specify the amount of water that must be added to make the proper consistency.

4-2102G Compost

Requirements for compost are in Sections 21-2.01D, “Quality Assurance,” and 21-2.02K, “Compost,” of the *Standard Specifications*. There will be a compost standard special provision when compost is used on the project.

4-2102H Duff

Requirements for duff are shown in Sections 21-2.02B, “Duff,” and 21-2.03B, “Duff,” of the *Standard Specifications*. Duff must be stockpiled in accordance with specifications to assure the microorganisms will be alive when the material is applied to the slope. Application of these microorganisms is the main reason that duff is specified.

4-2102I Bonded Fiber Matrix

Bonded fiber matrix differs from other erosion control mixes in that it has fiber that is chemically bonded to the tackifier. Requirements for bonded fiber matrix are shown in Section 21-2.02J, “Bonded Fiber Matrix,” of the *Standard Specifications*. Manufacturer's directions and rate of application are printed on the packaged product.

4-2102J Rolled Erosion Control Products

Rolled erosion control products are manufactured textiles designed to reduce soil erosion by covering and holding sediment in place. They may be jute mesh, netting, erosion control blankets, or turf reinforcing mat. See *Standard Plans* detail H51 for fiber roll and compost sock construction. See Section 21-2.02O, “Rolled Erosion Control Products,” of the *Standard Specifications* for material requirements.

4-2102K Fiber Rolls

Fiber rolls are composed of natural netting filled with rice or wheat straw, wood excelsior, or coconut fiber. They are typically laid parallel to the contours of a slope to reduce sediment movement down the slope. See *Standard Plans* detail sheet H51 for fiber roll construction. See Section 21-2.02P, “Fiber Rolls,” of the *Standard Specifications*.

4-2102L Compost Socks

Compost socks are long rolls of natural netting filled with compost. See *Standard Plans* detail sheet H51 for fiber roll construction. There will be a compost sock standard special provision on the project when it is used.

4-2102M Turf Reinforcement Mats

Turf reinforcement mats typically are used in very steep or very loose soil conditions. See Section 21-2.02O(5), "Turf Reinforcement Mats," of the *Standard Specifications*, about the systems of cells or webbing made of plastic or polypropylene to hold soil in place.

4-2103 Before Work Begins

Before work begins, do the following:

- Review the project, and *Standard Plans* and specifications to determine the specified type of erosion control material and the time of application.
- Verify that Form CEM-3101, "Notice of Materials to Be Used," includes erosion control materials. Refer to Section 6-202, "Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products," of this manual for additional information.
- When the bid item 190123 roadway excavation (topsoil) is specified, examine the topsoil to determine that sufficient quantity is available and that it is suitable for the planned use. If the topsoil appears inadequate, consult with the project landscape architect or landscape specialists. Verify that sufficient area exists at the top of slopes to stockpile topsoil.
- The contractor must provide the seed vendor's lab test results. Make sure the test results are complete and received in a timely manner.
- Erosion control materials are applied at a specified rate, in pounds or tons per acre. Before installation of the erosion control, measure and compute areas and verify the bid item so that spread rates may be checked during application and the contractor is aware of anticipated area of payment.
- Examine equipment to be used in erosion control work to determine if it meets specified requirements.
- Arrange the inspection schedule to be able to verify the materials as they are placed inside of the hydroseeder.

4-2104 During the Course of Work

As materials for erosion control arrive on the project, and before application, do the following:

- Through examination, verify that imported topsoil meets the specified requirements.
- To determine if fertilizer meets specifications, check the chemical analysis on the label of the fertilizer bag. This label generally is sufficient information to determine that the fertilizer meets the requirements.
- In addition to furnishing certified daily summary weigh sheets, require the contractor to furnish weighmaster certificates with each load of straw delivered to the project. Keep records for the mass of straw delivered to stockpiles. Based on

specifications, check for county agricultural certification if out-of-county straw is used.

- Verify the receipt of a certificate of compliance for fiber. Check the labeling on the package for moisture content.
- Verify the species of seed listed on the seed label for consistency with the species listed on the erosion control plans.
- Compare the percentage total viability stated on the vendor seed label with the percentage total viability on the seed vendor's lab test results.
- Check that the percentage of total weed identified on the seed label is less than the percentage stated in the special provisions.
- Verify that no California-prohibited noxious weeds are identified on the vendor seed label.
- Check the seed lot test date. For purity and germination, the seed must have been tested within the past 12 months.
- Check seed package labels and other required documentation. Calculate the weight of pure live seeds in each sack.
- When approving the use of seed with a germination rate lower than the minimum rate specified, application rates must be sufficient to attain the specified amount of pure live seed. Before approving a lower germination rate, consult with the project landscape architect.
- Look for the following when inspecting seed labels and seed laboratory reports:
  - Species of seed on the seed label does not match the species in the special provisions.
  - The percentage total viability of the seed is lower than what is specified in the special provisions.
  - The percentage total weed identified on the vendor seed label is greater than what is specified in the special provisions.
  - The presence of California-prohibited noxious weeds is identified on the vendor seed label or test results.
- Verify the receipt of a certificate of compliance for tackifier.

During the application of erosion control materials, do the following:

- Verify that the contractor prepares areas to receive erosion control as required in the specifications.
- Check that topsoil, duff, or compost is spread uniformly at the specified rate or depth. Make sure the contractor loosens any compacted topsoil.
- Verify that the contractor applies erosion control materials in the specified sequence and application rate.
- When straw is required, determine the spread rate by counting bales and using average bale weights. If the contractor applies the straw pneumatically, suspend

the operation if wind conditions cause the straw or visible dust to be blown onto public roadways or onto private property.

- Observe the amounts and proportions of materials spread or entered into the hydroseeder. You may use sack counts and weights to determine the weights of seed, stabilizing emulsion, fiber, and commercial fertilizer.
- Compute and record the spread rates of the various materials applied. For each day of operation, compute and record the spread rates at least once.

4-2105 Labor Related Bid Items during Course of Work

4-2105A Move-in or Move-out Erosion Control

This bid item is used when there may be phases to the work that affect the timing of the application of erosion control. When this bid item is used, the contractor is paid each time they mobilize for erosion control with the moving in or out of equipment to the construction site.

4-2105B Incorporate Materials

Section 21-2.03J, "Incorporate Materials," of the *Standard Specifications*, provides the requirements for work usually required with compost to provide the mixing-in of the compost into the soil. Equipment, such as a disc, drives the compost deeper into the soil where it will improve the material that the plant roots will grow in.

4-2105C Permanent Erosion Control Establishment Work

Section 21.3, "Permanent Erosion Control Work," of the standard special provisions, requires the contractor to perform weekly inspections of the erosion control for one year after the construction is complete using construction Form CEM-2032, "Permanent Erosion Control Establishment (PECE) Report," along with forms used for stormwater work to develop a list of work items that need attention or repair. A change order is used to complete the repair work found in the inspections. Examples of the repair work might be: re-application of hydroseeding in areas with low germination rates, minor grading of slopes that have significant sediment movement, or repair of rolled erosion control products. The change order repairs for this item should be limited to items that are damaged or failing through no fault of the contractor.

4-2106 Level of Inspection

Suggested level of inspection for typical erosion control work activities, including applying temporary and permanent erosion control measures to the soil surface, is benchmark inspection.

4-2107 Quality Control

Verify that erosion control materials used on the project are sampled and tested under Section 21, "Erosion Control," of the *Standard Specifications,* using the test methods specified and meeting the requirements for each quality characteristic

described. Verify the material data sheets indicate quality is within ranges stated in the standard special provision for compost.

4-2108 Payment

From the weight shown on the certified scale sheets, deduct any straw not used in the work. If a “weigh back” certified weight is not available, you may use bale counts and average bale weights for this purpose.

To determine pay quantities, you may use sack counts and sack weights. Make accurate counts and record them in the project records.

Determine the pay quantity of pure live seed using the germination and purity rates of the bulk seed.

To determine the pay quantity for erosion control items that are paid for by area, field measure the area that receives the erosion control.