SECTION 02295

RIPRAP SLOPE AND CHANNEL PROTECTION

02295.01 GENERAL

A. Description

Riprap slope and channel protection shall include, but not necessarily be limited to, protecting slopes and channels with coverings of stone to the lines and grades shown on the Plans in accordance with the Contract Documents or as directed by the Engineer.

B. Related Work Included Elsewhere

Excavation; Sections 02210, 02220, and 02230.

C. Quality Assurance

1. The Engineer will inspect all materials and work to ensure compliance with the Contract Documents.

2. Criteria for visual inspection of stone shall be as specified in Section 02291.01.

D. Submittals

1. Shop Drawings

   Shop drawings shall be submitted as specified in the "General Provisions" for all filter fabric furnished. The shop drawings shall include general product information and a tabulation of the fabrics physical properties. The Contractor shall also submit his stone source.

2. Certificates of Compliance

   Certificates of compliance shall be submitted as specified in the "General Provisions" for the filter fabric stating that the filter fabric meets the materials requirements specified in Section 02295.02.

02295.02 MATERIALS

A. Materials Furnished by the County

The County will not furnish any materials for riprap slope and channel protection.

B. Contractor's Options

When permitted by the Engineer, broken concrete may be substituted for stone.

C. Detailed Materials Requirements

1. Stone for Channels and Ditches

Stone for channels and ditches shall meet the general requirements for stone and the size requirements of Class I Riprap as specified in Section 02291.02. In addition, the stone shall meet the following quality requirements:

Test and Method	Specification Limits
Apparent Specific Gravity, AASHTO T 85, min.	2.50
Absorption AASHTO T 85, % max	3.0
Sodium Sulfate Soundness 5 cycles, 2 1/2 to 1 1/2 inch Aggregate, AASHTO T 104, % max. loss	20

2. Stone for Slopes

Stone for slopes shall meet the quality requirements specified in Paragraph 1 above and shall meet the gradation requirements of AASHTO M 43, No. 1 when determined in accordance with AASHTO T 27 omitting AASHTO T 11 as follows:

Sieve Sizes U.S. Standard	Mass Percent Passing
4 inch	100
3 1/2 inch	90-100
2 1/2 inch	25-60
1 1/2 inch	0-15
3/4 inch	0-5

3. Filter Blanket

Filter blanket for riprap slope and channel protection shall be graded aggregate AASHTO M 43, No. 57 meeting the gradation requirements and quality requirements for graded aggregate for base courses as specified in Section 02621.02.

4. Filter Fabric

a. Fabric shall be a nonwoven fabric consisting of long chain polymeric filaments or yarns of polypropylene, polyester, polyamide, or polyvinylidene-chloride formed into a stable network.

b. Fabric shall be inert to chemicals commonly encountered in soil and to hydrocarbons.

c. Fabric shall be resistant to mildew, rot, and insect and rodent attacks.

d. Fabric shall contain ultraviolet ray inhibitors and stabilizers and be suitable for use at temperatures of 0°F to 120°F.

e. Fabric shall conform to the following test criteria:

Test and Method	Specification Limits
Grab Tensile Strength, ASTM D 1682, lbs min.	90
Tensile Elongation, ASTM D 1682, % min.	20
Burst Strength, ASTM D 3786, psi min.	140
Trapezoidal Tear Strength, ASTM D 1117, psi min.	45
Equivalent Opening Size, U.S. Standard Sieve Size, CW-02215 Corps of Engineers	40-100 As shown on the Plans
Flow Rate, AASHTO M 2281 Appendix, gpm/sq ft min.	40
Coefficient Permeability, AASHTO M 228 Appendix, cm/sec min.	0.05

f. Fabric securing pins shall be 3/16-inch diameter steel, pointed at one end, and fabricated at the other end with a head to retain a steel washer having an outside diameter of not less than 1 1/2 inches. Pin length shall be at least 18 inches.

02295.03 EXECUTION

A. Excavation

Excavation for riprap slope and channel protection, including cutoff walls, shall be made in reasonably close conformity with the lines and grades shown on the Plans. The foundation upon which the slope and channel protection is to be placed shall be an even surface that is acceptable to the Engineer.

B. Foundation

1. Filter Fabric

After the Engineer has approved the excavation, the Contractor shall install the filter fabric over the prepared surface. Securing pins shall be used to anchor the fabric in place. Where fabric overlaps are necessary, the minimum overlap shall be 12 inches.

2. Filter Blanket

The filter fabric shall be covered with a 6-inch deep filter blanket, which shall be consolidated to the satisfaction of the Engineer.

C. Riprap Placement

The placement of the riprap shall begin with the cutoff walls. The larger stones should be placed in the cutoff walls and along the outside edges of the limits of the slope and channel protection. The riprap shall be placed with suitable equipment in such a manner as to produce a reasonably graded mass of stones. Placing the stones by methods that causes extensive segregation or damage to the underlying filter fabric will not be permitted.

D. Backfill

Any excavation voids existing along the edges of the completed slope and channel protection shall be backfilled to the satisfaction of the Engineer.

02295.04 METHOD OF MEASUREMENT

A. Riprap

Measurement for riprap slope and channel protection will be made of the finished surface area. Area measurements will be made parallel to the foundation on which the riprap is placed.

B. Cutoff Walls

Measurement for constructing cutoff walls will be made of the length of cutoff wall constructed.

02295.05 BASIS OF PAYMENT

A. Riprap

Payment for riprap slope and channel protection will be made at the price bid per square yard. The price bid shall include all excavation; backfill; disposal of surplus materials; furnishing and installing all filter fabric, filter blanket and stone; and furnishing all materials, labor, tools, equipment, and incidentals necessary to complete the work.

B. Cutoff Walls

Payment for cutoff walls will be made at the price bid per linear foot. The price bid shall include excavation; backfill; disposal of surplus materials; furnishing and installing all filter fabric, filter blanket, and stone; and furnishing all materials, labor, tools, equipment, and incidentals necessary to complete the work.