

## SECTION 65

### RIPRAP

#### 65.1 DESCRIPTION

**A. General:** This work consists of furnishing and placing approved material for the protection of piers, abutments, walls, embankments, and other plan-designated locations.

**B. Related Work:**

Section 202 Geosynthetics for Roadways  
Section 203 Submittals

#### 65.2 MATERIALS

Riprap shall be under-laid with Class 1 non-woven separation fabric per Section 202.

**Riprap:** Stone for riprap shall be hard and durable and shall have a minimum weight of 155 pounds per cubic foot. Riprap may be ledge rock or field stone. If field stone is utilized for Class B or larger, the stone shall have a minimum of 2 crushed faces as defined under SDDOT Materials Sampling and Testing SD 211. Stone shall be free from overburden, spoil, shale, and organic material. The riprap stone shall meet the following gradation requirements:

Riprap Class	Rock Size* <sup>1</sup> in feet	Rock Size in pounds	Percent of Riprap Smaller Than
A	1.30	200	100
	0.95	75	50
	0.40	5	15
B	1.80	500	100
	1.30	200	50
	0.40	5	15
C	2.25	1000	100
	1.80	500	50
	0.95	75	15
D	2.85	2000	100
	2.25	1000	50
	1.80	500	15
E	3.60	4000	100
	2.85	2000	50
	2.25	1000	15
F	4.50	8000	100
	3.60	4000	50
	2.85	2000	15

\*<sup>1</sup> Based on a specific gravity of 2.65 and spherical shape.

The riprap class is the median particle weight with 50% of the material smaller and 50% of the material larger.

Each load of riprap shall be well graded from the smallest to the maximum size specified.

### **65.3 CONSTRUCTION REQUIREMENTS**

Areas to be protected by riprap shall be free of brush, trees, stumps, and other objectionable material and shall be dressed to a smooth surface. Soft or spongy material shall be removed to the specified depth and replaced with approved material. Filled areas shall be thoroughly compacted. All excavation required to construct the riprap subgrade to the configuration detailed in the plans shall be incidental to the payment for riprap. On slopes, a trench at least one (1) foot deep and one (1) foot wide shall be cut along the toe of the slope to receive the first or bearing course of large riprap stone.

The surface to be covered with separation fabric shall be smooth, free of obstructions, and shall conform to plan shown dimensions prior to placement of the separation fabric. The separation fabric shall be placed under and along all sides of the riprap that are in contact with earth, unless otherwise shown on the plans. Lapped joints in the separation fabric shall be placed transverse to the direction of flow with the overlap in the direction of flow. All lapped joints shall be lapped a minimum of one (1) foot. Vehicles and equipment shall not be operated directly on the separation fabric.

Protection for structure foundations shall be provided as early as the foundation construction permits. The area to be protected shall be cleaned of waste materials.

Riprap shall be placed in a manner which will produce a reasonably well graded mass of stone with the minimum practicable percentage of voids. Riprap shall be placed to its full course thickness in one operation without displacing the underlying material. Bridge berms, channel slopes/bottoms, and other surfaces that will be covered with riprap shall be finished to an elevation that will permit the placement of the required depth of riprap and match plan elevations or existing channels. Placing of riprap in layers, or by dumping into chutes, or similar methods likely to cause segregation will not be permitted. The larger stones shall be well distributed and the entire mass of stone shall conform to the gradation specified.

In order to produce a compact riprap protection in which all sizes of material are placed in their proper proportions, hand placing or rearranging of individual stones by mechanical equipment may be required.

The riprap protection shall be placed in conjunction with the construction of the embankment. To prevent mixture of embankment and riprap, sufficient lag in construction of the riprap may be necessary. The Contractor shall maintain the riprap protection until accepted. Material displaced by any cause shall be replaced.

### **65.4 METHOD OF MEASUREMENT**

**A. Riprap:** Will be measured to the nearest one-tenth (0.1) ton or one-tenth (0.1) cubic yard.

**B. Separation Fabric:** Will not be measured separately.

**65.5 BASIS OF PAYMENT**

**A. Riprap:** Will be paid for at the contract price per ton or cubic yard of material furnished. Payment for this item will be full compensation for furnishing, loading, hauling, placing, spreading the stone, and for labor and equipment required for shaping, excavating and performing all operations necessary.

**B. Separation Fabric:** Is incidental to the contract unit price for riprap.

**END OF SECTION**