

Section 813. SLOPE PROTECTION

813.01 Description. This work consists of constructing precast and cast-in-place concrete slope paving, including headers along the edge, and grouted riprap, plain riprap, and heavy riprap.

813.02 Materials. Materials shall meet the following requirements.

Concrete, Grade P2	601
Mortar, Type R-3	702
Cement	901
Granular Material Class II	902
Curing Compound	903
Steel Reinforcement	905
Geotextile Liner	910
Precast Concrete Slope Paving Blocks	913
Riprap	916
Heavy Riprap	916

For concrete, the maximum allowable time interval between introduction of the mixing water and placement of the concrete in the work shall be one and one half hours. If additional time is required, a retarding admixture selected from the Qualified Products List may be used to delay the set time. The maximum time interval shall not exceed the manufacturers' recommendations for maximum initial set time. Retempering is not allowed. No additional compensation will be allowed for any admixture.

813.03 Construction.

- A. **Preparation of Base.** The subgrade shall be excavated or filled, compacted to insure its stability, and shaped for bottom of riprap, precast and cast-in-place concrete slope paving, or to the bottom of the granular material layer. The excavated surplus subgrade material shall be disposed of according to subsection 205.03.P. The subgrade shall be trimmed to the tolerances specified for Class A slopes in subsection 205.03.N. The granular material layer shall be constructed according to subsection 301.03 except that the material shall be compacted to not less than 90 percent of its maximum unit weight. Geotextile shall be placed on the prepared base as specified.
- B. **Precast Concrete Slope Paving.** The precast units shall be placed on a layer of granular material. The joints between precast units shall be filled with Type R-3 mortar. The edges of the precast units shall be moist when the mortar is placed. Mortar shall be placed from bottom to top, and sufficient mortar shall be used and consolidated to completely fill the joints between the precast units. Any excess mortar shall be removed from the surface of the slope paving. The mortar shall be cured and protected according to subsection 813.03.C.3. Weather and temperature limitations for placing and curing mortar shall be according to subsection 602.03.T.

C. Concrete Slope Paving.

1. **Forms.** The forms shall be wood or metal, straight and free from warp, and of sufficient strength to resist deflecting during concrete placement. The forms shall be the full depth of the concrete. All forms, including slab division forms, shall be firmly staked to the required line and grade. The slab division joints shall be straight and continuous.
2. **Placing and Finishing Concrete.** The base shall be thoroughly wetted immediately prior to concrete placement. The concrete shall be continuously placed to the proper depth, in blocks of the dimensions shown on the plans.

The concrete shall be thoroughly consolidated along the faces of the forms.

The concrete surface shall then be tamped to remove all voids and struck off with a strike board to the required finished grade and cross section.

The concrete surface shall be finished with a wood float. All edges and joints shall be rounded to a radius of $\frac{1}{4}$ inch with an approved finishing tool. Edging and finishing tool marks shall be removed with a float and soft bristle brush.

Weather and temperature limitations for placing and curing concrete shall be according to subsection 602.03.T.

3. **Curing and Protection.** The concrete shall be cured for a minimum of four days by being kept continuously wet, or by the application of transparent membrane curing compound meeting subsection 903.06.A.

D. **Slope Paving Headers.** Forms shall be as specified in subsection 813.03.C.1, except that concrete placed at the depth below the elevation of the slope paving subgrade, or granular material layer when specified, may be cast neat to the earth, as approved by the Engineer. Steel reinforcement shall be placed according to subsection 802.03.C. Placing and finishing slope paving header concrete shall be according to subsection 813.03.C.2. Curing slope paving header concrete shall be according to subsection 813.03.C.3.

E. **Riprap.** Geotextile fabric shall be placed under all riprap. Laps in the geotextile shall be a minimum of 2 feet. Horizontal laps shall have the upgrade section overlapping the downgrade section (shingle lap).

1. **Plain Riprap.** The riprap shall commence in a trench below the toe of the slope and shall progress upward. Placement of the individual stones shall progress up the slope with each stone firmly embedded into the slope and interlocked against the adjoining stones. Joints between consecutive rows of stones shall be random and well broken. The riprap shall be thoroughly compacted as the construction progresses, and the finished surface of the riprap shall present an even, tight surface. With the exception of precast concrete blocks, the thickness of the riprap shall not be less than 8 inches, measured perpendicular to the slope.
2. **Grouted Riprap.** Grouted riprap shall be constructed as specified for plain riprap, according to subsection 813.03.E.1. The spaces between the stones shall be filled with Type R-3 mortar. Mortar shall be placed from bottom to top and sufficient mortar shall be used and consolidated to completely fill all voids between the stones. The top surface of the stone shall be left exposed. All excess mortar shall be immediately removed with a stiff brush. Grouted riprap shall be cured and protected according to subsection 813.03.C.3.

- 3. **Heavy Riprap.** Heavy riprap shall be constructed according to subsection 813.03.E.1. With the exception of precast concrete blocks, the thickness of the riprap shall be not less than 16 inches measured perpendicular to the slope. When broken pavement is used, it shall be placed in two layers with staggered joints and all voids filled with smaller pieces of broken pavement, as approved by the Engineer.

813.04 Measurement and Payment.

Contract Item (Pay Item)	Pay Unit
Slope Paving, Precast Conc	Square Yard
Slope Paving, Conc	Square Yard
Slope Paving Header	Foot
Riprap, Grouted	Square Yard
Riprap, Plain	Square Yard, Ton
Riprap, Plain, LM	Cubic Yard
Riprap, Heavy	Square Yard, Ton
Riprap, Heavy, LM	Cubic Yard

- A. **Slope Paving** includes the granular material, unless the pay item granular material is specified on the plans. The work includes excavation and disposal of surplus materials.
- B. **Slope Paving Header**, both sides and toe, will be measured in place.
- C. **Riprap** includes furnishing and placing the geotextile liner, excavation and disposal of surplus materials, and riprap headers.