

600 INCIDENTALS

ITEM 601 SLOPE AND CHANNEL PROTECTION

- 601.01 Description**
- 601.02 Materials**
- 601.03 General Construction**
- 601.04 Riprap**
- 601.05 Grouted Riprap or Rock**
- 601.06 Crushed Aggregate Slope Protection**
- 601.07 Concrete Slope Protection**
- 601.08 Dumped Rock Fill**
- 601.09 Rock Channel Protection**
- 601.10 Detention Basin, Infiltration Basin, or Water Quantity Swale Aggregate**
- 601.11 Paved Gutter**
- 601.12 Tied Concrete Block Mat**
- 601.13 Method of Measurement**
- 601.14 Basis of Payment**

601.01 Description. This work consists of the excavation for and the construction of gutters, riprap, interlock precast concrete blocks, concrete, grouted items, tied concrete block mats, crushed aggregate, or rock items for protecting slopes and channels.

Use removed or excavated materials in the Work when the material conforms to the specifications; if not, then recycle or dispose of the material according to 105.16 and 105.19.

601.02 Materials. Furnish materials conforming to:

Curing.....	451 or 705.07 Type 1
Concrete, Class C.....	499, 511
Water for grout.....	499.02
Reinforcing steel.....	509.02
Cement for grout.....	701
Structural Backfill Type 3.....	703.11
Fine Aggregate for Mortar or Grout.....	703.03
Rock and Aggregate Materials.....	703.19
Brick and blocks.....	704
Preformed expansion joint.....	705.03
Joint sealer.....	705.04
Filter fabric, Type B.....	712.09

Provide steel filter fabric securing pins with washers for securing filter fabric. Use a steel washer having an outside diameter not less than 1 1/2 inches (38 mm). Use securing pins at least 18 inches (0.5 m) long and at least 3/16 inch (5 mm) in diameter that are pointed at one end and fabricated with a head to retain the steel washer.

For tied concrete block mats, the articulating concrete blocks are held together by galvanized steel wire, HDPE mesh, stainless steel wire, or any 75 year mat material. The size of the concrete blocks, the space between the concrete blocks, and the required wire or mesh area shall conform to the Plans.

601.03

601.03 General Construction. Cure gutters, concrete slope protection, and grouted riprap according to Item 451, except apply all the membrane cures at the rate of not less than 1 gallon per 200 square feet (1 L/5 m²) of surface.

Mix and place all concrete according to Item 511. Finish to produce a sandy texture.

601.04 Riprap. Construct riprap according to one of the following four alternatives unless specifically itemized in the Contract. The Contractor may elect to use a different alternative at each location on the project.

A. Provide Flat Stones or Broken Concrete. Ensure that individual pieces are roughly rectangular in cross-section with a minimum volume of 1/3 cubic foot (0.01 m³) and a minimum thickness of 3 inches (75 mm). Place individual pieces by hand in courses and so that the pieces overlap the joints in the course below. Place riprap with the flat surfaces roughly perpendicular to the slope and in contact with the courses immediately below and above. Fill spaces between larger pieces with spalls that are rammed into place to present an even and tight surface, pleasing in appearance and varying not more than 3 inches (75 mm) from that shown on the plans. When required by the plans, fill riprap with grout. Compact the backing as riprap construction progresses. Ensure that the thickness of the riprap, measured perpendicular to the slope, is not flatter than 9 inches (230 mm) and averages not flatter than 12 inches (0.3 m).

B. Provide Interlock Precast Concrete Blocks. Interlock precast concrete block dimensions, spacing and manufacturers shall conform to the Plans. Place the interlock precast concrete blocks per the manufacturer's recommendations.

C. Construct Concrete Riprap Using Cloth or Burlap Bags. After soaking the bags with water, fill them with approximately 2/3 cubic foot (0.02 m³) of concrete and place the bags by hand to the limits on the plans. Provide bags with approximate dimensions of 6 × 12 × 16 inches (150 × 300 × 400 mm).

Stack the bags on the slope to ensure a minimum of 1/3 cubic yard (0.3 m³) of concrete for each square yard (square meter) of riprap in place as measured along the slope.

Tie the open end of each bag and fold the tie under the bag. Place each tie or fold so that it overlaps the joint in the lower layer. After placing, pierce each bag in the lower layer to allow some concrete to flow out and bond with the top overlying layer.

Stretchers are bags placed with the long length parallel to the streambed flow. Headers are bags placed with the long length perpendicular to the streambed flow. A layer runs horizontally at approximately the same elevation perpendicular to the protected slope grade.

If the slope is 1.5:1 or steeper, make the bottom layer with two bags laid as stretchers. Place the next overlying layer as a header. Place the rest of the overlying upslope layers as stretchers.

If the slope is flatter than 1.5:1, make the bottom layer with two bags as stretchers. Place all remaining layers as headers.

Push or drive No. 4 (No. 13M) reinforcing bars approximately 18 inches (0.5 m) long and spaced approximately 12 inches (0.3 m) apart through the top three layers. When required by the plans, fill voids with grout.

D. Construct a 6-inch (150 mm) Reinforced Concrete Slab. Reinforce the slab approximately midway between the top and bottom of the slab with steel bars or fabricated reinforcement equivalent to No. 3 (No. 10M) round bars, spaced at 24-inch (0.6 m) centers in two directions, or wire fabric according to the Standard Drawings for pavement reinforcing. The Contractor may use formed construction joints. Extend reinforcement through all formed construction joints. Include cutoff walls as shown on the plans in the unit price bid for reinforced concrete slab.

601.05 Grouted Riprap or Rock. When specified, grout in place riprap cloth bags, riprap burlap bags, flat stones, precast blocks, broken concrete, rock, or tied concrete block mats. Make the grout by mixing one part portland cement, three parts sand, and enough water to allow the grout to flow into the joints and cracks.

Prepare the grout in a mixing machine of an approved design and equipped with an accurate graduated regulating device for controlling the amount of water in each batch. Accurately measure and proportion the quantities for each batch, and ensure that the quantities are exactly sufficient for one or more sacks of cement.

Immediately before applying grout, thoroughly wet all surfaces. Place the grout, filling all the joints or voids. Do not add water to the grout after it has been placed.

601.06 Crushed Aggregate Slope Protection. Furnish material conforming to 703.19. Place the material on the filter fabric so that the surface is flush with the embankment slopes. Use a thickness of 12 inches (300 mm) unless a different thickness is specified. Extend the aggregate from the face of the abutments down to the toe of the slope or to normal water elevation, and a minimum of 3 feet (1 m) beyond the outer edges of the superstructures or as shown on the plans.

601.07 Concrete Slope Protection. Construct a concrete slab, 6 inches (150 mm) thick, extending over the embankment area under a bridge from the face of the abutment down to the toe of the slope and extending a minimum of 3 feet (1 m) beyond the outer edges of the superstructure or as shown on the plans. Thicken the bottom 3 feet (1 m) of the concrete slab from 6 to 18 inches (150 to 460 mm) to provide resistance to sliding.

Where pier columns extend through the slab, place 1-inch (25 mm) preformed expansion joint material around the columns and for the full thickness of the slab.

Divide the surface into an equally spaced block grid pattern at approximately 4 to 5-foot (1.2 to 1.5 m) intervals. Make the block grid pattern with one direction horizontally at a constant elevation or as directed by the Engineer, and the other direction parallel to the superstructure centerline, skewed, or as directed by the Engineer. Saw or form the block grid pattern to make joints at a depth of not less than one-fourth the thickness of the slab and approximately 1/8 inch (3 mm) wide.

601.08 Dumped Rock Fill. Furnish material conforming to 703.19. Dump larger pieces at the outer face and smaller pieces in the inner surface of the protected area. Ensure a reasonably smooth and continuous surface conforming to the slope lines shown on the plans. Avoid concentration of fines and small pieces at any location in the completed dumped rock fill material. When required by the plans fill all voids with grout.

601.09 Rock Channel Protection. Furnish material conforming to 703.19. When specified with a filter, provide a filter consisting of filter fabric or a 6-inch (150 mm)

601.10

bed of aggregate conforming to 703.19. When placing rock, exercise reasonable care to ensure that the finished surface of the protected channel conforms to the channel cross-sections shown on the plans.

If filter fabric is used, prepare the surface to receive the fabric to a relatively smooth surface, free of obstruction and debris. With the long dimension parallel to the flow direction, loosely place the fabric without wrinkles and creases. Where joints are necessary, provide a 12-inch (0.3 m) minimum overlap, with the upstream strip overlapping the downstream strip. Place securing pins with washers at a minimum distance apart of 2 feet (0.6 m) along the joints and at a minimum distance apart of 5 feet (1.5 m) everywhere else. When required by the plans fill all voids with grout.

601.10 Detention Basin, Infiltration Basin, or Water Quantity Swale Aggregate.

For detention basin or infiltration basin aggregate, furnish material conforming to Structural Backfill Type 3 at 6 inches (150 mm) thick. Furnish material conforming to 703.19.B, Type D for Water Quantity Swale Aggregate. Use a filter consisting of filter fabric. When placing aggregate, exercise reasonable care to ensure that the finished surface of the basin conforms to the details shown in the Plans.

601.11 Paved Gutter. Construct paved gutter by one of the following methods:

A. Brick. Place bricks with their long dimension perpendicular to the surface of the gutter.

B. Concrete. Mix concrete according to 499.03 for Class C, and place according to Item 499 and 511.12. Construct concrete gutters to the dimensions and shape as shown on the plans or the Standard Drawings.

C. Stone and Broken Concrete. If individual pieces of stone or broken concrete are not of sufficient thickness to meet the requirements of the plans when laid in a single course with their flat surfaces parallel to the surface of the ditch, set the pieces with the flat surface roughly perpendicular to the surfaces of the ditch. Fill with spalls rammed into place.

When the gutter constructed under this Item is bonded or semi-bonded to an existing concrete base, pavement or other rigid structure, match the type and location of joints in the gutter with those in the adjoining pavement.

When gutter is independent of other construction, form impressed joints in the gutter by impressing a device or bar shaped to the section of the gutter into the newly deposited concrete before initial setting. Remove the device or bar as soon as the concrete is in such condition to preclude distortion or injury to the concrete. The groove thus formed shall be 3/8 inch (9.5 mm) wide at the surface, 1/4 inch (6.4 mm) wide at the bottom and a depth equal to 1/3 the depth of the concrete. Edge the joints to a radius not greater than 1/4 inch (6.4 mm). After the joint is formed, protect it from dirt or foreign matter until the filler is placed. Fill the impressed joints with joint sealer in such a manner that the material will be confined to the joint and in no way mar the surface.

Compact the subgrade for all paved gutters to not less than 90 percent maximum dry density, as defined in 203.07, for a minimum depth of 6 inches (152 mm) below the surface of the subgrade of the paved gutter. Include the cost of compacting the subgrade in the unit price bid for the paved gutter.

601.12 Tied Concrete Block Mat. When specified, use Tied Concrete Block Mat Type ____ for protection of slopes, channels, and gutters as shown on the plans. Place directly on the filter fabric. Toe in the mat along the top of the slope and along the first or leading edge that is exposed to flow. When Tied Concrete Block Mat for Water Quantity Swales is specified, furnish Tied Concrete Block Mat Type 1. When required by the plans, fill all voids with grout. Furnish products according to the City's Qualified Products List (QPL).

Tied Concrete Block Mats may be used instead of Rock Channel Protection, Dumped Rock, or Riprap with the approval of the Engineer.

601.13 Method of Measurement. The City will measure Riprap, Interlock Concrete Blocks, Crushed Aggregate Slope Protection, Concrete Slope Protection, and Tied Concrete Block Mats by the square yard (square meter) of the finished surface completed and accepted in place, with or without grout.

The City will measure Dumped Rock Fill and Rock Channel Protection (with or without filter), by the cubic yard (cubic meter), completed and accepted in place according to the dimensions shown on the plans, excluding rock filter, with or without grout. The City may determine quantities by volume in the vehicle or by a job conversion weight of acceptable material delivered.

The City will measure Paved Gutter by the foot (meter) completed and accepted in place.

601.14 Basis of Payment. The City will specify with grout in the pay item description when required. When the pay item calls out Tied Concrete Block Mat, include filter fabric material and installation in the price.

The City will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
601	Square Yard (Square Meter)	Riprap
601	Square Yard (Square Meter)	Crushed Aggregate Slope Protection
601	Cubic Yard (Cubic Meter)	Water Quantity Swale Aggregate
601	Square Yard (Square Meter)	Tied Concrete Block Mat for Water Quantity Swale
601	Square Yard (Square Meter)	Concrete Slope Protection
601	Square Yard (Square Meter)	Tied Concrete Block Mat, Type ____
601	Cubic Yard (Cubic Meter)	Dumped Rock Fill, Type ____
601	Cubic Yard (Cubic Meter)	Rock Channel Protection, Type ____ with Filter
601	Cubic Yard (Cubic Meter)	Rock Channel Protection, Type ____ without Filter
601	Cubic Yard (Cubic Meter)	Rock Channel Protection, Type ____ with Aggregate Filter

601.14

601	Cubic Yard (Cubic Meter)	Detention Basin Aggregate
601	Cubic Yard (Cubic Meter)	Infiltration Basin Aggregate
601	Square Yard (Square Meter)	Interlock Concrete Blocks
601	Foot (Meter)	Paved Gutter