600 INCIDENTALS

ITEM 601 - SLOPE AND CHANNEL PROTECTION

601.01 Description. This work shall consist of protecting slopes, channels and gutters with riprap, concrete, crushed aggregate or rock or dumped rock including excavation for placing the rock. Types, locations, dimensions, lines, grades and slopes shall be as specified.

Extensive areas of existing stable rock will not be removed to install any of the protection types under this item. The Engineer will designate areas to remain in place and adjust quantities accordingly.

601.02 Materials. Rock, broken concrete, and broken stone shall be sound and durable and not weathered beyond a degree of usefulness for the purpose intended. Rock and stone shall be relatively free of laminations, seams and fractures, or injury due to blasting. Where major portions of the material, from a source on record at the ODOT laboratory, has shown the characteristic of acquiring a mud-like condition when tested for soundness, it shall be tested for soundness and the maximum loss shall be 5 percent.

Other materials shall be as follows:

Concrete, Class C 499, 511
Brick and blocks 704
Cement for grout 701
Crushed gravel, stone or slag (Nos. 1, 2, 3 and 4) 703.04
Filter fabric ..... 712.09, Type B
Joint sealer.....705.04
Preformed expansion joint.....705.03
Sand for grout.....703.03
Steel wire fabric 709.10, 709.12
Reinforcing steel.....709

601.03 General. When specified, brick, stone or broken concrete used in riprap and gutters shall be grouted in place.

The grout filler shall be composed of a mixture of Portland cement, sand and water mixed in the proportion of one part cement and three parts sand by volume.

Cement grout shall be prepared in a mixing machine of approved design equipped with an accurate graduated regulating device for controlling the amount of water for each batch. The quantities for each batch shall be exactly sufficient for one or more sacks of cement and shall be accurately measured and proportioned.

Brick, block, stone or broken concrete shall be thoroughly wet immediately before grout is applied. As soon as the grout is deposited on the surface, it shall be thoroughly worked into the joints. The application of additional water to the grout after it has been deposited will not be permitted.

Grouted gutters and riprap shall be cured in accordance with Item 451, except that membrane cure shall be applied at the rate of not less than 1 gallon (3.8 L) per 200 square feet (18.6 m^2) of surface.

All concrete shall be Class C, mixed and placed in accordance with Item 511, and finished with a wood float. Concrete shall be cured as described in Item 451 except that material meeting the requirements of either Section 705.07, Type 1, may be used. Membrane cure shall be applied at the rate of not less than 1 gallon (38 L) per 200 square feet (18.6 m^2) of surface.

Excavation for the volume of protection material shall be done prior to the placement to assure the finished protection material surface will conform to the channel elevations and cross section required by the plans.

601.04 Riprap. This type of protection shall be provided in accordance with one of the following three alternates:

1. Flat stones, precast concrete blocks or broken concrete roughly rectangular in cross section, not less than 1/3 cubic foot (0.01 m^2) in volume nor less than 3 inches (76 mm) thick may be used. The individual pieces shall be placed by hand, one upon the other so that they will break joints with the piece in the course below. They shall be placed with their flat surfaces roughly perpendicular to the slope, forming contact with the courses immediately below and above. The space between the larger pieces shall be filled with spalls rammed into place. The surface of the finished riprap slope shall not vary more than 3 inches (76 mm) from that shown on the plans, and shall present an even, tight surface, pleasing in appearance. When required by the plans the riprap slope shall be grout filled. The backing shall be compacted as the construction of the riprap progresses, in

layers not more than 6 inches (152 mm) thick. The thickness of the riprap, measured perpendicular to the slope, shall be not less than 9 inches (228 mm) and shall average not less than 12 inches (305 mm).

2. Concrete riprap in cloth or burlap bags may be used. The bags shall be soaked with water and filled with approximately 2/3 cubic foot (0.02 m^2) of Class C concrete and the bags hand placed to protect the slope as shown on the plans. The approximate size of each bag of concrete shall be 6 x 12 x 16 inches (152 x 305 x 406 mm) in length.

   The open end of each bag shall be tied or folded under and each course of bags shall be placed to overlap the joints in the lower course. After being placed, each bag shall be pierced to permit some concrete to flow out and made bond with the overlying course. The volume of concrete used shall not be less than 1/3 cubic yard (0.01 m^2) for each square yard of riprap in place 1/2 inch (13 mm) reinforcing bars approximately 18 inches (457 mm) long and spaced approximately 12 inches (305 mm) apart shall be pushed or driven down through the top three courses. When the protected slope is 1 1/2:1 or steeper, a bed shall be placed consisting of two courses of bags placed with their long dimension parallel to the flow as stretchers and covered by a row of bags placed with their long dimension normal to the flow as headers.

   Succeeding courses of bags shall be placed as stretchers. On slopes flatter than 1 1/2:1 all courses after the bed course shall be placed as headers.

3. A 6 inch (152 mm) reinforced concrete slab may be used. The reinforcement shall consist of steel bars, fabricated reinforcement or wire fabric equivalent to 3/8 inch (9.5 mm) round bars spaced at 24 inch (610 mm) centers in two directions and placed approximately midway between top and bottom of the slab. Formed construction joints may be used, subject to the approval of the Engineer, but the reinforcement shall extend through the joint. Cut off walls as shown on the plans shall be included for payment in the unit price bid for reinforced concrete slab.

601.05 Crushed Aggregate Slope Protection. The aggregate shall be crushed gravel, stone or slag, Size No. 1 or No. 2. It shall be placed so that the surface is flush with the embankment slopes. It shall be 12 inches (305 mm) thick where placed under bridges, it shall extend from face of abutments down to the toe of the slopes or to normal water elevation, and a minimum of 3 feet (0.9 m) beyond the outer edges of the superstructures.

601.06 Concrete Slope Protection. A concrete slab, 6 inches (152 mm) thick, shall extend over the area of the embankment under a bridge from the face of the abutment down to the toe of the slope and extending a minimum of 3 feet (0.3 m) beyond the outer

edges of the superstructure. The concrete slab shall be thickened along the bottom edge from 6 inches (152 mm) to 18 inches (457 mm) in a distance of 3 feet (0.9 m) to provide resistance to sliding.

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

Depressed grooves, 1 inch (25 mm) deep with rounded edges, shall be uniformly spaced at 4 to 5 foot (1.2 to 1.5 m) centers in two directions. The grooves shall be truly horizontal in one direction and parallel to the centerline of the superstructure in the other direction.

601.07 Dumped Rock Fill. Sound and durable rock, broken concrete or stone shall be placed as a rock fill material for the protection of the slope or other surfaces. Thin slab-like pieces or any piece having a dimension larger than 36 inches (0.9 m) shall not be used. The material shall be carefully dumped in place, with the larger pieces at the outer face and the smaller pieces and spalls near the face of the slope or protected area. Care shall be exercised in placing the material to insure a reasonably smooth and continuous surface, and to conform to the slope lines indicated on the plans. The completed dumped rock fill material shall be sufficiently uniform to avoid a concentration of fines and small pieces at any location. Reinforcing steel in broken concrete shall not protrude more than 1 inch (25 mm) beyond the surface of the concrete. Some handwork may be necessary to accomplish the above requirements.

This item shall be of four types defined below:

Type A shall consist of sizes such that at least 85 percent of the total material by weight shall be larger than an 18 inch (457 mm) square opening but less than 30 inch (762 mm) square. At least 50 percent of the total material by weight shall be larger than a 24 inch (610 mm) square opening. The material smaller than an 18 inch (457 mm) square opening shall consist predominantly of rock spalls and rock fines and shall be free of soil.

Type B shall consist of sizes such that at least 85 percent of the total material by weight shall be larger than a 12 inch (305 mm) but less than a 24 inch (610 mm) square opening. At least 50 percent of the total material by weight shall be larger than an 18 inch (457 mm) square opening. The material smaller than a 12 inch (305 mm) square opening shall consist of rock spalls and rock fine and shall be free of soil.

Type C shall consist of sizes such that at least 85 percent of the total material by weight shall be larger than a 6 inch (152 mm) but less than an 18 inch (457 mm) square opening. At least 50 percent of the total material by weight shall be larger than a 12 inch (305 mm) square opening. The material smaller than a 6 inch (152 mm) opening shall consist predominantly of rock spalls and rock fines and shall be free of soil.

Type D shall consist of sizes such that at least 85 percent of the material by weight shall be larger than a 3 inch (76 mm) but less than a 12 inch (305 mm) square opening. At least 50 percent of the total material by weight shall be larger than a 6 inch (152 mm) square opening. The material smaller than a 3 inch (76 mm) square opening shall consist predominantly of rock spalls and rock fines and shall be free of soil.

601.08 Rock Channel Protection. Material for rock channel protection shall meet the requirements of Type A, Type B, Type C or Type D dumped rock fill material as defined in Section 601.07 and it shall be placed with or without a filter fabric as specified. The filter shall consist of filter fabric or 6 inch (152 mm) bed of No. 3 or 4 crushed gravel, stone or slag. Reasonable care shall be taken in placing the rock to assure that the finished surface of the protected channel will conform with the channel cross sections required by the plans.

Where filter fabric is used, the surface to receive the fabric shall be prepared to a relatively smooth surface free of obstruction and debris. The fabric shall be placed with the long dimension parallel to the direction of flow and shall be laid loosely but without wrinkles and creases. Where joints are necessary, strips shall be placed to provide a 12 inch (305 mm) minimum overlap, with the upstream overlapping the downstream strip. Securing pins shall be 3/16 inch (4.8 mm) diameter of steel pointed at one end and fabricated with a head to retain a steel washer having an outside diameter not less than 1 1/2 inches (38 mm).

Pin lengths shall be at least 18 inches (457 mm).

601.09 Paved Gutter. Paved gutter shall be constructed by one of the following methods:

(a) **Brick.** Brick shall be placed with their long dimension perpendicular to the surface of the gutter.

(b) **Concrete.** Concrete shall be mixed in accordance with Section 499.03 for Class C, and placed in accordance with Item 499 and Section 511.09. Concrete gutters shall be built to the dimensions and shape as shown on the plans or the standard construction drawing.

(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, the pieces shall be set with the flat surface roughly perpendicular to the surfaces of the ditch. They shall be filled with spalls rammed into place.

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

When gutter is independent of other construction, impressed joints shall be formed in the gutter by impressing a device or bar shaped to the section of the gutter into the newly deposited concrete before initial setting. The device or bar shall be removed 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. The joints shall be edged to a radius not greater than 1/4 inch (6.4 mm). After the joint is formed, it must be protected from dirt or foreign matter until the filler is placed. The impressed joints shall be filled with joint sealer in such a manner that the material will be confined to the joint and in no way mar the surface.

The subgrade for all paved gutters shall be compacted to not less than 90 percent maximum dry density, as defined in Section 203.12, for a minimum depth of 6 inches (152 mm) below the surface of the subgrade of the paved gutter. The cost of compacting the subgrade shall be included in the unit price bid for the paved gutter.

601.10 Method of Measurement. Riprap, crushed aggregate slope protection and concrete slope protection will be measured by the square yard (square meter) or cubic yard (cubic meter) of finished work complete in place. Dumped rock fill and rock channel protection with or without filter, will be measured by the cubic yard (cubic meter) completed in place, and accepted in accordance with the dimensions shown on the plans, excluding filter thickness. If it is not practical to determine the amount by measurement, the quantity may be measured in the vehicle or established by a job conversion weight from tonnage (metric tonnage) of acceptable material delivered. Cost of filter is to be included in the unit contract price for the dumped rock fill. Paved gutter will be measured by the linear feet (meter) complete in place.

601.11 Basis of Payment. Payment will be made at the contract price for:

Item	Unit	Description
601	Square Yard (Square Meter) or Cubic Yard (Cubic Meter)	Riprap
601	Square Yard (Square Meter) or Cubic Yard (Cubic Meter)	Crushed Aggregate Slope Protection
601	Square Yard (Square Meter)	Concrete Slope Protection
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 ____

601	Linear Foot (Meter)	Without Filter Paved Gutter