

Payment will be made under:

Item No.	Pay Item	Pay Unit
8011XX0	Aggregate Underdrain ( <i>Agg. No.</i> )	Linear Foot
8011XX0	Aggregate Underdrain ( <i>Agg. No.</i> )	Cubic Yard

## SECTION 802

### PIPE UNDERDRAINS

**802.01 Description.** This work shall consist of constructing underdrains using pipe and granular filter material and constructing underdrain pipe outlets, where designated on the plans or directed by the Engineer, in accordance with these specifications and in conformity with the lines and grades given. This work shall include furnishing pipe of the kind, size and length specified; excavation and backfilling with coarse aggregate; the furnishing and construction of proper joints and connections to other drains, pipes, catch basins, etc., and the removal and disposal of surplus materials which may be required to complete the work.

#### MATERIALS

**802.02 Corrugated Polyethylene Underdrain.** Corrugated polyethylene drainage tubing used as underdrain shall conform to the requirements of AASHTO M 252.

**802.03 Perforated Concrete Pipe Underdrain.** Perforated concrete pipe underdrain shall conform to the requirements of AASHTO M 175 for the type pipe specified.

**802.04 Perforated Corrugated Metal Pipe Underdrain.** Perforated corrugated metal pipe underdrain shall conform to the requirements of AASHTO M 36 for Type III metallic (zinc or aluminum) coated corrugated steel underdrains.

**802.05 Perforated Bituminized-Fiber Pipe Underdrain.**

Bituminized-fiber pipe underdrain, except for the modification permitted or stated herein, shall conform to the requirements of AASHTO M 177. The pipe may be of the laminated wall type construction. The couplings shall be of the same material as the pipe or of material having equal or superior physical and chemical properties.

**802.06 Perforated Corrugated Aluminum Alloy Pipe Underdrain.** Corrugated aluminum alloy pipe underdrain shall conform to the requirements of AASHTO M 196 for Type III corrugated aluminum alloy underdrains.

**802.07 Polyvinyl Chloride (PVC) Pipe Underdrain.** PVC pipe shall conform to the requirements of AASHTO M 278 for Class PS 46 having a cell classification of 12454-B as defined in ASTM D 1784. ASTM D 3034, SR 35 pipe is considered an equal.

In all underdrain applications of Section **802**, polyethylene (PE) pipe may be substituted where PVC PS 46 pipe is specified. The polyethylene pipe shall meet AASHTO M 252 with the following exceptions:

1. Corrugated Polyethylene Pipe Underdrain, in nominal sizes of 4 inches through 10 inches, shall have a full circular cross-section with an outer corrugated pipe wall and smooth inner liner as specified in AASHTO M 294, Section 4.1.2 – Type S for non-perforated or Section 4.1.4 – Type SP for perforated as specified in the plans.
2. Polyethylene Pipe Underdrain shall meet the minimum Pipe Stiffness (PS) of AASHTO M 278 (latest edition) at 5% deflection when tested in accordance with ASTM D 2412.
3. Acceptance of Polyethylene Pipe Underdrain shall be based on conformance with the above specifications. Sampling of the pipe shall be in accordance with

paragraph 7-58 of the Construction Manual.

**802.08 Coarse Aggregate No. 789.** The aggregate shall consist of crushed stone, crushed slag, or gravel conforming to the requirements as specified in Subsection **801.02**.

## CONSTRUCTION REQUIREMENTS

**802.09 Construction Requirements.** Trenches for underdrains shall be excavated to a width equal to the outside diameter of the pipe, plus 8 inches and to a depth as is required to permit the pipe to be laid to the desired grade. Where the underdrains are placed in cut sections, the bottom of the trench shall be of sufficient depth below the side ditch or median ditch to adequately intercept the water.

A layer of Aggregate No. 789 coarse aggregate shall be tamped in the bottom of the trench to a depth of 4 inches. The pipe shall be placed in the center of the trench and bedded firmly on the bottom course of aggregate. If pipe of the bell and spigot type is used, the bell end shall be laid up-grade. Perforated pipe shall be laid with the perforations on the underside of the pipe, except that when the pipe is being used strictly for outlet purposes. For outlet purposes, the pipe shall be laid with the perforations on the upper side of the pipe. The joints of butt-end drain tile shall be covered with burlap, roofing paper, or other approved material that is not less than 6 inches in width, is of sufficient length to cover the joint, turns outward, and lays flat on the bottom course of stone a distance of 3 inches on each side of the pipe. Bell and spigot or tongue and groove pipe shall be laid without mortar in joints and the lengths shall be pressed firmly together to prevent infiltration of the aggregate. Lengths of perforated metal pipe, aluminum alloy pipe and bituminous-fiber pipe shall be joined by couplers. Lateral connections shall be made with suitable tee, wye, bend, reducer, or increaser specials as required. The up-grade end not terminating in a structure shall be capped or plugged in a satisfactory manner.

After the pipe has been laid and has been inspected and approved, Coarse Aggregate No. 789 shall be placed around the pipe. The aggregate shall be placed above the bottom of the pipe for a minimum depth of 20 inches. For large diameter pipe underdrains, the depth of the coarse aggregate shall be increased to provide a minimum cover of 4 inches over the top of the pipe. The aggregate shall be placed in a careful manner so as not to disturb the pipe. The remainder of the trench shall be filled with suitable earth or, when directed by the Engineer, aggregate underdrain shall be used instead of earth backfill. The backfill material shall be satisfactorily compacted in 4 inch layers. Aggregate underdrain, when used, shall be paid for at the contract unit price and constructed in accordance with Section **801**.

Pipe outlets shall be constructed when directed by the Engineer. When directed by the Engineer, they shall be protected by endwalls. The outlet pipe may be of the same type as the underdrain, or may require the use of bell and spigot type pipe meeting the requirements specified herein. In all cases, the outlet pipe joints shall be connected and sealed in accordance with Section **714** or shall be connected and sealed with materials recommended by the pipe manufacturer.

The trench for pipe outlets shall be filled with suitable earth material instead of aggregate, and the earth material shall be placed and compacted in four-inch layers. Endwalls for pipe outlets shall be constructed of Class 2500 or Class 3000 concrete, whichever is specified, in accordance with Sections **701** and **702**.

**802.10 Method of Measurement.** Pipe underdrains will be measured by the linear foot for pipe of the type and size specified, measured along the center of each line or lateral.

**802.11 Basis of Payment.** The accepted footage, measured as provided above, will be paid for at the contract unit price for Pipe Underdrain or Tile Underdrain of the size and type specified, which price and payment shall be full compen-

sation for excavating (except as otherwise hereinafter specified), backfilling and disposal of surplus materials, furnishing, hauling and placing all the materials, including pipe, aggregate, incidental concrete, wye, tee, bend joints and other connections, and including all labor, tools, equipment and incidentals necessary to complete the work.

Endwalls, when required, will be paid for at the contract unit price for Class 2500 or Class 3000 concrete, whichever is specified and used.

If it is necessary to place the bottom of the underdrain more than 36 inches below the subgrade or cross-section lines to which the roadway is graded, or the ground surface when the drain is constructed outside the roadway lines, all additional excavation in excess of the 36 inch depth will be paid for at the contract unit price for Unclassified Excavation in accordance with the provisions of Section 203, which price and payment shall include the costs of backfilling and tamping over the underdrain.

Pipe outlets will be paid for as Pipe Underdrain.

Payment for each item includes all direct and indirect costs and expenses required to complete the work.

Payment will be made under:

Item No.	Pay Item	Pay Unit
80211XX	(size)" Pipe Underdrain	Linear Foot
80212XX	(size)" Perforated Pipe Underdrain	Linear Foot
802140X	(size)" Perforated Concrete Pipe Underdrain	Linear Foot
802160X	(size)" Perforated Corrugated Metal Pipe Underdrain	Linear Foot
80217XX	(size)" Perforated Bituminized Fiber Pipe Underdrain	Linear Foot

**Pay Items (Continued)**

Item No.	Pay Item	Pay Unit
802180X	<u>(size)</u> " Perforated Corrugated Aluminum Alloy Pipe Underdrain	Linear Foot
802190X	<u>(size)</u> " Polyvinyl Chloride (PVC) Pipe Underdrain	Linear Foot
802200X	<u>(size)</u> " Corrugated Polyethylene Underdrain	Linear Foot

## SECTION 803

### PIPE SLOPE DRAINS

**803.01 Description.** This work shall consist of furnishing and installing intake spillway assemblies and pipe slope drains; constructed on the shoulders, slopes and at other designated locations and shall be of the types, sizes and dimensions shown on the plans or specified in the proposal, all in accordance with these specifications and in conformity with the lines and grades set by the Engineer.

This work shall include the furnishing and construction of joints, connections, bends and elbows as may be required to complete the construction indicated.

#### MATERIALS

**803.02 Corrugated Metal Pipe.** Corrugated metal pipe shall conform to the requirements of AASHTO M 36 for Type I Culvert Pipe.

**803.03 Bituminized-Fiber Pipe.** Bituminized-fiber pipe shall conform to the requirements set forth in Subsection **802.05**, except that it shall not be perforated.

**803.04 Class PS 46 Polyvinyl Chloride (PVC) Pipe.** PVC