

ITEM 07605.50 M - DRAINAGE COLUMNS

DESCRIPTION:

Drill, bore, or auger holes and backfill at the locations and to the depths indicated on the contract plans, or as ordered, in writing, by the Engineer.

Keep all holes open for backfilling.

Permeability testing in rock shall be conducted at the drainage column holes as identified on the contract plans or as directed by the Engineer.

MATERIALS:

Backfill material shall be crushed stone, crushed gravel, screened gravel or sand as indicated on the contract plans.

Type 1: Provide Underdrain Filter Type I in accordance with Subsection 605-2.02 of the Standard Specifications, except the Soundness requirement is waived.

Type 2: Provide Underdrain Filter Type II in accordance with Subsection 605-2.02 of the Standard Specifications, except the Soundness requirement is waived.

Type 3: Provide concrete sand conforming to the provisions of Subsection 703-07, Concrete Sand.

PERMABILTY TESTING EQUIPMENT

A surge tank shall be used for water supply storage when a centrifugal pump is to be used in permeability testing. The surge tank shall be used to ensure that a constant non-pulsating flow of water is pumped into the test section during the duration of testing.

The Contractor shall supply water meter(s) accurate at ranges of expected water deliveries to be used during the testing. The Contractor shall supply the gauges, meters and testing equipment and shall also provide manufacturers specifications and recent (within one year) calibration curves by an authorized laboratory for this equipment.

In the event that the Contractor supplying the gauges, meters and testing equipment cannot provide recent (within 1 year) calibration charts by an authorized laboratory for the various items, the Project EIC may require field or laboratory calibration tests on all applicable water pressure test items.

CONSTRUCTION DETAILS:

Drill, bore, or auger through in-situ soils, boulders, buried obstacles, debris, footings, concrete slabs and rock whether indicated on the Contract plans or not. Provide equipment capable of penetrating to the required elevation. No jetting is permitted without the written permission of the Engineer.

Progress holes with the diameter shown on the Contract plans.

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Progress holes without noticeable subsidence of the surrounding ground surface. If noticeable subsidence occurs, in the Engineer's opinion, work shall be stopped. The contractor shall propose a scheme for progressing the work without subsidence for the Engineer's approval and progress no further work until receiving written approval.

Clean out the holes to the elevation required by the Contract plans, or to the elevation established by the Engineer. Immediately after cleaning each hole to the Engineer's satisfaction, perform permeability testing as indicated on the Contract plans, and backfill with material as indicated on the Contract plans. Dispose of the excavated material in a manner satisfactory to the Engineer.

PERMEABILITY TESTING PROCEDURES

Falling head permeability tests in rock shall be performed in accordance with the procedures provided below:

1. The borehole shall be advanced to the depth shown on the contract plans and cleaned. The boring shall be cased to the top of rock, and the casing sealed to prevent water and soil movement into or out of the boring.
2. Water introduced into the hole during boring shall be pumped out, and the water level within the borehole shall be permitted to stabilize to the satisfaction of the Engineer. The static water level in the borehole, if present, shall be measured prior to the permeability testing.
3. Water shall be pumped into the borehole at a constant rate of 4 liters per minute. Water flow readings and the water level in borehole shall be recorded every minute for 5 minutes. The pumping rate shall be adjusted to maintain the water level at a constant elevation that is approximately 0.3 meters below the observed top-of-rock elevation or 1.0 meter above the static water level, whichever is higher. The constant water level shall be maintained for a period of 15 minutes and the flow rate and water level shall be recorded at one-minute intervals during testing.
4. The Contractor shall record all irregularities that may occur during the test, such as leakage, running out of water, damage to the test apparatus, or other items that may impact the data or test results.
5. Permeability tests shall be conducted using clean water.
6. Upon completion of the test, the permeability test equipment shall be removed from the borehole and inspected. In addition the pump shall be operated for at least two minutes and the flow, as observed on the water meter, shall be recorded and checked to confirm that there is an unrestricted flow through the entire test apparatus. This is especially important during the winter months since water may freeze inside the meter under no-flow conditions.
7. If the test does not produce desired pressure and flow information, advise the Engineer prior to demobilizing from the borehole.

The falling head permeability test results shall be deemed acceptable if the water flow rate in the bedrock in the test borehole is 1 liter per minute or greater.

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In the event that the permeability testing does not indicate water flow rates that are acceptable, the test borings shall be advanced to such additional depth as directed by the Engineer. The permeability testing shall then be repeated within the test boring in the additional depth drilled. Alternatively, additional drainage columns shall be installed at the locations and to the depths as directed by the Engineer such that the rock mass water flow rates are deemed satisfactory.

METHOD OF MEASUREMENT:

The quantity to be paid is the number of linear meters of hole progressed, measured along the centerline of the hole from the proposed subgrade to the bottom of the hole. No payment will be made for any length of hole progressed below the elevation shown on the Contract plans unless ordered, in writing, by the Engineer.

BASIS OF PAYMENT:

The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work.

No separate payment shall be made for installation of pipe casing or any other means required to support the hole during construction.

No separate payment shall be made for permeability testing.