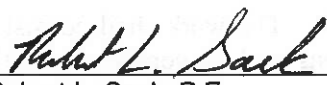


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| <b>SUPERSEDED BY</b><br><b>EB 15-031</b><br><b>EFFECTIVE 9/28/15</b>                                                                                                                                                                                                                                                                                                         |  | New York State<br>Department of<br>Transportation<br><b>ENGINEERING<br/>         INSTRUCTION</b>                                                                                                                                          | <b>EI</b><br><b>10-023</b> |
| Title: <b>SECTION 605 – UNDERDRAINS</b>                                                                                                                                                                                                                                                                                                                                      |                                                                                   |                                                                                                                                                                                                                                           |                            |
| Distribution:<br><input checked="" type="checkbox"/> Manufacturers (18) <input type="checkbox"/> Surveyors (33)<br><input checked="" type="checkbox"/> Local Govt. (31) <input checked="" type="checkbox"/> Consultants (34)<br><input checked="" type="checkbox"/> Agencies (32) <input checked="" type="checkbox"/> Contractors (39)<br><input type="checkbox"/> _____ ( ) |                                                                                   | Approved:<br><br>Robert L. Sack, P.E.,<br>Deputy Chief Engineer (Research) <div style="float: right;"> <b>21 July 10</b><br/>         Date       </div> |                            |

#### ADMINISTRATIVE INFORMATION:

- This Engineering Instruction (EI) is effective beginning with projects submitted for the letting of January 6, 2011.
- Superseded issuance(s): This EI does not supersede any previous issuances.
- The information transmitted by this issuance will be incorporated into a future revision to the Standard Specifications.

**PURPOSE:** The purpose of this EI is to revise Standard Specifications Section 605.

#### TECHNICAL INFORMATION:

- EI 09-027 assigned the material specifications related to underdrain filter material to Specification §733-20. To complete the specification change, the material requirements are being removed from Section 605, which will now reference the appropriate subsection of Section 700. This will align the specification with SiteManager's methodology in defining its Material Codes and Pay Items, with Items referring to one or many materials.

#### IMPLEMENTATION:

- The Main Office Design Quality Assurance Bureau will insert the standard specification revisions into contract proposals beginning with projects submitted for the letting of January 6, 2011.

#### TRANSMITTED MATERIALS:

- Revisions to Standard Specification *Section 605 Underdrains*. Both metric and US Customary revisions are attached.

**BACKGROUND:** To embrace the future that is SiteManager, the Geotechnical Engineering Bureau is changing how some of its specifications are written to align them with most Standard Specifications, which separate materials from pay items.

**CONTACT:** Questions or comments regarding this issuance should be directed to Randall J. Romer, P.E., of the Geotechnical Engineering Bureau at (518) 457-4714, [rromer@dot.state.ny.us](mailto:rromer@dot.state.ny.us).

## UNDERDRAINS

Make the following changes to the Standard Specifications dated May 1, 2008:

Pages 499 through 502, **Delete** SECTION 605 and **Replace** it with the following:

### SECTION 605 – UNDERDRAINS

**605-1 DESCRIPTION.** The work shall consist of constructing underdrain installations in accordance with these specifications and in conformity with the lines, grades, and cross-sections shown in the contract documents.

#### 605-2 MATERIALS

**605-2.01 Underdrain Pipe.** Underdrain pipe shall meet the requirements of the following subsections of Section 700 *Materials and Manufacturing* for the type of pipe specified in the contract documents:

|                                                      |         |
|------------------------------------------------------|---------|
| Corrugated Steel Pipe - Type III, 16 gage            | §707-02 |
| Porous Concrete Pipe Underdrain                      | §706-05 |
| Extra Strength Porous Concrete Pipe Underdrain       | §706-05 |
| Perforated Corrugated Polyethylene Underdrain Tubing | §706-13 |
| Corrugated Aluminum Pipe - Type III, 16 gage         | §707-13 |
| Perforated Polyvinyl Chloride Underdrain Pipe        | §706-18 |

Optional underdrain pipe shall meet the requirements of any of the above at the Contractors option except that porous concrete pipe shall not be used in an edge of pavement underdrain installation.

**605-2.02 Underdrain Filter.** The requirements for Underdrain Filter materials are described below. The procedure for acceptance or rejection of Underdrain Filter materials shall be in conformance with the procedures contained in the geotechnical control procedure "*Procedure for the Control and Quality Assurance of Granular Materials*". Underdrain Filter material shall meet the requirements of the following subsections of Section 700 *Materials and Manufacturing* for the type of underdrain filter material specified in the contract documents:

**A. Underdrain Filter Type I.** Provide material meeting the requirements of §733-20 *Underdrain Filter, Type 1*.

**B. Underdrain Filter Type II.** Provide material meeting the requirements of §733-20 *Underdrain Filter, Type 2*.

**C. Underdrain Filter Type III.** Provide material meeting the requirements of §703-07 *Concrete Sand*.

#### 605-3 CONSTRUCTION DETAILS

**605-3.01 Underdrain Pipe.** The construction details of Section 603 *Culverts and Storm Drains* shall apply. The type of filter material to be used at any location will be as shown in the contract documents. A carefully leveled and compacted bed of this material shall be prepared just prior to the placement of the underdrain pipe. The upgrade end of corrugated polyethylene underdrain pipe shall be closed with a solid plastic cap; the upgrade end of all other types of underdrain pipe shall be closed with a suitable plug. Unless otherwise shown in the contract documents, the underdrain pipe shall be placed with the perforations down. In the event that the semi-circular option of the Steel Pipe underdrain is utilized, the pipe shall be placed such that the flat surface is on the top.

## UNDERDRAINS

**A. Perforated Corrugated Polyethylene Underdrain Tubing and Perforated Polyvinyl Chloride (PVC) Underdrain Pipe.** When these underdrains are daylighted through the side slope they shall be protected from sunlight by shielding with a minimum 3 ft. long section of corrugated steel or aluminum pipe at the outlet. The metal pipe for shielding the underdrain shall be of such internal diameter to easily slip over the underdrain. For 4 in. and 6 in. diameter underdrains, the metal pipe shielding the underdrain shall extend a minimum of 6 in. into the ground and overlap the underdrain by 6 in. For underdrains from 8 in. through 12 in. in diameter, the metal shielding pipe shall extend at least 12 in. into the ground and overlap the underdrain by 12 in. In no case shall the outlet end of the underdrain be exposed or extend beyond the end of the metal pipe shielding it. To prevent intrusion of the filter material into the joint between the metal and underdrains, a reducer fitting shall be placed over the joint, roofing felt shall be wrapped around the joint, or another method shall be approved by the Engineer.

Perforated corrugated polyethylene underdrain tubing and perforated PVC underdrain pipe will melt and burn when exposed to flame. Flame damage or damage by deterioration, crushing or stretching will be cause for rejection.

**B. Corrugated Aluminum Pipe.** Do not place grout in contact with aluminum pipe, such as at drainage inlet structures, including connections, fixtures, etc., unless the aluminum has been thoroughly coated with Zinc Chromate Primer, §708-04 *Zinc Chromate Primer* or an equivalent alternative as approved by the Materials Bureau.

**C. Optional Underdrain Pipe.** The Contractor shall not intermix types of underdrain in the same run of pipe.

**605-3.02 Underdrain Filter.** After the pipe installation has been inspected and approved, Underdrain Filter shall be loosely placed around and over the pipe to such a depth that, after compaction, Underdrain Filter shall extend to a level 6 in. above the underdrain pipe or to the next course, whichever is less. Subsequent lifts of Underdrain Filter shall be no more than 6 in. thick prior to compaction and shall be compacted by two passes of a vibrating pad or drum type compactor. The remainder of the installation shall be in accordance with the applicable standard sheet or as indicated in the contract documents.

If the excavation for the underdrain extends outside the payment lines, it shall be backfilled with Underdrain Filter material installed at the Contractor's expense.

Any contaminated underdrain filter material shall be replaced by the Contractor at no additional cost to the State.

For corrugated polyethylene underdrain tubing, the filter material shall be placed around and over the tubing to such a depth that, after compaction, the underdrain filter material shall extend to a level 12 in. above the underdrain tubing or to the next course, whichever is less. After placement, the surface of the filter material shall be compacted by three passes of a vibrating pad or drum type compactor. The remainder of the backfill shall be placed in maximum 2 ft. loose lift thicknesses and compacted by three passes of a vibrating pad or drum type compactor after the placement of each lift.

In the event that a pipe is not included in this installation, the filter shall be placed in horizontal layers not exceeding 6 in. in thickness prior to compacting. Each lift shall be compacted by two passes of a vibrating pad or drum type compactor.

No compaction control tests will be required.

**A. Underdrain Filter at Structures.** Underdrain filter at structures denotes the installation of Underdrain Filter, Type I placed behind bridge abutments, walls, and other major structures requiring positive drainage to relieve large lateral pressures resulting from a saturated backfill. Underdrain Filter, Type I material shall be placed adjacent to structures in accordance with the contract documents. The lift thickness for the loose Type I material shall not exceed 6 in. and shall precede the placement of each lift of the adjacent backfill material. A physical barrier may be used to facilitate

## UNDERDRAINS

placement of the Underdrain Filter and adjacent backfill. This barrier shall not be left in place and shall be removed prior to compaction of the material. Each lift of filter material and backfill material located within a minimum distance of the footing heel projection plus 3 ft. shall be compacted simultaneously. Compactive effort for this material shall be provided by two passes of a vibratory or drum type compactor. Placement and compaction operations shall be conducted in a manner so as to ensure that the top surface of each lift of Type I filter material shall not be contaminated by the adjacent backfill materials. No compaction control tests will be required for the Type I filter material.

### 605-4 METHOD OF MEASUREMENT

**605-4.01 Underdrain Pipe.** Underdrain pipe will be measured in feet, measured to the nearest whole foot, installed in accordance with the contract documents.

**605-4.02 Underdrain Filter.** Underdrain filter material will be measured in cubic yards, measured to the nearest whole cubic yard, installed between the payment lines shown in the contract documents. A deduction to the cross sectional area of the underdrain trench will be made for the pipes (based on nominal diameters) when the combined cross-sectional area exceeds 1.0 sq. ft. No deduction will be made for the cross-sectional area of an existing facility.

**A. Underdrain Filter at Structures.** Underdrain filter, Type I material at structures will be measured in cubic yards, measured to the nearest whole cubic yard, installed between the payment lines shown in the contract documents. No deduction will be made for the volume occupied by the underdrain pipe.

### 605-5 BASIS OF PAYMENT

**605-5.01 Underdrain Pipe.** The unit price bid per foot shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work. The unit price bid per foot for perforated corrugated polyethylene underdrain tubing and perforated PVC underdrain pipe installations that are daylighted through the side slope shall include the shield pipe.

Excavation, granular fill and backfill will be paid for separately.

**605-5.02 Underdrain Filter.** The unit price bid per cubic yard shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work.

Excavation, granular fill and backfill will be paid for separately.

#### *Payment will be made under:*

| Item No. | Item                                                 | Pay Unit   |
|----------|------------------------------------------------------|------------|
| 605.04xx | Porous Concrete Pipe Underdrain                      | Foot       |
| 605.05xx | Extra Strength Porous Concrete Pipe Underdrain       | Foot       |
| 605.07xx | Corrugated Steel Pipe - Type III                     | Foot       |
| 605.08xx | Corrugated Aluminum Pipe - Type III                  | Foot       |
| 605.0901 | Underdrain Filter, Type I                            | Cubic Yard |
| 605.1001 | Underdrain Filter, Type II                           | Cubic Yard |
| 605.1101 | Underdrain Filter, Type III                          | Cubic Yard |
| 605.15xx | Perforated Corrugated Polyethylene Underdrain Tubing | Foot       |
| 605.16xx | Perforated Polyvinyl Chloride Underdrain Pipe        | Foot       |
| 605.17xx | Optional Underdrain Pipe                             | Foot       |

Refer to the Standard Contract Pay Item Catalog for full Item Number and full Description.

## UNDERDRAINS

Make the following changes to the Standard Specifications dated May 4, 2006:

Pages 495 through 498, **Delete** SECTION 605 and **Replace** it with the following:

### SECTION 605 – UNDERDRAINS

**605-1 DESCRIPTION.** The work shall consist of constructing underdrain installations in accordance with these specifications and in conformity with the lines, grades, and cross-sections shown in the contract documents.

#### 605-2 MATERIALS

**605-2.01 Underdrain Pipe.** Underdrain pipe shall meet the requirements of the following subsections of Section 700 *Materials and Manufacturing* for the type of pipe specified in the contract documents:

|                                                      |         |
|------------------------------------------------------|---------|
| Corrugated Steel Pipe - Type III, 16 gage            | §707-02 |
| Porous Concrete Pipe Underdrain                      | §706-05 |
| Extra Strength Porous Concrete Pipe Underdrain       | §706-05 |
| Perforated Corrugated Polyethylene Underdrain Tubing | §706-13 |
| Corrugated Aluminum Pipe - Type III, 16 gage         | §707-13 |
| Perforated Polyvinyl Chloride Underdrain Pipe        | §706-18 |

Optional underdrain pipe shall meet the requirements of any of the above at the Contractors option except that porous concrete pipe shall not be used in an edge of pavement underdrain installation.

**605-2.02 Underdrain Filter.** The requirements for Underdrain Filter materials are described below. The procedure for acceptance or rejection of Underdrain Filter materials shall be in conformance with the procedures contained in the geotechnical control procedure "*Procedure for the Control and Quality Assurance of Granular Materials*". Underdrain Filter material shall meet the requirements of the following subsections of Section 700 *Materials and Manufacturing* for the type of underdrain filter material specified in the contract documents:

**A. Underdrain Filter Type I.** Provide material meeting the requirements of §733-20 *Underdrain Filter, Type 1*.

**B. Underdrain Filter Type II.** Provide material meeting the requirements of §733-20 *Underdrain Filter, Type 2*.

**C. Underdrain Filter Type III.** Provide material meeting the requirements of §703-07 *Concrete Sand*.

#### 605-3 CONSTRUCTION DETAILS

**605-3.01 Underdrain Pipe.** The construction details of Section 603 *Culverts and Storm Drains* shall apply. The type of filter material to be used at any location will be as shown in the contract documents. A carefully leveled and compacted bed of this material shall be prepared just prior to the placement of the underdrain pipe. The upgrade end of corrugated polyethylene underdrain pipe shall be closed with a solid plastic cap; the upgrade end of all other types of underdrain pipe shall be closed with a suitable plug. Unless otherwise shown in the contract documents, the underdrain pipe shall be placed with the perforations down. In the event that the semi-circular option of the Steel Pipe underdrain is utilized, the pipe shall be placed such that the flat surface is on the top.

## UNDERDRAINS

**A. Perforated Corrugated Polyethylene Underdrain Tubing and Perforated Polyvinyl Chloride (PVC) Underdrain Pipe.** When these underdrains are daylighted through the side slope they shall be protected from sunlight by shielding with a minimum 1 m long section of corrugated steel or aluminum pipe at the outlet. The metal pipe for shielding the underdrain shall be of such internal diameter to easily slip over the underdrain. For 100 mm and 150 mm diameter underdrains, the metal pipe shielding the underdrain shall extend a minimum of 150 mm into the ground and overlap the underdrain by 150 mm. For underdrains from 200 mm through 300 mm in diameter, the metal shielding pipe shall extend at least 300 mm into the ground and overlap the underdrain by 300 mm. In no case shall the outlet end of the underdrain be exposed or extend beyond the end of the metal pipe shielding it. To prevent intrusion of the filter material into the joint between the metal and underdrains, a reducer fitting shall be placed over the joint, roofing felt shall be wrapped around the joint, or another method shall be approved by the Engineer.

Perforated corrugated polyethylene underdrain tubing and perforated PVC underdrain pipe will melt and burn when exposed to flame. Flame damage or damage by deterioration, crushing or stretching will be cause for rejection.

**B. Corrugated Aluminum Pipe.** Do not place grout in contact with aluminum pipe, such as at drainage inlet structures, including connections, fixtures, etc., unless the aluminum has been thoroughly coated with Zinc Chromate Primer, §708-04 *Zinc Chromate Primer* or an equivalent alternative as approved by the Materials Bureau.

**C. Optional Underdrain Pipe.** The Contractor shall not intermix types of underdrain in the same run of pipe.

**605-3.02 Underdrain Filter.** After the pipe installation has been inspected and approved, Underdrain Filter shall be loosely placed around and over the pipe to such a depth that, after compaction, Underdrain Filter shall extend to a level 150 mm above the underdrain pipe or to the next course, whichever is less. Subsequent lifts of Underdrain Filter shall be no more than 150 mm thick prior to compaction and shall be compacted by two passes of a vibrating pad or drum type compactor. The remainder of the installation shall be in accordance with the applicable standard sheet or as indicated in the contract documents.

If the excavation for the underdrain extends outside the payment lines, it shall be backfilled with Underdrain Filter material installed at the Contractor's expense.

Any contaminated underdrain filter material shall be replaced by the Contractor at no additional cost to the State.

For corrugated polyethylene underdrain tubing, the filter material shall be placed around and over the tubing to such a depth that, after compaction, the underdrain filter material shall extend to a level 300 mm above the underdrain tubing or to the next course, whichever is less. After placement, the surface of the filter material shall be compacted by three passes of a vibrating pad or drum type compactor. The remainder of the backfill shall be placed in maximum 600 mm loose lift thicknesses and compacted by three passes of a vibrating pad or drum type compactor after the placement of each lift.

In the event that a pipe is not included in this installation, the filter shall be placed in horizontal layers not exceeding 150 mm in thickness prior to compacting. Each lift shall be compacted by two passes of a vibrating pad or drum type compactor.

No compaction control tests will be required.

**A. Underdrain Filter at Structures.** Underdrain filter at structures denotes the installation of Underdrain Filter, Type I placed behind bridge abutments, walls, and other major structures requiring positive drainage to relieve large lateral pressures resulting from a saturated backfill. Underdrain Filter, Type I material shall be placed adjacent to structures in accordance with the contract documents. The lift thickness for the loose Type I material shall not exceed 150 mm and shall precede

## UNDERDRAINS

the placement of each lift of the adjacent backfill material. A physical barrier may be used to facilitate placement of the Underdrain Filter and adjacent backfill. This barrier shall not be left in place and shall be removed prior to compaction of the material. Each lift of filter material and backfill material located within a minimum distance of the footing heel projection plus 1 m shall be compacted simultaneously. Compactive effort for this material shall be provided by two passes of a vibratory or drum type compactor. Placement and compaction operations shall be conducted in a manner so as to ensure that the top surface of each lift of Type I filter material shall not be contaminated by the adjacent backfill materials. No compaction control tests will be required for the Type I filter material.

### 605-4 METHOD OF MEASUREMENT

**605-4.01 Underdrain Pipe.** Underdrain pipe will be measured in meters, measured to the nearest 0.3 meter, installed in accordance with the contract documents.

**605-4.02 Underdrain Filter.** Underdrain filter material will be measured in cubic meters, measured to the nearest whole cubic meter, installed between the payment lines shown in the contract documents. A deduction to the cross sectional area of the underdrain trench will be made for the pipes (based on nominal diameters) when the combined cross-sectional area exceeds 0.1 sq. m. No deduction will be made for the cross-sectional area of an existing facility.

**A. Underdrain Filter at Structures.** Underdrain filter, Type I material at structures will be measured in cubic meters, measured to the nearest whole cubic meter, installed between the payment lines shown in the contract documents. No deduction will be made for the volume occupied by the underdrain pipe.

### 605-5 BASIS OF PAYMENT

**605-5.01 Underdrain Pipe.** The unit price bid per meter shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work. The unit price bid per meter for perforated corrugated polyethylene underdrain tubing and perforated PVC underdrain pipe installations that are daylighted through the side slope shall include the shield pipe.

Excavation, granular fill and backfill will be paid for separately.

**605-5.02 Underdrain Filter.** The unit price bid per cubic meter shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work.

Excavation, granular fill and backfill will be paid for separately.

#### *Payment will be made under:*

| Item No. | Item                                                 | Pay Unit    |
|----------|------------------------------------------------------|-------------|
| 605.04xx | Porous Concrete Pipe Underdrain                      | Meter       |
| 605.05xx | Extra Strength Porous Concrete Pipe Underdrain       | Meter       |
| 605.07xx | Corrugated Steel Pipe - Type III                     | Meter       |
| 605.08xx | Corrugated Aluminum Pipe - Type III                  | Meter       |
| 605.0901 | Underdrain Filter, Type I                            | Cubic Meter |
| 605.1001 | Underdrain Filter, Type II                           | Cubic Meter |
| 605.1101 | Underdrain Filter, Type III                          | Cubic Meter |
| 605.15xx | Perforated Corrugated Polyethylene Underdrain Tubing | Meter       |
| 605.16xx | Perforated Polyvinyl Chloride Underdrain Pipe        | Meter       |
| 605.17xx | Optional Underdrain Pipe                             | Meter       |

Refer to the Standard Contract Pay Item Catalog for full Item Number and full Description.