

GUIDELINES — FOR PROJECTS REQUIRING UNDERDRAINS, CROSSDRAINS, AND EDGEDRAINS.

SS50102-1215

June 15, 2015

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS**SUPPLEMENTAL SECTION 501—UNDERDRAINS, CROSSDRAINS, AND EDGEDRAINS****SECTION 501—UNDERDRAINS** of the Specifications is replaced by the following:**501.01—Description**

This work shall consist of constructing underdrains, crossdrains, edgedrains, and prefabricated geocomposite pavement edgedrains (PGPE), including outlet pipe, (collectively, “underdrains”) using pipe, aggregate, and geosynthetics, in accordance with these specifications, the VDOT Road and Bridge Standards, and in conformity to the lines and grades shown on the plans or as designated by the Engineer.

501.02—Materials

- (a) **Pipe** for underdrains shall conform to Section 232 of the Specifications.
- (b) **Fine Aggregate material** used to level and fill depressions in the bottoms of underdrain, crossdrain, and outlet pipe trenches shall conform to Section 202 of the Specifications.
- (c) **Coarse Aggregate material** used to backfill underdrain, crossdrain, and outlet pipe trenches shall conform to Section 203 of the Specifications and be No. 57 aggregate, No. 8 aggregate, or crushed glass conforming to No. 8 aggregate material gradation requirements.
- (d) **Geosynthetics**, including **geotextile drainage fabrics and prefabricated geocomposite pavement edge drains** shall conform to Section 245 of the Specifications.

501.03—Procedures

- (a) **Excavation:** The Contractor shall excavate trenches so that the walls and bottom are uniformly smooth and free of roots and unstable or jagged material. Fine aggregate shall be used to fill large depressions and level sharp contours and rises in the bottoms of underdrain, crossdrain and outlet pipe trenches. Excavated material shall be handled in a way that prevents contaminating clean aggregate material used to backfill the trench for the underdrain. Trench locations and grades shall be in accordance with the plans, the VDOT Road and Bridge Standards, and other contract documents.
- (b) **Placing Geosynthetics:** When geotextile drainage fabric or prefabricated geocomposite pavement edgedrain (PGPE) is required, these items shall be placed as shown on the plans and the VDOT Road and Bridge Standards. Torn or punctured fabric in either type of application shall be replaced at the Contractor's expense. The Contractor shall correct or repair misaligned installation of geotextile fabric or inadequate overlaps at pipe joints or other locations prior to placing aggregate.

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Splices, when required for PGPE, shall be made using splice kits furnished by the manufacturer and installed in accordance with the manufacturer's written instructions. Spliced joints in PGPE shall not damage the panel or impede the open flow area of the panel, and shall maintain the vertical and horizontal alignment of the PGPE within 5 percent. The Contractor shall construct splices in such a manner as to prevent infiltration of the backfill or any fine material into the water flow channel. Inspection ports for PGPE shall be constructed in accordance with details shown in the VDOT Road and Bridge Standards at locations as specified on the contract plans or other contract documents.

- (c) **Installing Pipe:** Perforated pipe shall be installed with the perforations facing downward on a bed of aggregate material. Pipe sections shall be joined with appropriate corresponding couplings, fittings, and plugs. Semi-round underdrain pipe shall be installed with the rounded section facing down.

The Contractor shall use concrete or other types of underdrain pipe having a minimum compressive strength of 100 psi wherever the depth of the trench is modified to a lesser depth than that shown on the VDOT Road and Bridge Standards. Pipe shall be placed with the bell end up grade. Open joints shall be wrapped with the same geotextile drainage fabric used for lining the excavation. Geotextile drainage fabric shall extend at least 18 inches in each direction past the open joint.

Upgrade ends of underdrain pipe, except for crossdrains, shall be closed with suitable plugs. The Contractor shall construct a suitable secure watertight connection through the wall of the manhole or catch basin where an underdrain connects with a manhole or catch basin.

After the Engineer has approved the underdrain pipe installation, the Contractor shall place and compact the aggregate backfill material. The Contractor shall exercise caution to ensure pipe and geotextile drainage fabric covering at open joint locations maintain their proper orientation and are not displaced during subsequent construction operations.

Outlet pipes shall be installed at the low points of sags in vertical alignment as detailed in the VDOT Road and Bridge Standards. Prior to video camera inspection, the underdrain system shall be filled with water to detect sags. The Contractor shall install outlet pipe in the trench with sections securely joined. The outlet pipe trench shall be backfilled with coarse aggregate material in layers not more than 6 inches in depth and thoroughly compacted by hand tamping, mechanical means or other Engineer-approved methods, but only after the Engineer has approved the outlet pipe installation.

Endwalls for outlet pipes shall be placed on a prepared surface that has been compacted to comply with the requirements of Section 303.04 of the Specifications. The Contractor shall make necessary repairs at the Contractor's expense if settlement of the outlet pipe or endwall occurs.

- (d) **Post-Construction Inspection:** The Contractor shall conduct a post construction video inspection of the installed system in accordance with Virginia Test Method 108 prior to requesting final acceptance of the underdrain or crossdrain system. The Engineer must approve the video camera, and borescope camera (if used for PGPE), prior to use. Video camera inspection(s) on all underdrains shall be conducted at all outlet locations including mainline longitudinal connections after all potentially damaging construction operations over, near, or adjacent to the underdrain system have been completed. Pipe underdrains, including outlet pipes, shall be inspected in 200 foot segments in both directions from the outlet pipe. PGPE shall be inspected at all inspection ports, if provided. The Contractor shall provide a copy of the inspection report, including any digital recording/photographs, etc., to the Project Inspector, the Area Construction Engineer, and the District Materials

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Engineer within 2 business days of the completion of the inspection. The report shall be made part of the project records.

The Engineer will review the report and communicate the Engineer's findings to the Contractor within 5 business days of the date of receiving the report. If the report identifies areas requiring remediation efforts on the part of the Contractor, and the Engineer agrees with the proposed remediation measures submitted by the Contractor in the report, the Contractor shall be notified of such agreement and authorized to begin such work at no cost to the Department. Where the Engineer disagrees with the proposed remediation measures or identifies additional deficiencies that require remedial action by the Contractor, the Contractor will be notified of The Engineer's findings and advised to submit an amended remediation plan for review.

The Contractor shall re-inspect the deficient locations upon completion of the authorized corrective measures and satisfy the same criteria for acceptability as was used in the initial inspection for the new underdrain system. The Contractor shall continue with corrective measures and inspections at the Contractor's expense until the Engineer accepts the underdrain system at that location.

The Contractor shall remediate all deficiencies identified by the Engineer by repairing or removal and replacement of such areas at no cost to the Department. Any pavement settlement above the underdrain installation shall be repaired in kind to the satisfaction of the Engineer at the Contractor's expense

The following deficiencies are examples of unacceptable underdrain installations that require corrective action by the Contractor:

1. Crushed or collapsed pipe (including couplings, connections, or other pipe fittings) in non-PGPE underdrain, crossdrain, or outlet pipe applications that prevent passage of the 2 ½ inch diameter inspection camera.
2. Pipe that is partially crushed, deformed, splits or cracked for a length of 12 inches or greater, even if the deficiency allows the passage of the 2 ½ inch diameter inspection camera.
3. Any blockage or sediment buildup caused by rodent nests, open connections, cracks, or splits in the pipe.
4. Sags in the longitudinal profile of the underdrain pipe as evidenced by ponding of water for continuous lengths of 10 feet or greater. The Contractor shall flush the pipe run with water prior to checking for sags.
5. Blocked, partially blocked, and/or flattened PGPE panels that will not allow the passage of a 3/8 inch diameter borescope camera.
6. Outlet pipes that are installed with less than a 2 percent uniform positive grade sloped toward the outlet end.
7. Freeboard of less than 12 inches from the outlet pipe invert to the bottom of the ditch.
8. Pipe that has been penetrated, crushed, misaligned or otherwise damaged by the installation of guardrail posts, sign posts, delineator posts, etc. or similar construction.

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9. Cracked endwalls, reverse sloped installations, separation of outlet pipe from the back of the endwall, missing rodent screens, and missing or improperly installed outlet markers where required.
10. Cavities or undermining of the backfill at the endwall evidenced by or leading to the instability of the endwall or erosion at the endwall or on the slope.
11. Cavities, undermining or contamination of the bedding or backfill at joints or couplings as evidenced by instability or erosion in the vicinity of joints or couplings, lack of or displacement of geotextile fabric, etc.

501.04—Measurement and Payment

Underdrains and crossdrains will be measured in linear feet, complete-in-place, and will be paid for at the contract unit price per linear foot for the standard specified. The contract unit price for underdrains and crossdrains installed at depths greater than those shown in the VDOT Road and Bridge Standards will be increased 20 percent for each 1-foot increment of increased depth. No adjustment in the contract unit price will be made for an increment of depth of less than 6 inches. The contract unit price shall include removing and replacing pavement in kind when underdrains or crossdrains are to be installed under pavement that is not constructed under the contract.

Prefabricated geocomposite edge drains will be measured in linear feet, complete-in-place, and will be paid for at the contract unit price per linear foot. This price shall include furnishing and installing edge drain including connections.

Outlet pipe for underdrain, crossdrain, and PGPE systems will be measured in linear feet, complete-in-place, and will be paid for at the contract unit price per linear foot.

These prices shall include furnishing and installing underdrain and outlet pipe (including couplings, fittings, and plugs), geotextile drainage fabric, aggregate materials, splice kits, inspection ports (if designated), and outlet markers (if used). These prices shall also include excavating or trenching, leveling or filling depressions, backfilling, compaction, disposing of surplus and unsuitable materials, and video inspection.

Payment will be made under:

Pay Item	Pay Unit
Underdrain (Standard)	Linear foot
Crossdrain (Standard)	Linear foot
PGPE (Standard)	Linear foot
Outlet pipe	Linear foot

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