

NATURAL RESOURCES CONSERVATION SERVICE

VIRGINIA CONSERVATION PRACTICE STANDARD

UNDERGROUND OUTLET

(Feet)

Code 620

DEFINITION

A conduit installed beneath the surface of the ground to collect surface water and convey it to a suitable outlet.

PURPOSE

Dispose of excess water from terraces, diversions, subsurface drains, surface drains, trickle tubes or principal spillways from dams (outside the dam area only), or other concentrations without causing damage by erosion or flooding.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

1. Excess surface water needs to be disposed of
2. A buried outlet is needed for Virginia Conservation Practice Standard *Diversion* (Code 362) and *Terrace* (Code 600), or similar practices
3. An underground outlet can be installed that will safely dispose of excess water
4. Surface outlets are impractical because of stability problems, climatic conditions, land use, or equipment traffic.

CRITERIA

CAPACITY

The underground outlet shall be designed, alone or in combination with other practices, with adequate

capacity to ensure that the terrace, diversion, or other practices function according to the standard for the specific practice. For example, an underground outlet can be used in combination with a grassed waterway or a surface drain to carry part of the design flow. The capacity of the underground outlet for natural or constructed basins shall be adequate for the intended purpose without causing excessive damage to crops, vegetation, or improvements.

INLET

An inlet can be a collection box, a perforated riser, or other appropriate device. Its capacity shall be adequate to provide the maximum design flow in the conduit. Flow-control devices shall be installed as necessary. Perforated risers must be of durable material, structurally sound, and resistant to damage by rodents or other animals. If burning of vegetation is likely to create a fire hazard, the inlet shall be fire resistant. Blind inlets can be used where they are effective. Collection boxes must be large enough to facilitate maintenance and cleaning operations. The inlet must have an appropriate trash guard to ensure that trash or other debris entering the inlet passes through the conduit without plugging. It must also have an animal guard to prevent the entry of rodents or other animals.

Pressure-relief wells shall be designed and installed as needed to control pressure. If junction boxes and other structures are needed, they shall be designed and installed in a manner that facilitates cleaning and other maintenance activities.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

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HYDRAULICS

Underground outlets shall be continuous conduits, tubing, or tile. Joints shall be hydraulically smooth, and the materials and methods used shall be recommended by the manufacturer. If a pressure system is used, joints shall be adequate to withstand the design pressure, including surges and vacuum. The maximum velocity must not exceed the safe velocity for the conduit materials and installation.

Lines shall be adequate to carry the design flow when the outlet and all inlets are operating at design capacity. Positive grade shall be maintained in all sections of an underground outlet. Capacity shall be based on the pipe size or on other flow control devices to prevent water from the upper inlets from discharging through the lower inlets. The minimum conduit diameter shall be 3 inches.

MATERIALS

Materials shall meet or exceed the design requirements against leakage and shall withstand internal pressure or vacuum and external loading. Plastic, concrete, aluminum, and steel shall meet the requirements specified in the applicable ASTM standard. All materials specified for Virginia Conservation Practice Standard *Subsurface Drain (Code 606)* can be used for underground outlets. Conduits, however, can be perforated or non-perforated, depending on the design requirements. A filter fabric wrap (sock) or equivalent shall be used if migration of soil particles around conduit is anticipated. All exposed plastic materials shall be protected from degradation due to exposure to sunlight.

OUTLET

The outlet shall be sufficiently stable for all anticipated flow conditions. It shall be designed for the maximum anticipated water surface at design flow. A continuous section of rigid conduit having a minimum length of 10 feet or a headwall shall be used at the outlet. If a closed conduit is used, it shall be durable and strong enough to withstand all anticipated loads, including those caused by ice. Outlets shall not be placed in areas of active erosion. If fire is a hazard, the outlet shall be fire resistant. All outlets must have animal guards to prevent the entry of rodents or other animals. Animal guards must allow passage of debris.

PROTECTION

All disturbed areas shall be reshaped and regraded so that they blend with the surrounding land features and conditions. Visual resources must be given the same consideration as other design features. Areas that are not to be farmed or covered by structural works shall be established to vegetation or otherwise protected from erosion as soon as practicable after construction.

Seedbed preparation, seeding, fertilizing, and mulching shall be appropriate for the site-specific conditions. Refer to the *NRCS Plant Establishment Guide for Virginia* for allowable species, seeding mixtures, and recommended seeding dates. The vegetation shall be maintained and trees and shrubs controlled by hand, machine, or chemicals as necessary.

CONSIDERATIONS

Consider effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.

Consider effects on the volume of downstream flow that might cause undesirable environmental, social, or economic effects.

Evaluate potential use for water management.

Consider effects on erosion and the movement of sediment, pathogens, and soluble and sediment-attached substances that would be carried by runoff.

Consider effects on the visual quality of downstream water resources.

Consider the construction-related effects on the quality of downstream watercourses.

Consider effects on wetlands or water-related wildlife habitats.

Evaluate potential impact on water quality due to agri-chemicals in outflow.

Consider depth of underground outlet in regard to tillage equipment depth and maintenance, if applicable.

PLANS AND SPECIFICATIONS

Plans and specifications for installing underground outlets shall be in keeping with this standard and shall describe the requirements for installing the practice to achieve its intended purpose.

As a minimum, record and maintain the following planning and design data:

1. Document tract number, field number, and acres.
2. Record all design data in an engineering field notebook, and/or on a plan, or on a design sheet.
3. Include a location map. Document field layout showing proposed location of conduits by size, inlet, and outlet. Show location of contributing practices such as terraces, waterways, diversions, etc.
4. Document size, length, and type of inlet, and size of inlet flow control.
5. Profile along centerline of proposed conduits.
6. Document vertical distance between invert of outlet pipe and normal water level in outlet ditch.
7. Locate and describe the adequate outlet to be used. Include information on animal guard to be used.
8. Include specifications for seeding including necessary preparation, seed species, and mulching, liming, and fertilizer rates.
9. Complete form VA-EE-1.

As a minimum, record and maintain the following check data:

1. Manufacturer of conduit material.
2. Elevation of installed inlets and outlet.
3. Length of conduit installed by size.
4. A statement that the following have been satisfactorily completed:
 - (a) The underground outlet was installed according to standard.
 - (b) Seeding or successful establishment of vegetation on all disturbed areas.

The following general specifications may be incorporated into site-specific specifications where applicable:

INSPECTION AND HANDLING OF MATERIALS

Materials for underground outlets shall be inspected for workmanship, physical imperfections, nominal diameter, markings and thickness before installation. All material shall meet applicable specifications and requirements.

PLACEMENT

Conduits shall be laid to line and grade shown on the plans. Bedding and blinding shall be according to the recommendations of the manufacturer, and as shown on the plans. Earth backfill material shall be placed in the trench in a manner that will not displace the conduit. Where the conduit is to pass under structures (terrace ridges, diversion ridges, etc.) the backfill material is to be compacted in 6 inch lifts to the density of the original material before excavation. All trenches excavated for underground outlets shall be completely backfilled in such a manner that the field is left reasonably level and suitable for cultivation over the installed conduit.

PROTECTION

Markers, visible from farm equipment, should be placed at all inlets and appurtenant structures to protect them from damage by farming operations.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be established to maintain the inlets, conduits, and outlets installed as part of the underground outlet practice. Maintenance needs are to be discussed with the landowner or operator who is responsible for maintaining the practices installed under this standard.

Underground outlets shall be maintained by:

- Keeping inlets, trash guards, and collection boxes and structures clean and free of materials that can reduce the flow

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- Repairing leaks and broken or crushed lines to insure proper functioning of the conduit
- Checking outlet conduit and animal guards to ensure proper functioning of the conduit
- Keeping adequate backfill over the conduit
- Repairing any eroded areas at the pipe outlet

REFERENCES

1. National Engineering Handbook, Part 650, Engineering Field Handbook.
2. *Plant Establishment Guide for Virginia*.
3. NRCS, Virginia Field Office Technical Guide.
4. General Manual, 190, Part 410, Compliance with NEPA.

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UNDERGROUND OUTLET

Approved Practice Narratives

(Feet)

CODE 620

620 D1 Underground Outlet: Establish and maintain an underground outlet in accordance with the Virginia Conservation Practice Standard *Underground Outlet (Code 620)* and any design(s) or specification(s) provided.

620 D2 Underground Outlet: Maintain existing underground outlet in accordance with the Virginia Conservation Practice Standard *Underground Outlet (Code 620)* and any design(s) or specification(s) provided.

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