

**Natural Resources Conservation Service
Conservation Practice Standard**

**UNDERGROUND OUTLET
(Ft.)
CODE 620**

DEFINITION

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

PURPOSE

To 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 standard applies to underground conduits designed to dispose of excess surface water. It does not apply to trickle tubes or to principal spillways in ponds or in Subsurface Drains (606).

This practice is used where: (1) excess surface water needs to be disposed of; (2) a buried outlet is needed for Diversions (362), Terraces (600), or similar practices; (3) an underground outlet can be installed that will safely dispose of excess water; and (4) surface outlets are impractical because of stability problems, climatic conditions, land use, or equipment traffic.

CRITERIA

General

The underground outlet shall be designed, alone or in combination with other practices, with adequate capacity to insure 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.

Capacity. The capacity of the underground outlet for natural 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 insure 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.

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 (see Subsurface Drains (606)).

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

Lines shall be adequate to carry the design flow when the outlet and all inlets are operating at design capacity. 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 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 Subsurface Drains (606) can be used for underground outlets. Conduits, however, can be perforated or nonperforated, depending on the design requirements.

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 closed conduit or a headwall can 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. If fire is a hazard, the outlet shall be fire resistant. All outlets near ponds, outlet channels, or streams where water is normally present must have animal guards to prevent the entry of rodents or other animals. Animal guards must be hinged to allow passage of debris. A stilling well shall have a maximum of 2.5 feet of relief from the outlet invert to the well release port.

Protection. Before the outlet is installed, 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.

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 sediment-attached and construction-related effects on the quality of downstream water courses.
- Consider effects on wetlands or water-related wildlife habitats.

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.

Specifications for construction and installation of an underground outlet shall use or be in conformance with the requirements of the attached "Construction Specifications." Any variation from these specifications shall be approved by an engineer.

OPERATION AND MAINTENANCE

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. All leaks shall be repaired promptly to insure proper functioning of the conduit. Animal guards must be inspected periodically and maintained in proper working order.

Natural Resources Conservation Service Construction Specification

UNDERGROUND OUTLET

1. SCOPE

Work shall consist of installing the conduits, inlet and outlet features, and associated appurtenances to the lines and grades shown on the drawings or as staked in the field. The location of the underground outlet shall be as shown on furnished drawings or as staked in the field.

2. SITE PREPARATION

All trash, debris, brush and vegetation shall be removed from the conduit trench area that will be located under a terrace, diversion or other embankment area. In non-embankment areas, the conduit trench pathway shall be cleared and any root or other obstructions removed that would interfere with proper installation of conduit. All brush, logs, stumps or other debris must be removed from the conduit installation area and disposed of by burning, burying, or removal from the work site.

3. MATERIAL

Conduit material (metal pipe, plastic pipe or other) shall be new and of good quality to meet the intended use and life of the practice. Material shall meet the requirements of Subsurface Drains (606) or other applicable standards.

4. TRENCHING

Trenches shall be excavated deep enough to provide a minimum 2 feet of cover over top of conduit after backfilling is complete. Trench bottom should be shaped to conform to the exterior of the conduit surface. Bedding the conduit with a thin layer of moist, loose soil will improve its support and strength. Trenches may be:

- a. Vee shaped. This is recommended for conduits installed under an embankment. Side slopes of 2 horizontal to 1 vertical will allow adequate compaction and uniform fill settlement.
- b. Vertical sides (backhoe or trenches). This is not recommended for conduits installed under an embankment. Some additional backfill may be needed after initial trench settling has taken place.

Underground conduit installation shall be considered satisfactory when the trench and conduit are within ± 0.3 foot of design grade have a positive slope toward the outlet, and the conduit has 2 feet or more of earth cover.

5. BACKFILL

Backfill in the conduit trench under the embankment shall have adequate compaction to prevent water movement along the pipe and to minimize settlement. Mechanical compacting, water packing, using a vee-shaped trench, and using very moist soil are methods of achieving adequate compaction. Embankments constructed over the conduit shall also be compacted by passage of earthmoving equipment over fill as it is being placed. The ends of the conduit and all appurtenances shall be protected during installation.

Backfill around the conduit shall be loose, granular soil material to provide a good contact with the conduit. The material shall not contain stones or lumps of dry soil that could strike or damage the conduit during backfilling and compaction operations.

6. MEASUREMENT

Measurement of the underground conduit shall be the field laying length from the inlet end to the outlet end. No separate accounting or payment for appurtenances (band, tee, ell, reducer, etc.) shall be made. The length of each riser and underground conduit pipe size used shall be identified for payment quantities.