



DEFINITION

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

PURPOSES

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 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.

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.

This practice has the potential to affect National Register listed cultural resources or eligible (significant) cultural resources. These may include archeological, historic, or traditional cultural properties. Care should be taken to avoid adverse impacts to these resources. Follow NRCS state policy for considering cultural resources during planning.

CRITERIA

Capacity. 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. The capacity of the underground outlet for natural or constructed basins shall be

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

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.

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 Subsurface Drains (606) can be used for underground outlets. Conduits, however, can be perforated or nonperforated, 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 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. 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 be hinged to 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.

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.

OPERATION AND MAINTENANCE

Underground outlets shall be maintained by:

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

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

SUPPORTING DATA FOR DOCUMENTATION

The following is a list of the minimum data and documentation to be recorded in the case file:

Planning Information, Field Data and Survey Notes

1. Location and alignment of the underground outlet. Also note the location of the practice on the conservation map.
2. Description of the objectives of the practice, including the desired functions which the underground outlet is expected to provide.
3. Soils investigation logs and notes, as appropriate for site conditions and the proposed design.
4. Topographic survey of the site, as appropriate for site conditions and the proposed design.

Design Data

1. Location map with the site identified.
2. Soil survey map with the site identified.
3. Computations establishing the design capacity of the underground outlet.
4. A set of plans and specifications for the underground outlet, including a plan view and a profile of the system.

5. Description and location of the vents to be installed for the protection of the underground outlet (when needed).

Construction Check Data/As Built Plans

1. Check notes recorded during and after completion of construction showing the as-built measurements of the practice.
2. Red line the construction plans to indicate the construction's conformance to the design.
3. Sign and date check-notes and plans by someone with appropriate approval authority. Include statement that practice meets or exceeds plans and NRSC practice standards.