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Underground Outlets for Conservation Practices



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# **Underground Outlets for Conservation Practices**

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**Keywords:** Diversions, Drainage, Sediment control, Terraces, Underground outlets, Waterways

## **1 Purpose and Scope**

**1.1** This engineering practice is intended as a guide to engineers and technicians to plan, design, layout, construct and maintain underground outlets for conservation practices.

**1.2** This engineering practice applies to underground outlets used for the following applications:

**1.2.1** An outlet is needed for terraces, water and sediment control basins, diversions, roof gutter downspout discharge and other similar practices.

**1.2.2** A buried conduit can be installed to safely convey excess surface water to an adequate outlet.

**1.2.3** Where land use, equipment operation, stability problems, erosion hazards, climatic conditions or space limitations prohibits the use of surface outlets.

**1.3** The design of subsurface drains, even those receiving surface flow is not considered in this standard. Refer to ASABE Engineering Practice ASABE EP260, Design and Construction of Subsurface Drains in Humid Areas.

## **2 Cited Standards**

**2.1** ASABE EP260, Design and Construction of Subsurface Drains in Humid Areas

**2.2** Natural Resources Conservation Service, National Engineering Handbook, Part 630, Chapter 17

**2.3** Occupational Safety and Health Administration, Code of Federal Regulations, Part 1926.652, Requirements for Protective Systems

**2.4** Occupational Safety and Health Administration, Code of Federal Regulations, Part 1926.651, Specific Excavation Requirements

## **3 Terminology**

**3.1** Underground outlets are perforated or non-perforated conduits placed beneath the soil surface to collect excess surface water and convey it to a suitable outlet.

**3.2** Underground outlets consist of three component parts; an inlet, a conduit and an outlet.

**3.2.1** The inlet is a structure such as a riser pipe or collection box that extends from the conduit up to or above the ground surface to collect surface water and allow it to flow into the conduit.

**3.2.2** The underground conduit is any plastic, clay, concrete or metal pipe capable of conveying water.

**3.2.3** The outlet is a continuous portion of closed conduit or a headwall located at the downstream end of the underground conduit. It discharges the water into an outlet such as a stream, ditch or other stable outlet.

**3.3** An orifice is a plate with a properly dimensioned hole that may be placed in an inlet to control the rate of flow into the conduit.

**3.4** A trash guard is a cover for an open-top inlet that allows water to pass through but helps to prevent debris and animals from entering the conduit.

**3.5** A relief well is a riser pipe that extends from the underground conduit to or above the ground surface for the purpose of allowing a portion of the water flowing in the underground conduit to exit the conduit and flow over the surface. Relief wells should only be used where the surface flow will travel over a stable surface such as permanent grass cover.

**3.6** An animal guard is a hinged barrier placed at the discharge end of the outlet to prevent entry of animals but allow the free flow of water and any debris to exit the underground outlet.

**3.7** Joints are the junction points between the inlet and the underground conduits, between sections of the underground conduit or between the underground conduit and the outlet.

**3.8** Gravitational head is the height of a fluid above a reference point.

## **4 Planning**

**4.1** Plan the underground outlet as part of a system that considers the engineering, agronomic and environmental factors necessary to control runoff from the project area.

**4.1.1** Choose the location of the outlet of the underground conduit so that it drains freely to prevent standing water and sedimentation in the conduit.

**4.1.2** Design the layout of the underground outlet so that the conduit has at least 0.6 m (2 ft) of soil cover or if it must be shallower, install according to manufacturer's bedding requirements.

**4.1.3** Use materials for the underground outlet that meet the needs of the design, are economical and are readily available in the area.

**4.1.4** Underground outlets can provide a direct conduit to receiving waters for contaminated runoff from cropland. Underground outlets and the accompanying structure or practice they serve should be installed as part of a conservation system that addresses issues such as nutrient and pest management, residue management and filter areas.

**4.1.5** Plan the location of inlets to accommodate farming or other operations that will take place on the land served by the underground outlet.

## **5 Design**

**5.1** The capacity of the underground outlet system, alone or in combination with other outlets, shall remove water at a rate and quantity to meet the requirements of the practice it is serving.

**5.2** Flow requirements for an underground outlet can be met by sizing the conduit to carry the entire flow or, if the practice and site is suitable, a combination of flow through the conduit and temporary flood storage that will be released through the underground outlet over an extended period of time. The flood storage can be a natural or constructed storage basin at the inlet of the underground conduit. The storage required in the basin is dependent upon the volume and rate of inflow from the drainage area and the release rate through the underground outlet system.