

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

UNDERGROUND OUTLET

(no.)

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 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. It does not apply to trickle tubes or to principal spillways in Pond (378) or in Subsurface Drain (606).

DESIGN 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 basins shall be adequate for the intended purpose without causing excessive damage to crops, vegetation, or improvements.

Simplified flood routing techniques may be used to determine the relationship between flooding duration, underground release rate, and basin storage volume. Table M-1, found the NRCS Engineering Field Handbook, Chapter 8,

"Terraces", MN-EFH Notice 3, page 8-72.1 may be used for this purpose.

Inlet. An inlet can be a collection box, a perforated riser, a blind inlet (gravel), or other appropriate devices. 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, 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. The trash guard must be adequate to also prevent the entry of rodents or other animals.

Inlets shall be offset from the main conduit a minimum of 8 ft, except for the top inlet in the system. At least 8 ft. of sealed conduit shall be installed downstream from any vertical inlet.

Perforated risers or blind inlets shall be used where crop residues or other trash could plug ground level inlets. The minimum diameter of perforated risers shall be 5 inches. To compensate for possible plugging, slots or holes in risers shall be adequate to provide at least twice the design flow with the water depth in the basin at the design depth. Minnesota supplement to the NRCS Engineering Field Handbook, page 8-102.2 provides a chart of maximum tile intake capacities.

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

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and vacuum. The maximum velocity must not exceed the safe velocity for the conduit materials and installation. Pressure-relief wells shall be designed and installed if needed to control pressure. Vents should be considered points of sharp grade increases to prevent surges and vacuum conditions.

If junction boxes and other structures are needed, they shall be designed and installed in a manner that facilitates cleaning and other maintenance activities.

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 4 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 standards. All materials specified for Standard 606, "Subsurface Drains" can be used for underground outlets; however, conduits can be perforated or nonperforated, depending on the design requirements.

When corrugated plastic tubing is used under terrace fills or for the sealed section downstream of an intake, it shall meet the requirements for "heavy duty" tubing.

Corrugated plastic tubing shall not be used as a material for an above ground riser.

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. If fire is a hazard, the outlet shall be fire resistant. Consider recessing outlets into slopes where there is a potential for ice damage.

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. The outlet shall meet the requirements for outlets in Subsurface Drain (606).

Protection. Before the outlet installation is completed, 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 keeping inlets, trash guards, 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.