NATURAL RESOURCES CONSERVATION SERVICE
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.

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.

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 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 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.

Quality of Pipe - The pipe shall conform to or exceed the requirements of the appropriate specification listed below:

ASTM Specifications:

A 760 Corrugated Steel Pipe, Metallic Coated for Sewer and Drains
B 745 Corrugated Aluminum Pipe for Sewers and Drains
C 700 Vitrified Clay Pipe, Extra Strength, and Perforated
C 412 Concrete Drain Tile
C 118 Concrete Pipe for Irrigation or Drainage
C 497 Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile
C 14 Concrete Sewer, Storm Drain, and Culvert Pipe
C 76 Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
D 2729 Poly(vinyl Chloride) (PVC) Sewer Pipe and Fittings
D 1527 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80
D 1785 Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
D 2104 Polyethylene (PE) Plastic Pipe, Schedule 40
D 2239 Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
D 2241 Poly(Vinyl Chloride) (PVC), Pressure-Rated Pipe (SDR Series)
D 2282 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR)
D 2447 Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
D 2513 Thermoplastic Gas Pressure Pipe, Tubing and Fittings
D 2737 Polyethylene (PE) Plastic Tubing
D 2672 Joints for IPS PVC Using Solvent Cement
D 3035 Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
F 405 Corrugated Polyethylene (PE) Tubing and Fittings
F 667 Large Diameter Corrugated Polyethylene Pipe and Fittings
AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 inches through 12 inches
AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing, ½ inch through 3 inches

CLAY PIPE

These specifications may be modified as follows:

Where clay pipe will not be subject to freezing and thawing hazards, before or during installation, and where the average frost depth is less than 18 inches, the freezing and thawing and absorption tests may be modified or waived.

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.

Anti-seep Collars - Consideration must be given to prevent piping in the backfill along the pipeline. Failure of the system can result if this is not considered. Piping is controlled at many sites by sloping of the trench banks and compacting the backfill (see figure 8-78, page 8-83 of the Engineering Field Manual). Moisture content of the backfill should be adjusted to aid compaction. Highly angular material which may bridge should not be used for backfill where piping is a concern. Protection can be provided by the use of anti-seep collars to increase the path of percolation.

Sufficient anti-seep collars shall be installed on an underground outlet to prevent the surface and subsurface waters from flowing into and adjacent to the pipe. Particular locations of weakness are below inlets, bends, transitions and areas where compaction is difficult. They should be placed on a maximum spacing of 100 feet.

Anti-seep collars of concrete, sheet metal, or rubber can be used. The collars are to extend beyond the pipe on all sides at least 1 foot or the diameter of the pipe whichever is greater.

Compaction around the anti-seep collars must be equal to or greater than the adjacent in-place material.

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.

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.

Cultural Resources Considerations

NRCS's objective is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice will have any effect on any cultural resources.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

GM 420, Part 401, the California Environmental Handbook and the California Environmental Assessment Worksheet provide guidance on how the NRCS must account for cultural resources. The Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Endangered Species Considerations

Determine if installation of this practice, along with any others proposed, will have an effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS's objective is to benefit these species and others of concern, or at least not have any adverse effect on a listed species. If the Environmental Evaluation indicates that the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the landowners, NRCS may initiate consultation with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Water Quantity

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation and ground water recharge;

2. Effects on the volume of downstream flow might cause undesirable environmental, social or economic effects;

3. Potential use for water management.

Water Quality

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

2. Consider effects on the visual quality of downstream water resources.

3. Consider sediment-attached and construction related effects on the quality of downstream water courses.

4. 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.

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;
- 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.