

Controlled Drainage (acre)

Definition

Control of surface and subsurface water through use of drainage facilities and water control structures.

Scope

This standard applies to management of surface or subsurface outflow from drainage facilities. This standard does not apply to water management systems that are planned to provide subirrigation water supply which is covered by Water Table Control (641).

Purpose

To conserve water and maintain optimum soil moisture to:

1. Store and manage infiltrated rainfall for more efficient crop production.
2. Improve surface water quality by increasing infiltration, thereby reducing runoff which may carry sediment and undesirable chemicals.
3. Reduce nitrates in the drainage water by enhancing conditions for denitrification.
4. Reduce subsidence and wind erosion of organic soils.
5. Hold water in channels in forest areas to act as ground fire breaks.
6. Provide water for wildlife and a resting and feeding place for waterfowl.

Conditions where practice applies

This practice applies primarily to cropland where:

1. The topography is relatively uniform, and flat to gently sloping.
2. Subsurface conditions are such that a water table can be maintained without excessive water loss. The presence of a slowly permeable underlying soil layer is needed to prevent excessive deep seepage losses during periods when a raised water table is desired.

Soil aeration is needed in addition to controlling ground water and surface runoff.

Saline or sodic soil conditions can be maintained at an acceptable level for efficient production of crops.

Improvement of on-site or off-site water quality is desired and may be provided by controlling drainage outflow.

6. Improvement of water quality can be achieved through management of water for maximum denitrification.

Planning considerations

1. Consider the effects on wetlands.
2. Evaluate the effects of variations in the water budget either above or below the point of control.
3. Consider effects of change in the flow of downstream water courses.
4. Consider the effects of change in the water table.
5. Consider effects of outflow on erosion in downstream water courses.
6. Evaluate the effects of possible change in the delivery of sediment and sediment-attached substances.
7. Consider the potential for changes in dissolved chemical loading from nitrates and other salts including managing denitrification.
8. Consider changes in salinity and other dissolved chemicals in soils and in ground water and surface waters.
9. Consider effects on downstream water temperatures.
10. Consider the effects of the planned drainage outflow on the visual quality of discharge or downstream water.

Design Criteria

General. Designs are in accordance with other pertinent Practice Standards such as Structure for Water Control (587); Subsurface Drain (606);

Surface Drainage, Field Ditch (607); Surface Drainage, Main or Lateral (608); and the following additional criteria:

Capacity. Facilities are to be designed so that all component parts shall have the capacity to remove the flow of water required for designed drainage. The combined capacity of the surface and subsurface facilities shall satisfy the appropriate drainage coefficient for the crops to be grown.

Structures for water control. Structures for water control shall be installed wherever necessary and field surfaces graded and smoothed to ensure that moisture from the controlled water table is available to the crop. Structures shall be sized such that design flows over the flashboard or through the control structure can be maintained with a maximum head of 0.5 feet during normal operation. Structures shall be designed so that the control can be removed to return to the drainage mode when desired. Water tables should be dropped slowly to prevent high exit gradients which may draw sediment or other pollutants into the drains. Ease of management and operation of the control structures shall be considered. Automatic devices should be considered to lower the flashboard or control the position of the outlet structure during sudden or high peak flows following infrequent storms. Pumping may be needed to achieve the objective in some sites. Refer to Pumping Plant for Water Control (533).

Operation

A plan of operations shall be prepared for the system to ensure that the system objectives are met. The plan of operations should address the following objectives as applicable:

1. During rainfall, if the water table rises significantly, the outlet controls should be lowered or the system put into a drainage mode.
2. Prior to tillage and planting operations, the water table should be at a depth to provide trafficability with capillary water available when needed.
3. Immediately after planting, the water table control device should be set to allow infiltration from rainfall to bring the water table up to the desired water level to provide capillary water in the root zone.
4. Water table management during wet periods is important because crops may be damaged if the water table is held too near the surface and if drainage is not provided when needed.
5. The system should be operated so that the water table is at a depth sufficient to ensure trafficability prior to harvest.

Plans and Specifications

Plans and specifications for controlled drainage shall be in keeping with this standard and shall describe the requirements for properly installing and operating the practice.