NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

DRAINAGE WATER MANAGEMENT

(Ac.)

CODE 554

DEFINITION

Control of water surface elevations and discharge from surface and subsurface drainage systems.

PURPOSES

The purposes of this practice are to:

- Improve water quality.
- Improve the soil environment for vegetative growth.
- Reduce the rate of oxidation of organic soils.
- Prevent wind erosion.
- Enable seasonal shallow flooding.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- The topography is relatively smooth, uniform, and flat to gently sloping.
- A water table may be maintained without excessive seepage and without having an adverse impact on adjoining properties.

CRITERIA

General Criteria Applicable To All Purposes

The system shall be designed to remove the water required for adequate drainage. The rate of outflow and the level of the water table shall be controlled by structures or pumps. Water velocities in the soil near the drain shall be kept slow enough to prevent soil particles from entering the drainage system.

Structures and pumps shall be located where they are accessible and subject to convenient control. Designs of critical components shall be in accordance with pertinent NRCS Practice Standards, including Structure for Water Control, Code 587, and Subsurface Drainage, Code 606.

Additional Criteria to Improve Water Quality

The system shall prevent automatic discharge of storm water during minor rainfall events. The controlled discharge of excess water shall account for water not otherwise removed by evapotranspiration and seepage. The uniformity of storm water draw down shall be improved throughout the areas influenced by the designed system. The distance the water must travel in surface ditches before it reaches the main discharge point shall be maximized when practical.

To reduce nitrate losses and maximize water quality benefits, the water level shall be maintained as high as feasible, without pumping, in accordance with O&M plan prepared for the site. For most agricultural sites, the water level should vary during the season; based upon crop stage and rooting depth; but should generally be maintained no greater than 30 to 36 inches from the ground surface. Water level during the winter months may be set at 12 to 18 inches from the ground surface. Short term adjustments may be made to accommodate field access and unusually high rainfall.

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service State Office or visit the electronic Field Office Technical Guide.

Prior to tillage, harvest, and other field operations, the water table should be at a depth to provide trafficability throughout the field.

The recommended depth from ground surface to water level in the chart below may be followed.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Corn	12 – 18”		24 – 36”			18 – 24”			24 – 36”		18 – 24”	
Wheat	12 - 24”	24 – 36”		18 – 24”			24 – 36”					
Soybeans						24 – 36”		18 – 24”			24 – 36”	

Additional Criteria to Improve Soil Environment for Vegetative Growth

The combined capacity of the surface and subsurface facilities shall satisfy the appropriate drainage coefficient for the crops to be grown. The water table shall be held between predetermined elevations at all points in the design area when the system is being used for sub-irrigation.

Additional Criteria to Reduce the Rate of Oxidation of Organic Soils

Drainage beyond that necessary to provide an adequate root zone for a crop shall be kept to a minimum. When practicable, the water table shall be raised to the surface, or to a designated maximum elevation, for a sufficient time to return the saturated zone to anaerobic conditions. The implementation of this practice must result in a reduced average annual thickness of the aerated layer of the soil.

Additional Criteria to Prevent Wind Erosion

The system shall provide sufficient moisture to the soil surface, either by ponding or capillary action, to prevent wind erosion when there is insufficient organic residue or plant material on the surface.

Additional Criteria to Enable Seasonal Soil Saturation or Shallow Flooding

The system shall provide saturation to the surface or shallow flooding for a sufficient time to accomplish the desired pest control, provide wildlife habitat, or reduce the rate of oxidation of organic soils.

CONSIDERATIONS

An adequate water supply should be available when it is necessary to raise the water.

The effect of drainage systems on wetlands should be evaluated.

Maintaining a high water table, especially in arid areas, may not be appropriate due to salinity / alkalinity.

When subsurface drains are used, they should be installed deeper than the maximum and minimum levels of the desired water table throughout the length of each lateral. The laterals should be placed within the soil layer having the highest hydraulic conductivity.

Because of the water movement into and out of subsurface drains with fluctuating hydraulic heads, the potential for siltation may be great. Suitable sand-gravel filters should be used as filters around subsurface drains in drainage water management systems, unless the soils

are coarser textured, well-graded sands. Only consider the use of a geotextile filter if the soils are fine-textured, poorly graded sands, otherwise, the filter should be tested to prove they will function satisfactory.

The spacing of main lines and drainage ditches should be as needed to enable the lateral lines to adequately serve the field area. The maximum spacing of laterals to achieve uniform distribution of water may be determined by one of the following:

- DRAINMOD program analysis,
- Using the average spacing recommendation from the local drainage guide, specifically for drainage water management systems,
- Comparing the subject site to existing systems with similar soils and crops, where the adequacy of the existing system is known,
- Small trial areas, where insufficient data are available for certain soils.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard as necessary and shall describe the requirements for applying the practice to achieve its intended use. A plan based on soils, topography, and crops to be grown shall be prepared. The plan shall show the location, elevations, spacing, size, and grade of all conduits, water control structures, and outlet channels.

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan shall be developed that will identify the intended purposes of this practice and that will identify critical dates and target elevations of the water level necessary to accomplish the intended purposes.

The plan shall also include the operation and maintenance of critical components of the infrastructure used to manage the drainage water.

Operation of the structures should be such that prolonged saturation of the root zone does not occur. For very shallow rooted crops, the ground water may be raised within 12 inches of the ground surface for a short period until the surface layer of the soil reaches its water-holding capacity. The water table may then recede by evapotranspiration to some predetermined level until the crop needs to be irrigated. Repeating this cycle allows air to move into the soil and plant root zone for optimum root development. For deeper rooted crops, the water level may be maintained at predetermined levels for the various crop stages, thus, variations in the water table will result only from rainfall and differing consumptive use rates during any particular crop stage.

In order to properly set the elevations of flashboards, it is necessary to know the respective levels of the water table in the various parts of the field served by the water control structure. This can be accomplished by installing small, open, perforated pipes (wells) about 4.0’ long in several selected locations of the field. Once the relationship of the water level at the structure and the water table levels at key locations in the field are established (under both wet and dry conditions) only a single indicator pipe well may be needed. This indicator well can then be effectively used to manage the flashboards throughout the growing season.