

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

PUMPING PLANT FOR WATER CONTROL

(No.)

CODE 533

DEFINITION

A pumping facility installed to transfer water for a conservation need, including removing excess surface or ground water; filling ponds, ditches or wetlands; or for pumping from wells, ponds, streams, and other sources.

PURPOSE

To provide a dependable water source or disposal facility for water management on wetlands or to provide a water supply for such purposes as irrigation, recreation, livestock, or wildlife.

CONDITIONS WHERE PRACTICE APPLIES

Wherever water must be pumped to accomplish the conservation objective. It is especially applicable for maintaining critical water levels in existing swamps, marshes, or open water and for providing water sources for newly constructed wetlands and ponds.

DESIGN CRITERIA

The efficiency of units, type of power, quality of building, automation and accessories installed, shall be in keeping with the value and importance of the system, needs and desires of the sponsoring group or individual, and shall accomplish the conservation and environmental objectives.

The pumping plant shall be designed as an integral part of the water management system. All Ohio drainage and water laws shall be adhered to in the planning and construction of this practice.

Drainage Coefficient

The entire watershed draining to the pump, including seepage must be used in arriving at the amount of water to be pumped.

For subsurface drainage only, the minimum capacity shall equal the capacity of the drainage system as determined, using charts and tables from Chapter 14 of the Engineering Field Manual for Conservation Practices, plus 20 percent.

For surface and subsurface water, the minimum capacity shall be 1 inch in 24 hours.

Pump Capacity

The capacity of the pump shall be determined using the following formula:

$$Q = C \times A \times 0.042 \times 450 \times F$$

Q = Capacity in gallons per minute
C = Drainage coefficients in inches in 24 hours

- A = Watershed area in acres
- 0.042 = Factor to change 1 inch in 24 hours to cubic feet per second per acre.
- 450 = Factor to change cubic feet per second to gallons per minute
- F = 1.2 for subsurface drainage only
- = 1.0 for surface drainage, or surface drainage plus subsurface drainage.

Pump Storage – Automatic Operations

Active water storage in the ditch, sump, or pump bay shall be provided to supply the pump. The number of cycles per hour used in designing the pump system shall be 12 cycles per hour or the manufacturer's recommendation, whichever is less. The active storage volume will be determined using the following formula:

$$\begin{array}{l} S \\ 12 = \frac{Qp}{6} \end{array} \qquad \begin{array}{l} A \\ 12 = \frac{Qp}{6xd} \end{array}$$

$$\begin{array}{l} S \\ 10 = \frac{Qp}{5} \end{array} \qquad \begin{array}{l} A \\ 10 = \frac{Qp}{5xd} \end{array}$$

$$\begin{array}{l} S \\ 8 = \frac{Qp}{4} \end{array} \qquad \begin{array}{l} A \\ 8 = \frac{Qp}{4xd} \end{array}$$

- S = Active storage volume in cubic feet; formulas for 12, 10, and 8 cycles per hour.**
- Qp = Pump capacity in gallons per minute**
- A = Active storage area in square feet; formulas for 12, 10 and 8 cycles per hour.**
- d = Depth of storage in feet or the difference in water level elevations where the pump will start and stop operations**

Pump Storage – Manual Operation

Active water storage for manual operation must be greater than for automatic operation. It depends on the number of times the operator desires to start the pump. When the number of starts is limited to two per day, the following formula may be used to estimate the active storage desirable.

$$\text{Active Storage in cu. ft.} = \text{Pump Capacity in CPM} \times 24$$

Pump

Pump selection for the installation will be done by the pump manufacturer after the required pump capacity, static head, and length of discharge pipe have been determined.

Power Units

The power units shall be selected on the basis of costs, operating conditions, conservation needs and objectives, including need for automation. The power unit shall be matched to the pump and be capable of operating the pump effectively within the range of operation conditions. The horsepower requirements, pump efficiency, and the total head on the pump shall be computed.

Suction and Discharge Pipes

The sizes of suction and discharge pipes shall be based on studies of efficiencies and effects on costs and operations. The arrangement and length of discharge pipe shall be based on need for recovery of head through syphonic action, and for delivery of water in keeping with conservation and environmental objective. Gates, valves, pipe connections, discharge bays, and other protective works shall be installed as needed for satisfactory plant operation.

Building and Accessories

The design of the plant and associated housing, if required, shall consider the need for protecting equipment from the elements, malicious damage, and fire, and the need for equipment maintenance and repairs. The appearance of the plant shall be in keeping with its surrounding environment and its importance or value.

The foundations shall be designed to safely support the loads imposed. Sheet piling or other measures shall be used as required to prevent piping beneath the foundation. Pumps may be mounted in the open, on piling or in a well or pit.

Suction bays (or sumps) shall be designed to conform to the hydraulic characteristics established by the pump manufacturer.

The discharge bay or connection with distribution system shall be ample to meet hydraulic and structural requirements. Provisions for repair or removal of pumps and engines shall be provided. Trash racks shall be provided as needed to exclude debris and trash from the pump.

All structural features and equipment shall provide adequate safety features to protect workers and the public against injury.

PLANS AND SPECIFICATIONS

Plans and specifications for constructing pumping plants for water control shall be in keeping with this standard and shall describe the requirements for proper installation of the practice to achieve its intended purpose.