

STANDARD

IRRIGATION STORAGE RESERVOIR (No. and Acre-Ft.)

Definition

An irrigation water storage structure made by constructing a dam.

Scope

This standard applies to irrigation water storage structures designed to be filled during the season of low irrigation demand to provide water needed for irrigation during some other part of the year or in some future year. It does not apply to structures designed primarily for flow control or those designed to store water for only a few hours or a few days.

This standard pertains to the planning and functional design of irrigation storage reservoirs. It does not include detailed design criteria or construction specifications for individual structures or components of the storage facility.

Purpose

To conserve water by holding it in storage until it can be beneficially used to meet crop irrigation requirements.

Conditions Where Practice Applies

This practice applies only to sites meeting all the following criteria:

1. The water supply available to the irrigated area is insufficient to meet conservation irrigation requirements during part or all the conservation season.
2. Water is available for storage from surface runoff streamflow, or a subsurface source during periods of low or nonirrigation use.
3. Topographic, geologic, and soils conditions are satisfactory at some suitable site for constructing an economically feasible storage reservoir.

Planning Considerations for Water Quantity and Quality

QUANTITY

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

2. Effects on downstream flows or aquifers that would affect other water uses or users.
3. Effects on the volume of downstream flow that could have undesirable environmental, social, or economic effects.
4. Potential use for irrigation water management.

QUALITY

1. Effects on erosion and the movement of sediment and soluble sediment-attached substances carried by runoff.
2. Effects on the movement of dissolved substances to groundwater.
3. Effects on downstream waters that could cause undesirable effects on aquatic and wildlife communities.
4. Short-term and construction-related effects on the quality of downstream water courses.
5. Effects on the temperature of downstream water that could cause undesirable effects on aquatic and wildlife communities.
6. Effects on wetlands or water-related wildlife habitats.
7. Potential for earthmoving to uncover or redistribute toxic materials.
8. Effects on the visual quality of water resources.

Design Criteria

IRRIGATION. The amount of water required to properly irrigate the crops in the area to be irrigated and the variations in water demand within the growing season must be known to adequately evaluate storage requirements. All demand hydrographs shall be computed from the consumptive use-time relationship, increased to reflect the anticipated level of farm irrigation efficiency plus any losses to be expected in conveying the water from the point of diversion to the farm and field. If water is required for such purposes as leaching or frost control, the amount needed shall be included in the demand hydrograph.

STORAGE. Irrigation storage reservoirs shall be designed to have a usable capacity sufficient to satisfy irrigation requirements in the design area, unless limited by characteristics of the reservoir site or by the available watershed yield (including limitations imposed by water rights). Additional capacity shall be provided as needed for sediment storage.

The stored water releases required to meet irrigation demands shall be those increments of the water demand hydrograph that exceed the available direct flows from other sources.

CAPACITY. In computing the reservoir capacity required to satisfy irrigation demands, due consideration shall be given to the length of the storage period, the anticipated inflow during this period, and the seepage and evaporation losses to be expected under the proposed plan of operation.

If the storage capacity is limited by the characteristics of the site to less than that required to meet the irrigation demands of the proposed area or if the water supply available for storage is insufficient to meet these demands, the quantity of water that can be made available at the reservoir outlet and the acreage that can adequately be irrigated shall be computed as a means of evaluating the benefits of the proposed installation. The benefits may be evaluated on the basis of the more frequent availability of water to satisfy irrigation demands for the full design area.

TYPE OF STRUCTURES. The type of dam and appurtenant structures to be used shall be selected for each site on the basis of hydrologic studies and engineering and geologic investigations of the site conditions and the materials available for construction.

The reservoir may be created by an impounding embankment used to intercept surface runoff or by an enclosed embankment used to store pumped water.

FOUNDATION, EMBANKMENT, AND SPILLWAY. Earthen dams and embankments and related appurtenant structures shall be designed to meet the criteria in the standard for ponds (378) or in TR-60, as appropriate.

Drop spillways, chute spillways, and box spillways shall be designed according to the principles set forth in the Engineering Field Manual for Conservation Practices, the National Engineering Handbook, Section 5--Hydraulics; Section 11--Drop Spillways; or Section 14--Chute Spillways, as appropriate.

OVERFLOW PROTECTION. An overflow protection structure with a capacity equal to or greater than the inlet stream shall be provided for an enclosed embankment. This structure may be designed and installed in combination with the outlet works.

OUTLET WORKS. Outlet works shall be provided for the controlled release of irrigation water. Outlet works may consist of a gated conduit through or over the dam for gravitational flow to the irrigated area or to a pumping plant or they may consist of a pumping plant designed to lift water directly from the reservoir basin.

The capacity of the outlet works shall not be less than that required to provide the outflow rate needed to meet peak period irrigation system demands.

Plans and Specifications

Plans and specifications for constructing irrigation storage reservoirs shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purposes.

Irrigation storage reservoirs within the scope of the standard for ponds (378) shall be constructed according to the construction and materials specifications for ponds (378). Those within the scope of the criteria in TR-60 shall be constructed according to guide specifications in the National Engineering Handbook, Section 20.