

**TITLE 252. DEPARTMENT OF ENVIRONMENTAL QUALITY
CHAPTER 656. WATER POLLUTION CONTROL FACILITY CONSTRUCTION
STANDARDS**

SUBCHAPTER 11. LAGOON STANDARDS

252:656-11-2. Basis of design

(a) **Facultative Lagoons.** Facultative lagoons depend on the relationship between organic loading and surface area (algal photosynthesis) or on surface area and supplemental mechanical aeration to provide an aerobic layer of water at the surface. Facultative lagoons may be either total retention or flow-through (discharge) to waters of the state.

(b) **Flow-through lagoons.**

(1) **Organic loading.** Limit the organic load to 35 pounds BOD per acre (water surface area) per day for any cell depending solely on algal photosynthesis for oxygen. The total water surface area requirement based on organic loading is calculated at the average water depth. Flow-through lagoon systems will not consistently provide ammonia removal through the nitrification process so the effluent from these facilities may be toxic to aquatic life and thus cause whole effluent toxicity test failures.

(2) **Flow Control.** Provide at least two primary cells on new systems. Design the primary cells so they may be operated in either series or in parallel, with at least 60 days retention time. Provide at least two secondary cells operating in series with the primary cells and in series with each other. Provide a bypass line around any secondary cell in a series to the next cell. The secondary cells shall have at least 60 days detention for a total of at least 120 days detention in the system.

(3) **Depth.** The maximum water depth shall not exceed 6 feet in primary cells and 10 feet in secondary cells. Provide structures to allow the primary cells to operate between four foot depth and the maximum design depth plus three feet of freeboard. The operating depth for a flow-through lagoon shall be between 4 and 6 feet.

(c) **Total Retention.** Size the primary cell(s) for the expected organic loading and additional evaporation cells designed for the hydraulic load. Base the design of all cells receiving raw wastewater on an organic loading of 35 lbs BOD per surface acre per day at the average operating depth. Design the primary cells so they may be operated in either series or in parallel.

(1) **Surface evaporation.** Where more than one acre of surface area is needed, provide at least two cells. For those systems greater than five (5) acres surface area provide at least two primary cells.

(A) Provide sufficient area to evaporate the annual influent flow based on the average daily design flow with allowances for infiltration and inflow to the sewage collection system.

(B) Base the evaporation rates on the annual average pan evaporation minus the 90th percentile annual precipitation for the geographical location, as contained in Appendix E.

(C) The system shall be designed with a five (5) foot operating depth, with three (3) feet of freeboard.

(2) **Land Application.** Design two (2) primary cells and one storage cell. Follow design guidelines stated in Subchapter 25 of this Chapter.

(A) Primary cells shall have sixty (60) days of retention time.

(B) Secondary cells shall have ninety (90) days of storage with the operating depth not to exceed ten (10) feet.

(d) **Aerated lagoon systems.** The following apply to all new aerated lagoon systems.

Only partial-mix systems will be considered for systems with 30 day average concentration limits for BOD and TSS of 30 mg/l and 90 mg/l, respectively, as their basic permit requirement. Aerated lagoon systems will not consistently provide ammonia removal through the nitrification process so the effluent from these facilities may be toxic to aquatic life and thus cause whole effluent toxicity test failures.

- (1) **Number of cells.** At least two aerated cells, in series, followed by one settling lagoon and provide a hydraulic retention time of at least two days.
- (2) **Depth.** The design water depth shall be 10 to 15 feet.
- (3) **Design Requirements.** Submit design calculations to the DEQ for review, and justify the use of any constants not listed.
- (4) **Aeration requirements.** Oxygen requirements will depend on organic loading, required treatment, and concentration of suspended solids to be maintained in the aerated cells. Aeration equipment shall be capable of maintaining a minimum dissolved oxygen level of 2 mg/l in the lagoons at all times. In the absence of experimentally determined values, the design oxygen requirements shall be 1.8 lb O₂/lb BOD applied at maximum loading.
- (5) **Additional information.** For a more detailed discussion of aerated lagoon design see *Design Manual Municipal Wastewater Stabilization Ponds*, U.S. Environmental Protection Agency, EPA-625/1-83-015 (1983). Also use *Wastewater Engineering: Treatment, Disposal & Reuse*, Metcalf & Eddy, Inc., 4th Edition, (2003).
- (6) **Disinfection.** Disinfection shall be required for all lagoon systems proposed to discharge to "waters of the state" where the beneficial use of the receiving water body is designated in Oklahoma's Water Quality Standards (OAC ~~785:45~~ 252:730) as either "Primary Body Contact Recreational" or "Public or Private Water Supply".