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Lagoon Sizing and Construction Fact Sheet

The size of a lagoon is based on the design flow for the dwelling or non-dwelling facility, the seepage rate of the wastewater into the soil below the lagoon and the average evaporation and precipitation using the appropriate location on maps found in [Title 124 – Onsite Wastewater Treatment Systems](#).

Design Flow

- Dwelling - The minimum wastewater flow is based on the number of bedrooms in the dwelling using the following: $150 \text{ gpd} + ((\text{number of bedrooms} - 1) \times 75 \text{ gpd})$, where gpd is gallons per day.
- [Non-dwelling](#) structure or other wastewater source - The wastewater flow is based on the highest daily wastewater flow.

Seepage Rate

Testing of the final seepage rate is based on soil permeability. The maximum allowable seepage rate is one-eighth inch per day after sealing and compaction. This may be determined by: an independent soils laboratory performing a hydraulic conductivity test on an undisturbed soil sample taken at the site; the two barrel method prior to filling; or a comparison test after prefilling with clean water, but before introduction of wastewater to the lagoon.

- Two barrel method - Two similar 55 gallon drums are required, one a control drum with one end removed and the other drum (seepage drum) with both ends removed. One end of the seepage drum is pressed into the sealed soil layer and a bead of polymer treated sodium bentonite clay is packed around the inside edge of the drum. The seepage drum is carefully filled with water and kept filled for two or more days to saturate the soil. The test begins with filling each drum equally. Each day the difference in levels is recorded, and the barrels filled to the beginning level. The control drum

measures the weather effects while the seepage drum records seepage plus weather effects. The test should continue for at least seven days.

- Comparison test method - Isolate the lagoon and record the water level changes as a result of seepage and weather effects. The changes resulting from weather effects alone may be measured separately in a nearly full white plastic five-gallon bucket partially buried near the shore. The test should continue for at least seven days.

Water Balance

The lagoon water surface area at the maximum operating level is determined by the following water balance equation:

Maximum Water Surface Area =

$$\frac{(\text{flow}) \times 976}{((\text{evap} - \text{precip}) \times 1.67) + (\text{OD})} = (\text{seepage} \times 608)$$

Where: flow = daily design flow or inflow, gallons per day

evap = annual lake evaporation for location from [Title 124](#) map

precip = annual precipitation for location from Title 124 map

OD = difference between maximum and minimum operating depths for the lagoon (typically three feet which is also the maximum allowed)

Construction

- Lagoon
 - The floor of the lagoon must be level. A difference of plus (+) or minus (-) three inches is permitted.
 - All vegetation must be removed from the floor of the lagoon. The organic material cannot be used in the construction of the lagoon.
 - The soil material of the lagoon floor must be designed so that it will not seep more than one-eighth inch per day. If soil borings and tests indicate the existing soils are not conducive to compaction to meet this requirement, then sodium bentonite clay or a synthetic liner may be used to restrict seepage.
 - The inside slope of the dikes must not be steeper than three horizontal to one vertical.
 - The exterior slope of the dikes must not be steeper than four horizontal to one vertical.
 - The minimum width of the top of the dike must be four feet.
 - The minimum operating depth of the lagoon must be two feet and the maximum operating depth must be five feet.
 - The dikes must provide a minimum freeboard of 12 inches.

- The lagoon must be equipped with a depth gage that provides a visual indication of the liquid level at minimum operating depth (two feet) and maximum design full depth relative to the lagoon floor.
 - The lagoon must be fenced with a four-foot-high woven wire, welded wire, or seven strand barbed wire with the first strand starting three inches from the ground and the following strands spaced evenly. The fence must also be equipped with a standard main gate that is kept locked. The fence must be placed on the outside edge of the top of the dike or four feet outside the toe of the dike.
 - A sign no less than 12 inches by 24 inches bearing the clearly-readable words "NO TRESPASSING - WASTEWATER LAGOON" must be located on the gate.
- Building Sewer Line
 - The influent line from the building sewer must be at least four inches inside diameter and have a grade of not less than one-eighth inch per foot.
 - The line must be equipped with clean-outs with tight fitting caps, at every seventy-five feet or less, or where angles greater than forty five degrees are encountered. A clean-out must also be located at least one foot above the highest water level and near the outside of the dike embankment.
 - The line must discharge at the center of the lagoon onto a concrete apron slab at least two feet square with the discharge end of the pipe placed below the minimum operating depth of the lagoon.
 - The sewer line pipe must have a loading bearing capacity of not less than 1,000 (455 kg) pounds per square foot. Plastic pipe must be installed and supported in such a manner that there is no deflection during backfilling or compaction.

The lagoon must be filled with surface or groundwater to a depth of two feet before wastewater wastes are discharged into it.