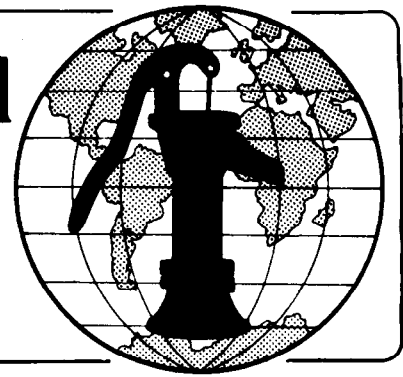


Water for the World



Constructing Mechanically Aerated Lagoons Technical Note No. SAN. 2.C.7

A mechanically aerated lagoon is similar to a stabilization pond except that it is equipped with one or more electrically powered aerators that treat effluent by mixing it with air. Constructing a mechanically aerated lagoon requires the services of an engineer or construction foreman experienced with these systems. Construction involves assembling materials, tools, and labor; preparing the site; staking the lagoon, embankment, and pipe locations; excavating the lagoon; building embankments; laying pipes; lining the lagoon; finishing embankments; and installing aerators.

This technical note describes how to construct a mechanically aerated lagoon. Most of the steps are identical to those described in "Constructing Stabilization Ponds," SAN.2.C.5. Read the entire technical note before beginning construction.

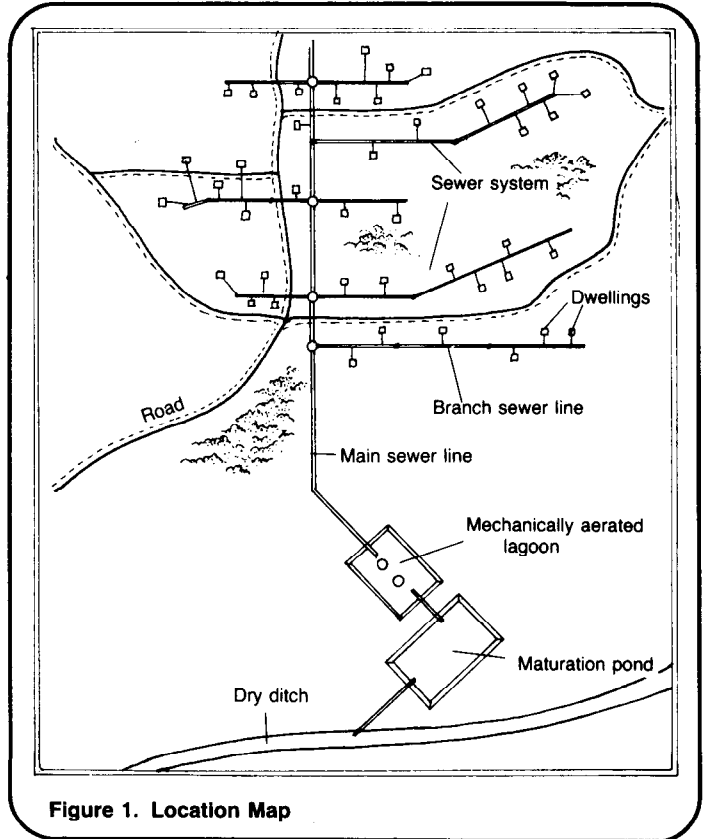


Figure 1. Location Map

Useful Definition

EFFLUENT - Settled sewage.

Materials Needed

Before construction can begin, the project designer must provide:

- 1) Location map, or master sewer map, similar to Figure 1.
- 2) Design drawings, similar to Figure 2 and 3.
- 3) Materials list, similar to Table 1 the sample.
- 4) Aerator Manufacturer's instruction and specification sheet.

You will also need the technical note "Constructing Stabilization Ponds," SAN.2.C.5.

Table 1. Sample Materials List for Aerated Lagoon

| Item | Description | Quantity | Estimated Cost |
|---------------------|---|----------|----------------|
| Labor | Engineer experienced with aerated lagoons | 1 | ---- |
| | Electrician | 1 | ---- |
| | Worker skilled with concrete mortar | 1 | ---- |
| | Unskilled workers | 6 | ---- |
| | Backhoe operator | 1 | ---- |
| Supplies | Aerators, (including spare parts, electric cables, and mooring lines, etc.) | ---- | ---- |
| | Sewer pipe, 100mm diameter | ---- | ---- |
| | Valves, 100mm diameter | ---- | ---- |
| | Flat stones | ---- | ---- |
| | Mortar mix | ---- | ---- |
| | Grass seed | ---- | ---- |
| | Tools | Backhoe | ---- |
| Shovels | | ---- | ---- |
| Electrician's tools | | ---- | ---- |
| Mixing containers | | ---- | ---- |
| Trowels | | ---- | ---- |

Total Estimated Cost • ----

Construction Steps

Depending on local conditions, availability of materials, skills of workers, and so on, some construction

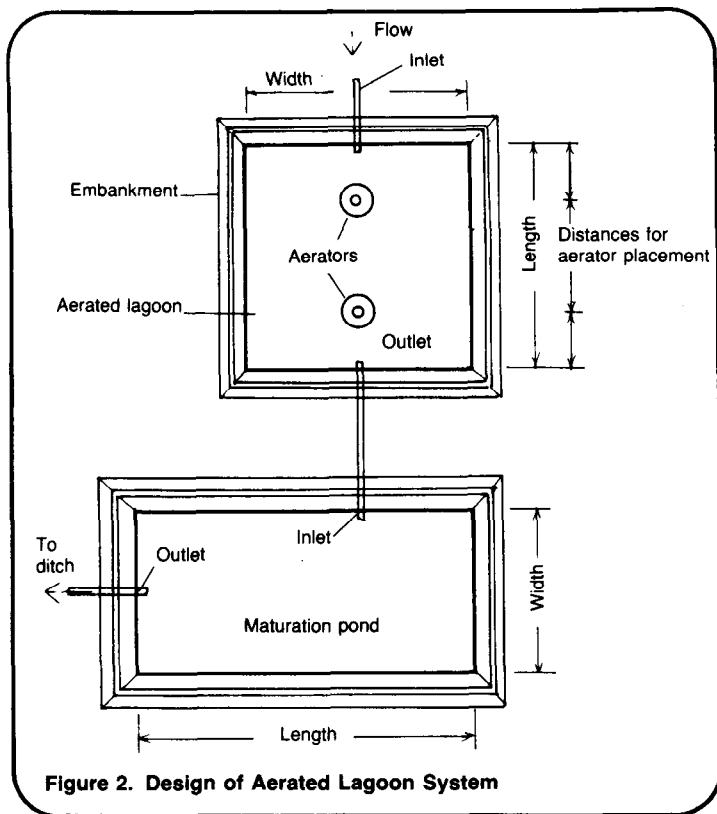


Figure 2. Design of Aerated Lagoon System

steps will take only a few hours, while others may require a day or more. Read the construction steps and make a rough estimate of the time required for each step based on local conditions. You

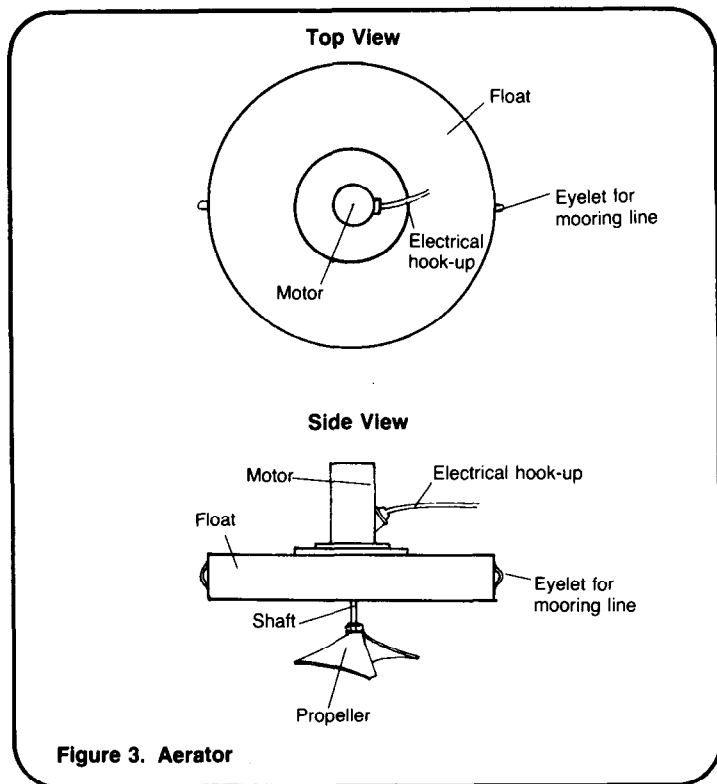


Figure 3. Aerator

will then have an idea of when specific workmen, materials, and tools must be available during the construction process. Draw up a work schedule to Table 2, showing construction steps.

Preparing the Site

See "Constructing Stabilization Ponds," SAN.2.C.5.

Staking Lagoon, Embankment, and Pipe Locations

See "Constructing Stabilization Ponds," SAN.2.C.5.

Excavating the Lagoon

See "Constructing Stabilization Ponds," SAN.2.C.5.

Building Embankments

See "Constructing Stabilization Ponds," SAN.2.C.5.

Laying Pipes

See "Constructing Stabilization Ponds," SAN.2.C.5.

Lining the Lagoon

The bottom of the lagoon and the inside of the embankment must be lined to prevent erosion caused by the aerators and to prevent bottom soil from being stirred into the effluent. See Figure 4.

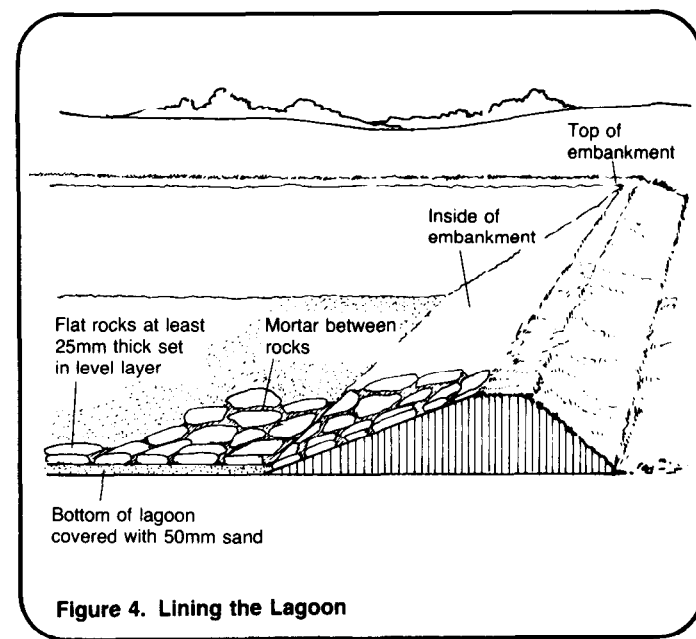


Figure 4. Lining the Lagoon

Table 2. Sample Work Schedule for Constructing an Aerated Lagoon.

| Time Estimate | Day | Task | Personnel | Materials/Tools |
|---------------|-------|--|---|--|
| 1/2 day | 1 | Mark lagoon site | Engineer or experienced foreman (always present), 2 workers | Maps, drawings, measuring tape |
| 1 1/2 days | 1-2 | Clean site of trees, brush, and debris | 6 workers | Axes, machetes, cart |
| 1 day | 3 | Scrape topsoil and pile for finishing embankment | 6 workers, 1 loader operator | Front-end loader, shovels |
| 1 day | 4 | Stake site of lagoon, embankment, pipes | 1 surveyor, 3 workers | Transit, level, level rod, steel measuring tape, stakes |
| 4 days | 5-8 | Excavate lagoon and build embankments | 1 loader operator, 6 workers | Front-end loader, shovels, picks, carts |
| 1 day | 9 | Dig pipe trenches and lay pipe | 6 workers, 1 worker skilled with mortar | Picks, shovels, 100mm diameter sewer pipe, pipe valves, mortar |
| 4 days | 10-13 | Line the lagoon | 6 workers, 1 worker skilled with mortar | Sand, flat stones, chipping hammers, safety goggles, mortar |
| 2 days | 14-15 | Finish embankment | 1 loader operator, 6 workers | Loader, shovels, topsoil, sod |
| 1/2 day | 16 | Set securing posts | 4 workers | Posts, shovels |
| 1 1/2 days | 16-17 | Lay electric cable | 1 electrician, 4 workers | Electric cable, electricians tools, shovels |

1. If the stones used for lining are not of uniform thickness, spread a 50mm layer of sand on the lagoon bottom. This will make it easier to work the stones into an even layer.

2. Stones used must be at least 25mm thick. Fit them as close together as possible. Use a stonemason's chipping hammer to improve the fit between the stones and wear protective goggles.

3. Pour concrete mortar between the stones and smooth with a trowel. The mortar should be 1 part cement, 2-3 parts sand, and enough water to make a very wet, pourable mix.

Finishing Embankment

See "Constructing Stabilization Ponds," SAN.2.C.5.

Installing Aerators

Floating aerators are connected to electric cables and held in place by mooring lines attached to securing posts on the embankment. See Figure 5.

1. String electric cable from the power source to the lagoon site. Cables should be suspended overhead or buried underground, and they should be

protected from damage caused by embankment maintenance.

2. Using the design drawings, locate the points for the securing posts on the embankment. The posts may be made of wood or steel and should be at least 1.0m long. Drive or set them firmly into the embankment.

3. The aerators cannot be positioned until the lagoon is filled to its design depth with effluent. See "Operating and Maintaining Mechanically Aerated Lagoons," SAN.2.0.7.

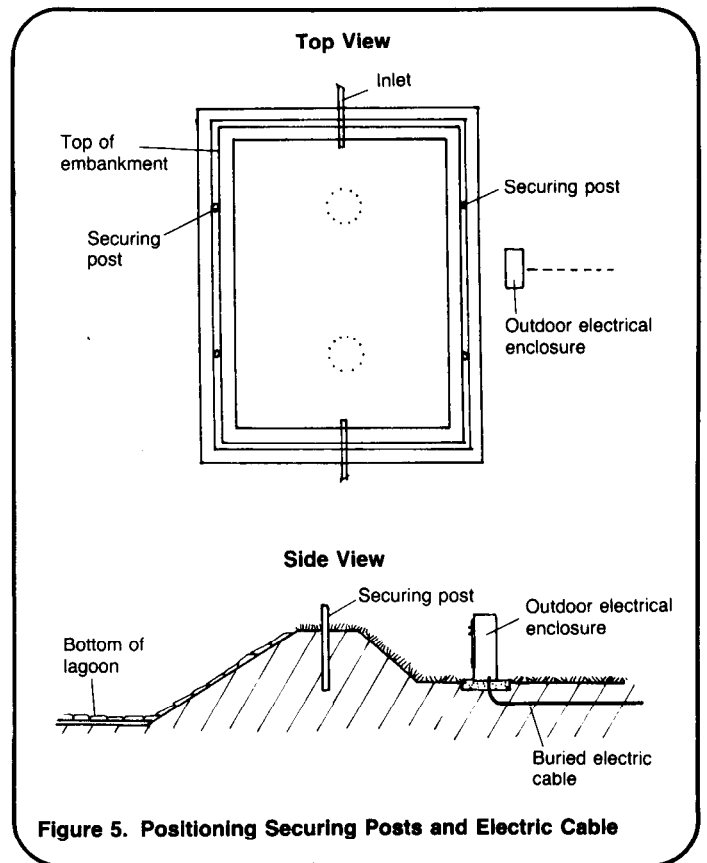


Figure 5. Positioning Securing Posts and Electric Cable

Technical Notes are part of a set of "Water for the World" materials produced under contract to the U.S. Agency for International Development by National Demonstration Water Project, Institute for Rural Water, and National Environmental Health Association. Artwork was done by Redwing Art Service. Technical Notes are intended to provide assistance to a broad range of people with field responsibility for village water supply and sanitation projects in the developing nations. For more detail on the purpose, organization and suggestions for use of Technical Notes, see the introductory Note in the series, titled "Using 'Water for the World' Technical Notes." Other parts of the "Water for the World" series include a comprehensive Program Manual and several Policy Perspectives. Further information on these materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C., 20523, U.S.A.