

Pond Sealing or Lining

Description

Pond sealing or lining is the process of installing a fixed lining of impervious material, or mechanically treating the soil in a pond to impede or prevent water loss. Ponds can serve as stormwater management detention facilities, add visual aesthetics, create an environment for wildlife, and serve as golf course hazards.

Pollutants Controlled and Impacts

Properly sealed ponds help prevent pollutants from infiltrating into the ground water and provide water storage in soils with high infiltration rates.

Application

Land Use

This practice applies to all land uses, but may be most important in areas where there are vulnerable aquifers, such as on sandy soils.

Soil/Topography/Climate

Soils at the site determine whether a pond needs to be sealed, and what type of material is needed in order to result in an effective seal.

When to Apply

Apply when soils are such that water cannot be retained, or in areas where groundwater is in need of protection.

Where to Apply

Apply on sites where soil types dictate an impervious liner is needed to retain water, or where possible leaching of unwanted pollutants or fine soil particles may adversely affect ground water.

Relationship With Other BMPs

Development of the pond should follow specifications in the Pond Construction and Management BMP. Spoil Piles should be properly stabilized during the pond lining process.

Specifications

General Considerations:

1. Site selection, construction and management of a pond should be consistent with specifications listed in the Pond Construction and Management BMP.
2. Soil samples should be collected from sites under consideration to help determine the type of pond sealer or liner that is needed.

Design Considerations:

1. Ponds designed with liners that exceed low-head dams in height or receive high volumes of surface water runoff, should be designed by a certified engineer.
2. Pond liners should be incorporated into the overall design of the pond. Refer to the specifications in the Pond Construction and Management BMP.
3. Maintain a slope of 4:1 or less on the bank of the pond.

Choose from the following types of liners:

Compaction: Areas containing a high percentage of coarse grained material can be made relatively impervious by compaction without any other treatment methods. However, the material must be well graded and consist of small gravel or coarse sand to fine sand, clay, and silt. This method of sealing is the least expensive, but it can only be used on the soil types described.

1. Clear the pond area of all trees following specifications in the Land Clearing BMP. Fill all stump holes, crevices and similar areas with relatively imperious soils.
2. Scarify the soil (see Grading Practices BMP) to a depth of 8-10 inches with a disk, roto-tiller, pulverizer, or similar equipment. Be sure to remove all rocks and tree roots.
3. Under optimum moisture conditions, roll the soil under to a tight layer making 4-6 passes with a sheepsfoot roller to compact the soil. The soil should be compacted to a minimum of 8 inches for impoundments up to 10 feet in depth. In cases where the depth of the water will exceed 10 feet, remove the top layers of soil and compact the bottom two or more layers. Each layer should be no more than 8 inches thick. Once the bottom layers are compacted, replace the topsoil and compact it like the other layer(s).

Clay: Areas dominated by coarse grained materials and lacking sufficient amounts of clay to prevent seepage can be sealed by adding material containing at least 20% clay:

1. The clay material should be a minimum of 18 inches thick for all depths of water up to 10 feet. Increase the minimum thickness by 2 inches for each additional foot of water.
2. Properly compact the clay according to the design to ensure a good seal.
3. Do not use in areas where drawdowns will be done. The exposed clay may crack and the seal therefore rendered ineffective. If drawdowns will be done, cover the clay with 12-18 inches of gravel.
4. Protect the clay and/or clay/gravel seal area by constructing a cantilevered pipe or rock Riprap at the intake point.

Bentonite: Bentonite is a fine-textured colloidal clay that will absorb several times its own weight of water. When Bentonite is mixed with coarse grained materials, then thoroughly compacted and saturated, it will fill pores in the material and make it virtually impervious.

1. Soil tests should be collected and analyzed to determine the percentage of Bentonite needed. Rates range from 1 to 3 pounds per square foot, depending on the soil content.
2. Do not use Bentonite in areas where the water level fluctuates significantly. When dry, Bentonite returns to its original volume and will leave cracks in the pond.
3. Excavate soil, mix Bentonite thoroughly with the soil in a pug mill, and apply to a depth of at least 6 inches.
4. Compact the area with a minimum of 4-6 passes of a sheepsfoot roller, or equivalent, to achieve required density. Pay special attention to moisture content.
5. If enough time will elapse before the Bentonite is covered with water for it to dry out, cover the treated area with a mulch of straw or hay anchored to the surface by the final passes of the sheepsfoot roller.
6. Protect the inflow to the treated area with Riprap or other appropriate measures.

Flexible Membranes: Flexible membranes include polyethylene, PVC, vinyl, and butyl rubber. Although structurally weak, these materials are water-tight if kept from puncture and properly sealed.

1. Choose from:
 - a. Vinyl, which is more resistant to damage from impact than other flexible membranes, and is easily sealed and patched with a solvent cement.
 - b. Polyethylene, which can only be sealed or patched by heat sealing.
 - c. Butyl rubber, which can be joined and patched with rubber cement.
2. All polyethylene and vinyl membranes should be covered with no less than 12 inches of soil that is free from rocks and other injurious materials. The bottom 3 inches of soil/gravel should be coarser than silty sand.
3. Because certain plants can penetrate the membrane liners, it may be necessary to sterilize the subgrade. Sterilization is not needed on butyl rubber membranes.
4. Anchor the top edge of the lining in a trench at the planned water level. The anchor should be buried 8-12 inches in a trench and secured with compacted backfill.

Chemical Treatment: The two types of chemical treatment discussed below can be used to line ponds if the specific products selected are chemically stable (i.e. are not leached into the water column) once they are applied.

1. **Dispersing Agents.** Dispersing agents are used to "seal" the porous holes that form between fine-grained clay particles. To be effective, the soils in the pond area should contain more than 50% of the fine-grained material (silt and clay finer than .074 mm diameter) and at least

15% of clay finer than .002 mm diameter). Soils should contain less than 0.5% soluble salts based on dry soil weight.

- a. Mix the dispersing agent into the top 6-inch layer of soil using a disk, roto-tiller, pulverizer or similar equipment. The thickness of the layer for depths of water up to 8 feet should be 6 inches. For water depths exceeding 8 feet, the layer should be 12 inches thick, treated in two 6-inch layers. For the best results, operate the mixing equipment in two different directions.
 - b. Compact each treated layer with 4-6 passes of a sheepsfoot roller, or equivalent.
2. Cationic Emulsion. In order to use cationic emulsion, the top 2 inches of soil should be sandy, very fine through very coarse, or loamy sands and sandy loams.
- a. Use sealants that are emulsions of suitable bituminous, resinous, or polymeric bases, with infinite dilutability and good stability after dilution.
 - b. Apply only when air and water temperatures are above 40-degrees F.
 - c. Minimum application should be 1 gallon per square yard. Follow manufacturer's directions.

Construction Considerations:

Follow construction specifications included in the Pond Construction and Management BMP. Install the liner promptly upon completion of the excavation processes. In the case of plastic liners, the pond should be filled immediately with water to stabilize the liner and cover the soil layer.

After Construction:

Stabilize the slope with vegetation to minimize erosion.

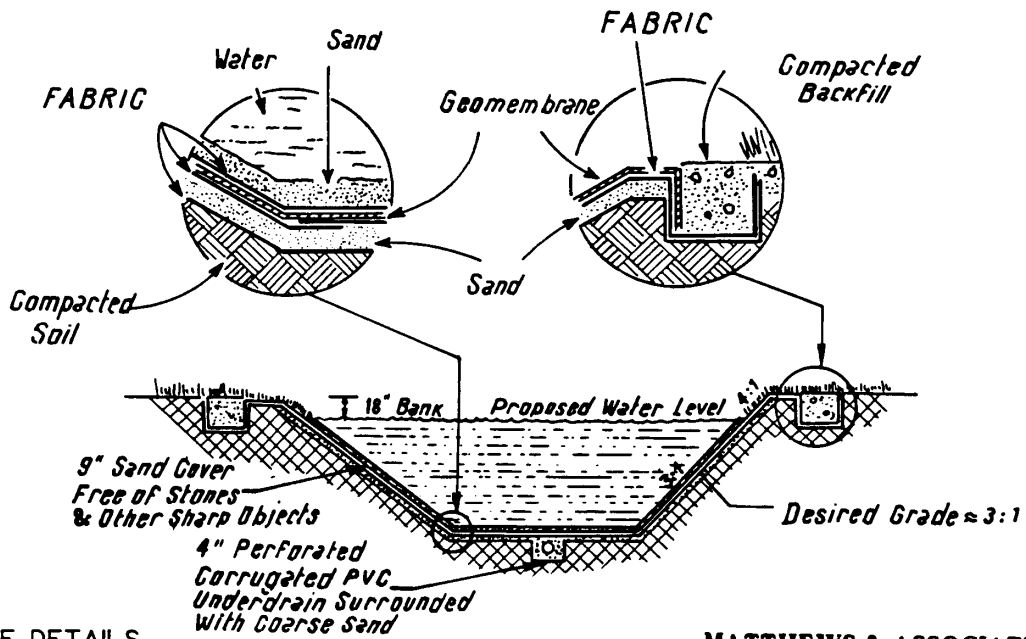
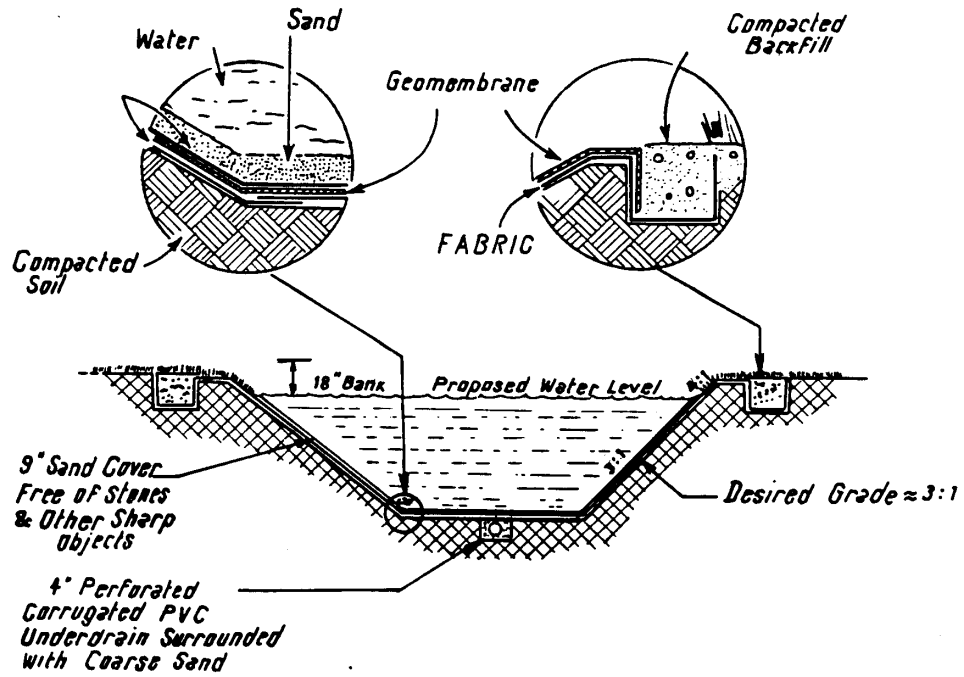
The water level of the pond should be kept at a sufficient level to minimize erosion of earth material covering the pond liner.

Exhibits

Exhibit 1: Pond Sealing Methods. Warren's - TerraBond Field Manual and Specification Guide.

Exhibit 1

Pond Sealing Methods



SOURCE OF DETAILS
WARREN'S - TerraBond
Field Manual and
Specification Guide

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