

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

POND SEALING OR LINING

SOIL-CEMENT

(No.)

CODE 740 CA INTERIM

DEFINITION

A liner for a pond consisting of a highly compacted mixture of soil and measured amount of cement and water

PURPOSES

To reduce seepage losses from ponds for water conservation and environmental protection.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- Ponds where water loss from excess seepage prevent the pond from fulfilling its planned purpose and where excess seepage will waste water, cause damage to land and crops, or cause environmental problems.
- Soils are suitable for treatment with cement.
- Soils to be treated are Unified Soils Groups GW, GP, GM, GC, SW, SP, SM, or SC.

This practice does not apply to ponds storing agricultural wastewater.

CRITERIA

Structures to be lined shall have been constructed to meet all applicable NRCS standards. All inlets, outlets, ramps, and other appurtenances may be installed before, during, or after the liner placement, but shall be done in a manner that does not damage or impair the proper operation of the liner.

Soil Properties

Sealing with soil-cement is applicable on coarse-grained soils. The ideal soil material should contain no more than 35 percent passing the No. 200 sieve size, and less than 0.5 percent of organic matter. The soil

should not contain gravel larger than 2 inches nor more than 45 percent gravel larger than 1/4 inch.

Clay balls (nodules of clay and silt intermixed with granular soil) have a tendency to form when the Plasticity Index (PI) of the soil is greater than 8, and tend to wash out and weaken the soil-cement structure. The PI of the soil shall be no greater than 8. Clay balls greater than 1 inch shall be removed. Clay balls less than 1 inch shall be limited to 10 percent.

If soils at project site are found to be not suitable, soils from a borrow area within an economical haul distance should be investigated.

Rate of Application

The rate of application shall be 10 percent cement by volume.

On large projects where the minimum amount of cement needed is determined to keep project costs low, the rate of application shall be based on laboratory tests.

Short-cut procedures have been developed for sandy soils containing less than 50 percent material smaller than 0.05 mm (silt and clay) and less than 20 percent material smaller than 0.005 mm (clay). These procedures are outlined in the Portland Cement Association Soil Cement Laboratory Handbook. Method A can be used for soils not containing material retained on the No. 4 sieve and Method B is used for soils retained on the No. 4 sieve. These short-cut procedures do not always indicate the minimum cement factor, but they do provide a safe cement factor that is generally close to that indicated by standard ASTM wet-dry and freeze-thaw tests.

For all other soils, the design cement factor shall be determined from wet-dry and freeze-thaw tests. The allowable weight loss for test specimens are as given under "Laboratory Data".

Thickness of Treated Blanket

The minimum thickness of the finished treated blanket shall be 4 inches for water depths up to 8 feet. Additional thickness shall be provided for greater water depths.

Subgrade

To reduce damage to the lining by vegetation, the subgrade shall be treated with a soil sterilant prior to the placement of soil-cement.

Area to be Treated

The total wetted area shall be treated and treatment shall be provided to an elevation that will protect the sides against wave action.

Laboratory Data and Report

A 200 pound sample of the on-site material shall be collected and submitted to a soil mechanics laboratory for testing. The following tests are to be performed, and a design mix determined that will yield the following results with the minimum cement content:

Test	Result
Compressive Strength (28 days)	greater than 750 psi
Wet-Dry Test (ASTM D559) (loss of weight)	less than 10 percent
Freeze-Thaw Test (ASTM D560) (percent loss of weight)	less than 10 percent

The laboratory shall prepare a report that contains the original worksheets and results of all tests performed.

The laboratory report shall also contain the test data for:

Moisture-Density Relationship of soil material with the percentage of cement that is determined to be the design-mix. (ASTM D558)

ASTMs

- D558 Standard Test Methods for Moisture-Density (Unit Weight) Relations of Soil-Cement Mixtures
- D559 Standard Test Methods for Wetting and Drying Compacted Soil-Cement Mixtures
- D560 Standard Test Methods for Freezing and Thawing Compacted Soil-Cement Mixtures

CONSIDERATIONS**PLANS AND SPECIFICATIONS**

Plans and specifications for sealing ponds with soil-cement shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

An operation and maintenance plan must be prepared by the Designer for use by the owner or other responsible for operating this practice. The plan should provide specific instructions for operating and maintaining the system to insure that it functions properly. It should also provide for periodic inspections and prompt repair or replacement of damaged components.