

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.
- Ponds are less than 12 feet in depth.
- 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 and 6 inches for depths between 8 and 12 feet.

### **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)

ASTM's

- D 558 Standard Test Methods for Moisture-Density (Unit Weight) Relations of Soil-Cement Mixtures
- D 559 Standard Test Methods for Wetting and Drying Compacted Soil-Cement Mixtures
- D 560 Standard Test Methods for Freezing and Thawing Compacted Soil-Cement Mixtures

## **CONSIDERATIONS**

### **Cultural Resources**

NRCS policy is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice or associated practices in the plan could have an effect on cultural resources. The National Historic Preservation Act may require consultation with the California State Historic Preservation Officer.

<http://www.nrcs.usda.gov/technical/cultural.html> is the primary website for cultural resources information. The California Environmental Handbook and the California Environmental Assessment Worksheet also provide guidance on how the NRCS must account for cultural resources. The e-Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

### **Endangered Species**

If during the Environmental Assessment NRCS determines that installation of this practice, along with any others proposed, will have an effect on any federal or state listed Rare, Threatened or Endangered species or their habitat, NRCS will advise the client of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the client selects one of the alternative conservation treatments for installation; or with concurrence of the client, NRCS initiates consultations concerning the listed species with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game.

**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.

