NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

POND SEALING OR LINING

Compacted Clay Treatment

(No.)

CODE 521-D

DEFINITION

Installing fixed lining of impervious soil in a pond to impede or prevent excessive water loss.

PURPOSE

To reduce seepage losses in ponds and manure storage/treatment facilities to an acceptable level.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where water loss from a pond through leakage is, or will be, of such proportion as to prevent the pond from fulfilling its planned purpose, where leakage will damage land and crops or cause loss of unacceptable amounts of water or environmental problems, or where the geologic exploration and design of a manure storage/treatment facility require sealing or lining.

DESIGN CRITERIA

General

Ponds to be sealed shall be constructed to meet NRCS standards for ponds (378), waste treatment facilities (313), waste treatment lagoons (359), or wildlife watering facilities (648), as appropriate.

Soil Properties

For liner-type sealing, soils shall have from 15 to 30 percent clay and be classified as CL or SC. The remaining portion of the liner material should have a wide range of soil particles in the silt, fine sand, and coarse sand range. For questionable materials, hydraulic conductivity tests should be performed on the proposed lining material.

Thickness of Compacted Liner

The minimum thickness of the finished compacted liner shall be 12 in. for water depths up to 8-ft. An additional 12-in. thickness of liner shall be added for every additional 5 ft. of water depth.

For non-animal waste management facilities, there shall be a minimum of 2 ft. of fine-grained soil over fractured rock outcrops or other highly permeable material, which may include the treated liner.

Liners for facilities installed under practice standards 313 and 359 shall be designed using the procedure in Appendix 10-D of the AWMFH with a maximum allowable specific discharge (ν) = $1x10^{-6}$ $cm^3/cm^2/sec$. There shall be a minimum of 3 ft. of fine-grained soil over fractured rock outcrops or other highly permeable material, which may include the treated liner.

PLANS AND SPECIFICATIONS

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

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

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There are to be treated shall be cleared of all vegetation and trash and all stones or other objects of a size to interfere with the operation of compaction equipment.

The area to be treated shall be drained. The moisture content of the soil should be near optimum for compaction. Water shall be added or additional drying by soil manipulation shall be done as the situation demands.

Holes shall be filled and fill material compacted.

Scarify or loosen the soil in the reservoir area to a depth of 4-in. Remove rocks and tree roots which are exposed.

The earth material shall be spread to a uniform depth of 6-8 in. over the surface to be sealed. All clods or lumps should be broke down to a fine state by disking, dragging, or preferably by roto-tilling.

Each layer of soil shall be compacted to a dry density of 90 percent or more of the maximum dry density (based on the “Standard Proctor Test”) with the water content above optimum moisture.

A sheepsfoot roller shall be used to compact each layer.

Treated areas should be protected from puncture by livestock trampling. Areas near the normal water line and points of concentrated surface flow into the pond should be protected against erosion.

Sediment coagulating chemicals such as gypsum or iron sulfate will not be used to clear reservoir water after treatment.

CONSTRUCTION REQUIREMENTS FOR SEALING AND LINING FACILITIES INSTALLED UNDER PRACTICE STANDARDS 313 AND 359 SHALL MEET THESE CONDITIONS:

Where this standard is used to repair an existing manure storage/treatment facility, the bottom and sideslopes shall be excavated to remove organically stained soil before liner construction begins

Procedure for sealing the bottom and sides of earthen manure storage pond or lagoon

The purpose of this procedure is to seal the bottom and sides of the facility to eliminate vertical cracks that may exist in the *in-situ* soil where a designed liner is not required.

- Scarify the bottom 9" deep with a ripper, disk, or chisel plow going in both directions perpendicular to each other.
- Add water to bring the moisture content up as required and disk the area to get uniform moisture distribution.
- Compact the soil with a minimum of 6 passes of a 200 psi sheepsfoot roller.
- Seal the surface by rolling with loaded rubber tired equipment or a loaded smooth drum roller.

Procedure for lining or compacting the bottom and sides of a manure storage pond or lagoon

The purpose of this procedure is to produce a compacted liner to blanket the bottom of a holding pond or lagoon. The liner is to be designed using the procedure in Appendix 10-D of the AWMFH. Use the following procedure to construct the liner:

- Excavate the pond or lagoon to its finished grade, and then remove an additional amount of soil from the bottom and the sideslopes equal to the thickness of the planned liner.
- Scarify the bottom of the excavation for a minimum depth of 4-inches with ripper, disk, or chisel plow going in both directions perpendicular to each other.
- Add water to the scarified soil to raise the moisture content above optimum moisture content.
- Compact the scarified soil with a minimum of 6 passes of a 200 psi sheepsfoot roller
- Add water to the soil for lining to raise the moisture content above optimum moisture.
- Place each lift of loose soil at the proper moisture content in a 9-inch thickness, and compact each lift with a sheepsfoot roller. This will result in a compacted lift that is 6-inches thick. Place a sufficient number of compacted lifts until the design liner thickness is reached.
- Roll the top surface of the final lift with loaded rubber tired equipment or a loaded smooth drum roller.

- Placement of a liner on the sideslopes will require overexcavation of the sideslopes in a horizontal distance equal to the width of the compaction equipment. Each lift shall be placed and compacted in horizontal lifts, starting at the bottom and continuing upward until the design grade is reached.

Soil compaction

The following are minimum requirements for compacting CL or SC soils used for embankments and liners when laboratory data is not available. (Restated from practice standards 313 & 359)

- *Precompacted Lift thickness:* The lift thickness shall be equivalent to the length of the feet of the sheepsfoot roller plus 3 inches; not to exceed 9 inches in total thickness.
- *Maximum rock diameter:* 3 inches.
- *Minimum Moisture content:* - The soil material shall be of sufficient moisture to easily form it into a moist, somewhat soft, ball by hand and not develop any cracks. This moisture content approximates optimum plus 2%.
- *Compaction equipment:* Sheepsfoot roller with a minimum 200-psi foot contact pressure, and feet a minimum of 7” in length.
- *Compaction effort:* a minimum of 6 passes of the roller over all points of each lift. When the moisture content is adequate, the sheepsfoot roller will penetrate the soil and ride on the drum. The soil is too dry if the sheepsfoot roller does not fully penetrate the soil.
- Any additional water needed for proper compaction shall be thoroughly mixed in with a disk prior to compaction.
- The surface of a compacted lift must be sufficiently moist to allow bonding with the next lift, otherwise the surface needs to be scarified, wetted to the minimum moisture content, and recompacted prior to placement of the next lift

Sideslopes

The bathtub construction method may be used for lining and sealing when the sideslopes are 3:1 and flatter. The stairstep construction method must be used for lining and sealing when the sideslopes are steeper than 3:1. See Figure 1.

Finished Liner Protection

Following sealing or lining, protect the exposed surface from excessive drying cracking

- When the bathtub construction method is used the sideslopes need to be covered with 6" of topsoil, seeded and mulched.
- When the stairstep construction method is used the sideslopes do not need further protection, provided the width of the liner exceeds 8 feet.
- The bottom is to be saturated within one week of construction. This can be accomplished with fresh water or wastewater as appropriate.

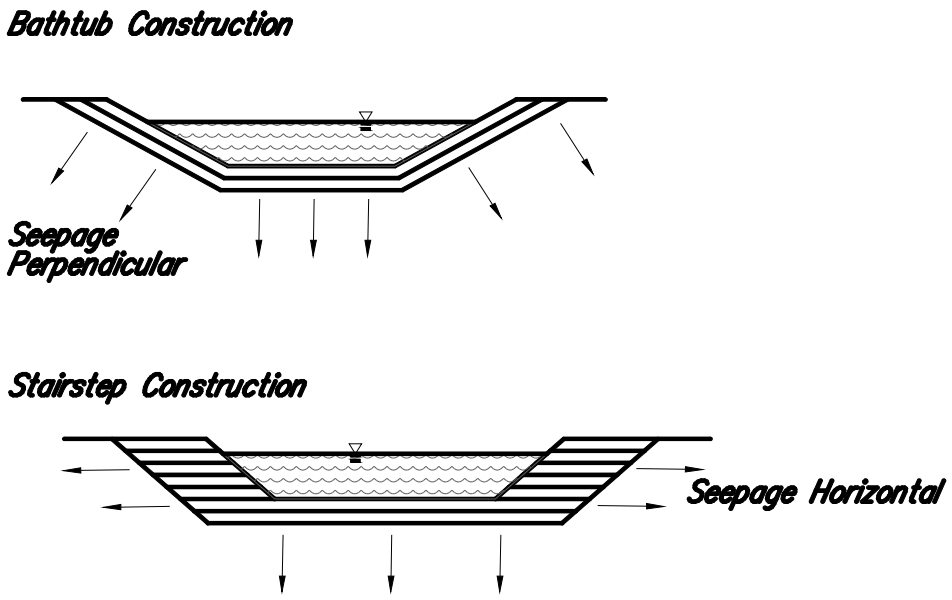

Figure 1