

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

**POND SEALING OR LINING – COMPACTED CLAY TREATMENT**

(No.)  
Code 521D



**DEFINITION**

A liner for a pond or waste storage impoundment constructed using compacted soil without soil amendments.

**PURPOSE**

To reduce seepage losses from ponds or waste storage impoundments constructed for water conservation and environmental protection.

**CONDITION WHERE PRACTICE APPLIES**

This practice applies where.

- Soils at the site exhibiting seepage rates in excess of acceptable limits or allowing an unacceptable migration of contaminants from the impoundment.
- An adequate quantity of soil suitable for constructing a clay liner without amendments is available at an economical haul distance.

**CRITERIA**

Specify compacted clay treatment liners to comply with all Federal, state, and local laws, rules, and regulations.

Evaluate and avoid or minimize impact to cultural resources, wetlands and Federal and state protected species to the extent practicable during planning, design and implementation of this conservation practice in accordance with established National and Florida policy, General Manual (GM) Title 420-Part 401; Title 450-Part 401, Title 190-Parts 410.22 and 410.26, National Planning Procedures Handbook (NPPH) Florida Supplements to Parts 600.1 and 600.6, National Cultural Resources Procedures Handbook (NCRPH), National Food Security Act Manual (NFSAM), and the National Environmental Compliance Handbook (NECH).

**Criteria for Limiting Seepage**

Design compacted soil liners for ponds not storing animal waste to reduce seepage to rates that will allow the pond to function suitably as intended.

Design compacted soil liners for waste storage impoundments to reduce specific discharge (unit seepage) to rates suggested in the National Engineering Handbook (NEH) Series, Part 651, Agricultural Waste Management Field Handbook (AWMFH), Chapter 10, Appendix 10D or rates mandated in state regulations if they are more restrictive. Use other, lower specific discharge rates for design at the discretion of the designer.

Use the methods for computing unit seepage rates contained in the AWMFH, Chapter 10, Appendix 10D or other generally accepted methods for computing unit seepage rates may be used.

**Liner filter compatibility.** Specify compacted clay treatment liners to be filter compatible with the sub-grade on which they are compacted to prevent loss of the liner soil into larger openings in the sub-grade material. The NEH, Part 633, Chapter 26 – Gradation Design of Sand and Gravel Filters, provides criteria on filter compatibility.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

**Liner Thickness.** Design the finished compacted liner minimum thickness based on the most stringent requirement listed below:

1. To achieve a specific discharge (unit seepage) design value selected by the designer, or
2. To meet state regulations, or
3. To meet requirement given in Table 1. The water depth to be used in the table is the normal full pool storage depth in the impoundment.

Table 1 – Minimum Liner Thickness

Water Depth (feet)	Liner Thickness (inches)
≤ 16	12
>16 to ≤ 24	18
>24 to ≤ 30	24

**Liner Construction.** Use methods described in Appendix 10D to the AWMFH for liner construction.

**Liner Protection.** Protect the soil liner against damage caused by the effects of water surface fluctuations, wave action, rainfall during periods when the liner is exposed, water falling onto the liner from pipe outlets, agitation equipment, solids and sludge removal activity, animal activity, penetrations through the liner, and any other activity capable of causing physical damage to the liner.

Include measures to protect against damage to the compacted liner due to uplift water pressures if a seasonal high water table occurs at a level above that of the lowest potential level of liquid in the impoundment. Use protective design measures such as by using perimeter drains to lower the water table, maintaining minimum liquid depth in the impoundment, and using liners thick enough to resist uplift water pressures.

Protect the finished liner against the effects of desiccation during periods when the pond or impoundment is empty. Use a protective soil cover that is of a soil type, thickness, and density that is resistant to erosion and desiccation. Under severe conditions, a protective soil cover may not adequately protect the liner from desiccation. Severe conditions

include liners constructed with very high plasticity soils that are exposed to long periods of hot, low humidity conditions. In this severe condition, consider installing a geomembrane in conjunction with a cover soil to protect the liner from desiccation adequately.

**Side Slopes.** Design the side slopes of ponds or waste storage impoundments to be 3H: 1V or flatter to facilitate compaction of soil on the slopes if the bathtub method of construction as described in Appendix 10D, AWMFH, is used. Design slopes as steep as 2H: 1V if the stair-step method of construction as described in Appendix 10D to the AWMFH is used for constructing the liner. Consider maintenance requirements when selecting side slopes.

### CONSIDERATIONS

Consider using a flexible geomembrane or geosynthetic clay liner for sites that have water or waste storage depths greater than 24 feet.

Consider alternatives to compacted clay liners for poor foundation conditions such as karstic bedrock, joints and other discontinuities of the underlying bedrock.

Consider filling the pond with water after construction to prevent desiccation.

### PLANS AND SPECIFICATIONS

Describe the requirements for applying the practice to achieve its intended purpose in the plans and specifications for compacted soil liners for ponds and waste storage impoundments.

As a minimum, include the following in the plans and specifications:

- Location of site
- Plan view of system layout
- Foundation preparation
- Type of material to be used
- Method of installation
- Method to protect liner
- Structural details
- Quantity of material
- Quality control requirements

**Field Office Technical Guide  
Section IV**

- Temporary erosion control measures during construction
- Vegetative requirements or other measures to stabilize the area
- Location of utilities and notification requirements

**OPERATION AND MAINTENANCE**

Maintenance activities required for this practice consist of those operations necessary to prevent and/or repair damage to the compacted soil liner. The O&M plan shall include, but not limited to, the following:

- Exclusion of animals and equipment from the treated area
- Reparation of the damage to the liner occurring from erosion during initial filling
- Erosion resulting from wave action after the impoundment fills, and erosion caused by agitation, pumping operation, and activities involved in removal of solids and sludge

**Pond Sealing or Lining – Compacted Clay Treatment  
Code 521D - 3**

- Prevent damage that might be caused by roots from trees and large shrubs by removing such vegetation.
- If the liner is damaged, repair any disturbed or eroded areas to restore the liner to its original thickness and condition.

**REFERENCES**

General Manual  
Title 420-Part 401  
Title 450-Part401  
Title 190-Parts410.22 and 410.26  
National Engineering Handbook  
Part 633, Chapter 26  
Part 650, AWMFH, Chapter 10, Appendix 10  
National Cultural Resources Procedures Handbook  
National Environmental Compliance Handbook  
National Food Security Act Manual  
National Planning Procedures Handbook  
Florida Supplements to Parts 600.1 and 600.6