

Pond Sealing or Lining, Compacted Clay Treatment (No.) 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.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- In-place soils at the site would exhibit seepage rates in excess of acceptable limits or would allow 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

General Criteria Applicable To All Purposes

Use of amendments as a part of a waste management system shall be planned, designed, and installed to meet all federal, state, local, and tribal laws, rules and regulations.

Criteria for Limiting Seepage. Compacted soil liners for ponds not storing animal waste shall be designed to reduce seepage to rates that will allow the pond to function suitably as intended.

Compacted soil liners for waste storage impoundments shall be designed using the procedure in Appendix 10D of the Agricultural Waste Management Field Handbook (AWMFH), with a maximum allowable specific discharge (v) of 0.028 ft/day (1×10^{-5} cm/sec). Lower specific discharge rates may be used at the discretion of the designer.

Clay liner material shall have a laboratory permeability (k) of 0.0028 ft/day (1×10^{-6} cm/sec) or less using the Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (ASTM D5084). Organic soils are not acceptable as a clay liner.

Liner Filter Compatibility. Compacted soil liners shall be filter-compatible with the sub-grade that they are compacted to in order to prevent loss of the liner soil into larger openings in the sub-grade material. The National Engineering Handbook, Part 633, Chapter 26-Gradation Design of Sand and Gravel Filters, provides criteria on filter compatibility.

Liner Thickness. The minimum thickness of the finished compacted liner on pond sides and bottom, measured perpendicular to the finished surface shall be the greater of:

1. That required achieving a minimum specific discharge (v) of 0.028 ft/day (1×10^{-5} cm/sec) design value.
2. That given in the following table. The depth to be used in the table is the storage maximum operating level.

Maximum Operating Depth (feet)	Liner Thickness (inches)
≤ 16	12
16.1 – 24	18
24.1 – 30	24

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

The liner material shall be placed in layers not over 9 inches thick before compaction. A minimum of two compacted layers is required. Liner compaction shall result in a minimum of 90 percent

of Standard Proctor Density (ASTM D-698) or the density required by the maximum permeability from the laboratory permeability test (ASTM D5084); whichever is greater.

Compacted soil liners shall be placed with the water content at optimum or greater.

Liner Protection. The soil liner shall be protected against damage caused by the effects of water surface fluctuations, desiccation and cracking, 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.

Where a water table exists, criteria in the Waste Storage Facility practice standard 313 shall be followed.

Protection of the finished liner from the effects of desiccation during periods when the pond or impoundment is low or empty is advisable.

When an earth cover is used the compacted earth liner shall be covered with not less than 1 foot of compacted soil material measured perpendicular to the finished surface. Earth cover material shall be cohesive mineral soil. Cover soils shall be compacted in accordance with Construction Specification, MI-154, Earthfill. The soil cover shall be 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. For example a soil liner constructed with very high plasticity soils which are exposed to long periods of hot, low humidity conditions may constitute a severe condition. Additional design measures might be considered which includes installing a geomembrane in conjunction with a cover soil to protect the liner from desiccation adequately.

Side Slopes. The side slopes of ponds or waste storage impoundments should be 3H: 1V or flatter to facilitate compaction of soil on the slopes when the bathtub method of construction as described in Appendix 10D of the AWMFH is used. Slopes as steep as 2H: 1V can be considered if the stair-step method of construction as described in Appendix 10D to the AWMFH is used. Maintenance

requirements should also be considered 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.

Alternatives to compacted clay liners should be considered for poor foundation conditions such as karstic bedrock, joints and other discontinuities of the underlying bedrock.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use.

Support data documentation requirements are as follows:

- Inventory and evaluation records
 - Conservation Assistance notes or special report
- Survey notes, where applicable
 - Design survey
 - Construction layout survey
 - Construction check survey
- Design records
 - Physical data, functional requirements, and site constraints, where applicable
 - Soils/subsurface investigation report, where applicable
- Design and quantity calculations
- Construction drawings/specifications with:
 - Location map
 - “Designed by” and “Checked by” names or initials
 - Approval signature
 - Job class designation
 - Initials from preconstruction conference
 - As-built notes
- Construction inspection records
 - Conservation Assistance notes or separate inspection records
 - Construction approval signature

- Record of any variances approved, where applicable
- Record of approvals of in-field changes affecting function and/or job class, where applicable.
- For Waste Storage Ponds with a clay liner, include an evaluation report (soils lab or qualified specialist) documenting suitability of liner material
- Well isolation distance documentation

OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be developed for this practice. The O&M plan shall be consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for the design.

REFERENCES

- *American Society for Testing and Materials (ASTM), 2000. D 5084, Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter*
- American Society for Testing and Materials (ASTM), 2000. D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- American Society for Testing and Materials (ASTM), 2000. D 2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
- American Society for Testing and Materials (ASTM), 2000. D 4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (Atterberg limits).