

**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.

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

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 to reduce specific discharge (unit seepage) to rates recommended in [Appendix 10D in Chapter 10 in National Engineering Handbook Part 651 \(NEH 651\), Agricultural Waste Management Field Handbook](#), or rates mandated in the

state of Kansas and the Kansas Department of Health and Environment rules and regulations (if they are more restrictive).

Lower specific discharge rates may be used at the discretion of the designer.

Use the methods for computing unit seepage rates contained in [Appendix 10D in NEH 651](#) or other generally accepted methods for computing unit seepage rates may also be used.

Liner filter compatibility. Compacted soil liners shall 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. [Chapter 26 in National Engineering Handbook Part 633 \(NEH 633\), Soil Engineering](#), provides guidance on filter compatibility.

Liner thickness. The minimum thickness of the finished compacted liner shall be the greater of (1) that required to achieve a specific discharge (unit seepage) design value selected by the designer, (2) that required by state regulations, or (3) that given in the following table. The water depth to be used in the table is the normal full pool storage depth in the impoundment (the freeboard elevation for a waste storage pond).

Water Depth (feet)	Liner Thickness (inches)
≤ 16	12
16.1-24	18
24.1-30	24

Liner Construction. Use methods described in [Appendix 10D in NEH 651](#) for liner construction.

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, and penetrations through the liner and any other activity capable of causing physical damage to the liner.

Design should 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. Examples of protective design measures are 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.

Protection of the finished liner from the effects of desiccation during periods when the pond or impoundment is low or empty is advisable. A protective soil cover may be considered. 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 that are exposed to long periods of hot, low humidity conditions may constitute a severe condition. Additional design measures might be considered which include installing a geomembrane in conjunction with a soil cover to protect the liner from desiccation adequately.

A soil cover with a 6-inch minimum thickness shall be placed over the liner unless the liner will always be covered by water. Topsoil for grass establishment can be used as soil cover for the side slopes.

Side slopes. The side slopes of ponds or waste storage impoundments should be 3 horizontal to 1 vertical (3:1) or flatter to facilitate compaction of soil on the slopes if the bathtub method of construction as described in [Appendix 10D in](#)

[NEH 651](#) is used. Slopes as steep as 2:1 may be used if the stair step method of construction as described in [Appendix 10D in NEH 651](#) is used for constructing the liner. 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 for compacted soil liners for ponds and waste storage impoundments shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. Plans and specifications shall include such drawings, specifications, material requirements, quantities, construction requirements, equipment requirements, quality control requirements, and other documents as are necessary to describe the work to be done.

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. This includes (but is not limited to): excluding animals and equipment from the treated area; repairing 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 operations, and activities involved in removal of solids and sludge. Damage that might be caused by roots from trees and large shrubs should be prevented by removing such vegetation. If the liner is damaged, any disturbed or eroded areas should be repaired to restore the liner to its original thickness and condition.