

**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:

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**

**Laws and Regulations.** This practice must conform to all federal, state, and local laws and regulations. Laws and regulations of particular concern include those involving water rights, pollution control, property easements, wetlands, Waters of the United States, preservation of cultural resources, and endangered species.

**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 suggested in the National Engineering Handbook (NEH) Series, Part 651, Agricultural Waste Management Field Handbook (AWMFH), Chapter 10, Appendix 10D or rates mandated by the South Dakota Department of Environment and Natural Resources (SD DENR) if they are more restrictive. Other, lower specific discharge rates may be used for design at the discretion of the Designer.

The AWMFH, Chapter 10, Appendix 10D provides methods for computing unit seepage rates and includes recommended allowable rates of seepage. Other generally accepted methods for computing unit seepage rates may also be used.

**Other Criteria**

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. The NEH, Part 633, Chapter 26, Gradation Design of Sand and Gravel Filters, provides guidance on filter compatibility.

**Liner Thickness.** The minimum thickness of the finished compacted liner shall be the greatest of:

that required to achieve a specific discharge (unit seepage) design value selected by the designer;

18-inch thickness as required by the SD DENR; or

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.

Water Depth (feet)	Liner Thickness (inches)
< 16	12
16.1 – 24	18
> 24	24

**Liner Protection.** The soil liner shall be protected 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, erosion caused by agitation or agitation equipment, solids and sludge removal activity, animal activity, and penetrations through the liner.

Design should include measures to protect against damage to the compacted liner if a seasonal high water table occurs at a level above that of the lowest potential level of liquid in the impoundment. Perimeter drains to lower the water table, maintaining minimum liquid depth in the impoundment, and using liners thick enough to resist uplift water pressures are examples of protective design measures.

The finished liner should be protected against the effects of desiccation during periods when the pond or impoundment is empty. A protective soil cover may be used. For 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. Designs including a geomembrane in conjunction with a cover soil may be considered for severe conditions 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 if the bathtub method of construction as described in Appendix 10D, AWMFH, is used. Slopes as steep as 2H: 1V

may be used if the stair-step method of construction as described in Appendix 10D to the AWMFH 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 30 feet.

Alternatives to compacted clay liners should be considered for poor foundation conditions such as karstic bedrock.

## PLANS AND SPECIFICATIONS

Plans and specifications for compacted soil liners for ponds and waste storage impoundments shall meet this standard and shall describe the requirements needed to achieve the intended purpose. Plans and specifications shall include the documents needed to fully describe the work to be done.

## OPERATION AND MAINTENANCE

An O&M plan shall be prepared for use by the owner/operator.

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 shall 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.