

USDA
NATURAL RESOURCES
CONSERVATION SERVICE

MARYLAND CONSERVATION
PRACTICE STANDARD

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

CODE 521D
(Reported by No.)

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:

1. Soils at the site would exhibit seepage rates in excess of acceptable limits or would allow an unacceptable migration of contaminants from the impoundment.
2. An adequate quantity of soil suitable for constructing a clay liner without amendments is available at an economical haul distance.
3. Limits for seepage rates are defined for waste storage ponds in the National Engineering Handbook Series, Part 651, Agricultural Waste Management Field Handbook, Chapter 10, Appendix 10D and/or state regulatory requirements. Designers may also determine that lower seepage rates are needed in certain situations.

CONSIDERATIONS

Consider using a flexible geomembrane or geosynthetic clay liner for sites that have water depths greater than 30 feet.

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

CRITERIA

General Criteria Applicable to All Purposes

Meet all federal, state, and local laws, rules, regulations and applicable NRCS standards.

Soils developed from karstic bedrock may be unsuitable for lining without the addition of soil amendments such as dispersants.

Design compacted soil 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 National Engineering Handbook, Part 633, Chapter 26-Gradation Design of Sand and Gravel Filters, provides guidance on filter compatibility.

Liner Protection – Protect the soil liner against desiccation cracking, the effects of water surface fluctuations, wave action, surface erosion, erosion from pipe inlets and outlets, agitation equipment, animals, or items installed through the liner. Protect against damage from seasonal high water table during times when the pond is emptied. Perimeter drains and using liners thick enough to resist uplift water pressures are examples of protective design measures.

Place at least 6 inches of soil over the compacted liner if desiccation cracking is likely. Soil for this purpose should have relatively low plasticity for maximum effectiveness.

Side Slopes - The side slopes of ponds or waste storage ponds 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 to the Agricultural Waste Management Field Handbook) is used. Slopes as

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the [Natural Resources Conservation Service - Maryland](#) or visit the [electronic Field Office Technical Guide \(eFOTG\)](#).

steep as 2H:1V may be used if the stair-step method of construction as described in Appendix 10D is used for constructing the liner.

Additional Criteria Applicable to Waste Storage Ponds

Design – Design compacted soil liners for waste storage ponds to protect the groundwater resources. National Engineering Handbook Series, Part 651, Agricultural Waste Management Field Handbook, Chapter 10, Appendix 10D provides methods for computing seepage rates. State regulatory requirements should be considered in selecting acceptable seepage rates and minimum liner thickness in designing clay liners.

Liner Thickness - The minimum thickness of the liner is as shown below but in no case less than 12 inches:

1. That required to limit seepage to selected values computed following Appendix 10D procedures;
2. That required by state regulatory rules; or
3. That given in the following table.

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

SPECIFICATIONS

Plans and specifications for compacted clay soil liners for ponds and waste storage ponds shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. Include as part of the plans and specifications drawings, specifications, material requirements, quantities, construction requirements, and other documents as necessary to describe the work to be done.

The area to be treated shall be drained and dried.

Remove all vegetation, stumps, trash, stones and other objects of a size sufficient to interfere (usually less than 1/3 of the treated soil depth) with the operation within the pool area.

Fill and compact holes or crevices beneath the layer to be treated to a minimum density of 90 percent of Standard Proctor with soil at optimum moisture content. Cover areas of exposed gravel or fractured rock with a minimum of 12 inches of soil that has a minimum of 20 percent clay content and is compacted to the specified density.

Place clay soil in 8-inch lifts and compact with 2 complete passes of a sheepsfoot roller. Compact finish surface with 2 complete passes over the entire surface with the heaviest equipment available.

Special attention must be given to sealing around pipes and structures.

Protect treated areas from damage by livestock. Protect areas near the water line and at points of concentrated surface flow against erosion.

OPERATION AND MAINTENANCE

Develop an Operation and Maintenance plan that includes the operation and maintenance requirements for the conservation practice being lined.

Maintenance activities required for this practice consist of those operations necessary to prevent breaching of the treated soil layer. This includes, but is not limited to, excluding animals and equipment from the treated area; protection of the layer during initial filling, agitation, or pumping operations; and repair of disturbed or eroded areas.

SUPPORTING DATA AND DOCUMENTATION

Field Data and Survey Notes

The following is a list of the minimum data needed:

1. System plan sketch;
2. Topographic survey of the site showing elevations and control features;
3. Soils investigation showing seasonal high water table, location of test holes, and gradation and classification of soils to be sealed.

Design Data

Record on appropriate engineering paper. For guidance on the preparation of engineering plans, see Chapter 5 of the Engineering Field Handbook, Part 650. The following is a list of the minimum required design data:

1. Statement concerning location and type of leaks or excessive permeability and description of foundation preparation to be made;
2. All required permits and documentation on file with the design information;
3. Plan view including, location map, all system components, material and construction specifications;
4. Rate of application and thickness of the treated blanket, method of mixing materials, method of compaction and protection, construction drawings, and component details;
5. Quantities estimate;
6. Job class on plan;
7. Details of foundation drainage, when required;
8. Planting plan. This must meet the criteria, specifications, and documentation requirements of the Maryland conservation practice standard for Critical Area Planting, Code 342.

Construction Check Data/As-built

Record on survey notepaper, SCS-ENG-28, or other appropriate engineering paper. Survey data will be plotted on plans in red. The following is a list of minimum data needed for As-builts:

1. Documentation of site visits on CPA-6. Include the date, who performed the inspection, specifics as to what was inspected, all alternatives discussed, and decisions made and by whom;
2. Actual dimensions of installed lining;
3. Verification of adequate foundation preparation;
4. Documentation of installation of foundation drainage;
5. Certification statement from the contractor(s) that they have constructed the soil liner in accordance with the plans and specifications.
6. Statement on seeding and fencing;
7. Final quantities and documentation for quantity changes, and materials certification;
8. Sign and date check notes and plans by a person with appropriate approval authority. Include statement that practice meets or exceeds plans and NRCS practice standards.

REFERENCES

1. USDA, Natural Resources Conservation Service. *Engineering Field Manual, Chapter 4, Elementary Soil Engineering and Chapter 11, "Ponds and Reservoirs."*
2. USDA, Natural Resources Conservation Service. *Conservation Practice Standards. Maryland Field Office Technical Guide, Section IV.*
3. USDA, Natural Resources Conservation Service. *National Engineering Handbook, Chapter 26, Part 633.*
4. USDA, Natural Resources Conservation Service. *National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook, Chapter 10, Appendix 10D.*
5. USDA Natural Resources Conservation Service, *National Handbook of Conservation Practices*