

USDA
NATURAL RESOURCES
CONSERVATION SERVICE

DELAWARE CONSERVATION
PRACTICE STANDARD

POND SEALING OR LINING
BENTONITE TREATMENT

CODE 521C
(Reported by No.)

DEFINITION

A liner for a pond or waste impoundment consisting of a compacted soil-bentonite mixture.

PURPOSE

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

**CONDITIONS WHERE PRACTICE
APPLIES**

This practice may be applied for one or more of the following purposes:

- Soils are suitable for treatment with bentonite.
- Ponds or waste impoundments require treatment to reduce seepage rates and to impede the migration of contaminants to within acceptable limits.

CONSIDERATIONS

Consider flattening the slopes of ponds or waste impoundments to facilitate compactive efforts during construction. The stair-step method of construction as outlined in Appendix 10D may be considered in lieu of slope flattening.

A protective compacted soil cover should be considered for protecting the soil-bentonite liner for ponds.

Consider using a flexible membrane liner for sites that have water depths greater than 24 feet.

This practice has the potential to affect National Register listed cultural resources or eligible (significant) cultural resources. These may include archeological, historic, or traditional cultural properties. Care should be taken to avoid adverse impacts to these resources. Follow NRCS state policy for considering cultural resources during planning.

CRITERIA

Criteria Applicable to All Purposes

Bentonite treated soil liners shall comply with all federal, state, and local laws, rules, and regulations.

Lined structures shall meet all applicable NRCS standards.

Bentonite treated soil liners shall be filter compatible with the natural foundation materials on which they are compacted according to Chapter 26, Part 633 of the National Engineering Handbook.

The minimum thickness of the finished compacted liner shall be 6 inches.

The bentonite shall be a sodium bentonite with a free swell of at least 22 milliliters as measured by ASTM Standard Test Method D5890, unless laboratory tests using other bentonite types are used for design.

When laboratory permeability tests are required to determine application rates, the tests shall be performed using bentonite of the same quality and fineness as that proposed for use.

For protection against bentonite dust, personnel on site during bentonite application and mixing shall wear mask and goggles.

be according to the following table:

Planting of disturbed areas should be specified in accordance with NRCS Practice Standard 342, Critical Area Planting.

Criteria Applicable To Waste Impoundments

Design. Design of the bentonite treated soil liners for waste impoundments shall be in accordance with National Engineering Handbook Series, Part 651, Agricultural Waste Management Field Handbook, Chapter 10, Appendix 10D and/or state regulatory requirements.

Liner Protection. The liner shall be protected against desiccation cracking, the effects of water surface fluctuations, wave action, surface erosion, erosion from pipe inlets, agitation equipment, animals, or items installed through the liner. Protective measures shall be designed into the system to protect the liner for these cases. At least 6 inches of compacted soil cover shall be placed over the soil-bentonite liner.

Criteria Applicable to Ponds

Application Rate. For ponds, in the absence of laboratory tests or field performance data on soils similar to those to be treated, the minimum application of finely ground bentonite per 1-inch thickness of constructed liner shall be:

Pervious Soil Description	Application rate (lb/ft²)
Silts (ML, CL-ML)	0.375
Silty Sands (SM, SC-SM, SP-SM)	0.5
Clean Sands (SP, SW)	0.625

Liner Thickness. In the absence of more detailed testing and analyses, liner thickness shall

Water Depth (feet)	Liner Thickness (inches)
8 or less	6
8.1 – 16	12
16.1 – 24	18
24.1 - 30	24

PLANS AND SPECIFICATIONS

Plans and specifications for this practice shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail concerning site preparation and establishment to ensure successful management of the practice. Appropriate conservation practice standards shall be used for designing and installing structural and vegetative measures. Documentation shall be in accordance with the section "Supporting Data and Documentation" in this standard.

OPERATION AND MAINTENANCE

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

SUPPORTING DATA FOR DOCUMENTATION

The following is a list of the minimum data and documentation to be recorded in the case file:

1. The location of the practice marked on the

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

- conservation plan map.
- 2. Assistance notes.
- 3. Completed copy of the appropriate Job Sheet(s) or other specifications for seeding. See NRCS Practice Standard 342, Critical Area Planting.
- 4. Operation and Management Plan.

Field Data and Survey Notes

Record on survey notepaper, SCS-ENG-28, or other appropriate format. The following is a list of the minimum data needed:

- 1. Plan view sketch showing the location and dimensions of the roofs.
- 2. Profile of existing ground along the proposed roof runoff outlet structures.
- 3. Locations and elevations of the proposed outlets for the roof runoff.

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. Note any special site restrictions or requirements for protecting the liner from wave action, erosion caused by inlet pipes, agitation equipment, animals, and components installed through the liner.
- 2. Determine the filter compatibility of the bentonite treated soil liner material with the natural foundation material.
- 3. Document the procedure used to determine the liner thickness and the application rate of bentonite needed to meet the requirements of this standard. Provide laboratory test data, field performance test data or state that the recommended standard application rate was used.
- 4. Show job class on the plan. Indicate the location, description, and elevation of the temporary benchmarks used in the design

survey. Provide a location map, which indicates the job site.

- 5. Provide a plan view of the pond with cross sections that gives the water depth, the thickness of the treated layer, the soil cover over the liner, and the side slopes of the pond.
- 6. Provide details of the material, construction, and equipment requirements needed to achieve the intended results.
- 7. Planting plan for embankments and disturbed areas around the pond. Indicate the seeding area on the plans.
- 8. Estimated quantities and cost estimate.

Construction Check Data/As-Built Plans

Record on survey notepaper, SCS-ENG-28, or other appropriate format. Survey data will be plotted on the as-built plans in red. The following is a list of minimum data needed for as-built documentation:

- 1. Documentation of site visits. The documentation shall include the date, who performed the inspection, specifics as to what was inspected, all alternatives discussed and decisions made and by whom.
- 2. Check notes recorded during or after completion of construction showing thickness of the treated layer bentonite material used, and the application rate, methods, and equipment utilized to incorporate the bentonite into the liner. The thickness of the soil cover placed over the liner and the pond side slopes.
- 3. Statement on seeding of disturbed areas surrounding the pond.
- 4. Final quantities and documentation for quantity changes. Material certifications as appropriate.
- 5. Signature and date on check-notes and plans of someone with the appropriate engineering job approval authority. Include a signed statement that constructed practice meets or exceeds the construction plans and NRCS practice standards.