

Pond Sealing or Lining – Flexible Membrane (No.) 521A

DEFINITION

A manufactured hydraulic barrier consisting of a functionally continuous *layer* of synthetic or partially synthetic, flexible material.

PURPOSE

To *restrict, impede,* and control seepage of *contaminants* from water and waste impoundment *structures* for water conservation and environmental protection.

CONDITIONS WHERE PRACTICE APPLIES

- On ponds and water storage structures that require treatment to control seepage rates within acceptable limits.
- On *earthen* waste storage and *other* waste *impoundment structures* that require treatment to *control seepage* of contaminants from the *storage structure*.

CRITERIA

General

Ponds sealed or lined with flexible membranes shall be planned, designed, and installed to meet all federal, state, local and tribal laws and regulations.

Structures to be lined shall have been constructed to meet all applicable NRCS standards. All inlets, outlets, ramps, and other appurtenances may be installed before, during, or after the liner placement, but shall be done in a manner that does not damage or impair the proper operation of the liner.

Membrane material

Design and installation of the flexible membrane shall be in accordance with manufacturer recommendations. The membrane shall have adequate tensile strength for the planned slope and anchoring and adequate puncture resistance for the planned subgrade and cover soil material.

All flexible membrane installations shall be certified by the installer as meeting the material and installation requirements of the plans and specifications.

Manufacturer recommendations shall be followed with regard to protection from weather and exposure.

Minimum Criteria for Membranes		
Type	Limiting Parameter	
	Wastewater	Clear Water
HDPE	40 mil	30 mil
LLDPE	40 mil	20 mil
PVC	30 mil	20 mil
GCL	0.75 lb./sq ft (bentonite)	
EPDM	45 mil	
<i>PP</i> <i>(Reinforced)</i>	36 mil	24 mil
<i>(Un-reinforced)</i>	40 mil	20 mil
<i>RPE</i>	<i>NR</i>	24 mil

1 mil = 1/1000 of an inch

HDPE – High Density Polyethylene Geomembrane

LLDPE – Linear Low Density Polyethylene Geomembrane

PVC – Polyvinyl Chloride Geomembrane

GCL – Geosynthetic Clay Liner

EPDM – Synthetic Rubber Geomembrane

PP – Polypropylene Geomembrane

RPE – Reinforced Polyethylene Geomembrane

NR – Not Recommended

Anchoring

Liners shall be anchored to prevent uplift due to wind or slippage down the side slope. Unless otherwise specified by the manufacturer, the liner shall be sized to account for a minimum of 12 inches

at the top to be placed in the anchor trench. The anchor trench shall be excavated completely around the area to be lined at the planned elevation of the top of the liner. The anchor trench shall be at least 8 inches deep and 12 inches wide.

Side slopes

For exposed membranes, all banks and fills within the area to be lined shall have side slopes of 2H:1V or flatter. The design side slope will be governed by the slope stability of the subgrade soil material. A slope stability analysis is required only when there is no prior experience for the type of subgrade soil material.

For earth-covered membranes, all banks and fills within the area to be lined shall have side slopes 3H:1V or flatter. The design side slope shall be determined by a stability analysis performed by the manufacturer considering the cover soil material in a saturated condition and a safety factor of 1.2. The manufacturer may be requested to demonstrate the adequacy of their stability analysis by a field test of the selected liner material with the intended soil cover in place under saturated conditions. The stability analysis must be approved by a qualified licensed engineer.

Protective Measures

PVC and GCL liners shall be covered with a minimum of 12 inches of soil. The protective soil cover thickness is measured perpendicular to the finished surface. Cover soil may be used on other liners but is not required.

Cover soil shall be used as cover for liners when required for the proper performance, protection and durability of the installation. In areas subject to livestock travel, all types of flexible membranes shall be covered with not less than 9 inches of compacted soil material. Cover soil shall not contain sharp, angular stones or any objects that could damage the liner. Maximum allowable particle size of soil cover material shall be 3/8-inch for geomembrane liners and 1/2-inch for geosynthetic clay liners, unless the liner is cushioned by an 8-ounce or greater needle punched, non-woven geotextile padding material. Cover mate-

rials shall be stable *against slippage down the slope* under all operational and exposure conditions.

Follow the manufacturer's recommendations for any additional protective measures.

Subgrade Preparation

Subgrade preparation shall conform to manufacturer recommendations. *A cushion or padding shall be placed beneath the liner if the subgrade particles contain sharp angular stones that could damage the liner or particles greater than 3/8-inch for geomembrane liners and 1/2-inch for geosynthetic clay liners. The padding or cushion may be an 8-ounce or greater non-woven geotextile or a soil meeting the particle size and shape requirements of the subgrade.*

Safety

All structures shall be fenced to protect the liner from damage. *Design shall include appropriate safety features to minimize the hazards of the structure. Warning signs, fences, ladders, ropes, bars, rails, and other devices shall be provided, as appropriate, to ensure the safety of humans, livestock, wildlife, and pets.*

Venting

The need for venting shall be investigated as part of the design. If venting is needed, manufacturer recommendations shall be followed in the vent system design.

CONSIDERATIONS

Venting of wastewater pond liners not covered with soil is recommended unless other site conditions exist to allow dissipation of gas pressure from beneath the liner. One such condition is the presence of granular foundation soils (SW, GW or GP).

If high water tables could adversely affect the proper functioning of the structure, interceptor or relief type drainage systems should be considered to control uplift pressures.

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
 - 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
 - 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

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

Quality Assurance and Quality Control for Waste Containment Facilities, EPA/1600/R-93/182, September 1993.