NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

POND SEALING OR LINING - FLEXIBLE MEMBRANE

(No.)

CODE 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.

CONDITION WHERE PRACTICE APPLIES

On ponds and water storage structures that require treatment to control seepage rates within acceptable limits.

On earthen waste storage lagoons and other waste impoundment structures that require treatment to control seepage of contaminants from the storage structure.

CRITERIA

Design. 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.

Design and installation of the flexible membrane shall be in accordance with manufacturer recommendations. 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	
PP (Reinforced) (Un-reinforced)	 36 mil 40 mil	 24 mil 20 mil
RPE	NR	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

Cover Soil. PVC and GCL liners shall be covered with a minimum of 12 inches of soil. 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. Cover soils 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-in for geomembrane liners and ½-inch for geosynthetic clay liners, unless the liner is cushioned by an 8-ounce or greater needle punched, non-woven geotextile padding material. Cover materials shall be stable against slippage down the slope under all operational and exposure conditions.

Subgrade Preparation. Subgrade preparation shall conform to manufacturer recommendations. Subgrade materials shall not contain sharp, angular stones or any objects that could damage the liner or adversely affect its function.

Slopes. All banks and slopes to be lined with PVC and GCL liners shall be sloped no steeper than 3:1. All other liner types may be placed on slopes no steeper than 2:1.

Slope the bottom of the pond towards the sides, at a minimum of 0.005 feet/feet, to allow migration of any gas from beneath the liner.

Venting. Liners shall be vented if organic soils are present. Manufacturer recommendations shall be followed regarding vent type.

Vents, when required, shall be spaced at no greater than 50-foot intervals. Install gas vents above the high water line and about 1 foot below the top of bank. The vent must be covered to protect the liner and prevent rainfall from getting below the liner.

Padding. 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 ½-inch for geosynthetic clay liners. Vented liners also require padding or a cushion. 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.

Anchorage. Liners shall be anchored to prevent uplift due to wind or slippage down the side slope.

Safety. 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 and livestock. .

CONSIDERATIONS

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.

Cultural Resources

NRCS policy is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice or associated practices in the plan could have an effect on cultural resources. The National Historic Preservation Act may require consultation with the California State Historic Preservation Officer.

http://www.nrcs.usda.gov/technical/cultural.html is the primary website for cultural resources information. The California Environmental Handbook and the California Environmental Assessment Worksheet also provide guidance on how the NRCS must account for cultural resources. The e-Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

Endangered Species

If during the Environmental Assessment NRCS determines that installation of this practice, along with any others proposed, will have an effect on any federal or state listed Rare, Threatened or Endangered species or their habitat, NRCS will advise the client of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the client selects one of the alternative conservation treatments for installation; or with concurrence of the client, NRCS initiates consultations concerning the listed species with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared for specific field sites in accordance with this standard and shall describe the requirements for

applying the practice to achieve its intended uses.

As a minimum, the plans and specifications shall provide the following:

1. Layout of the containment structure, collection points, waste transfer locations or pipelines, and topography of the site
2. Required liner properties, cushion materials, and pipeline materials
3. Subgrade details, including tolerances on smoothness of the finished grade
4. Details of liner installation, seaming requirements, and requirements for attachments and appurtenances
5. Quality control testing
6. Fence and signage requirements, if required.

OPERATION AND MAINTENANCE

A plan for operation and maintenance (O&M) of the liner and structure shall be prepared. The plan shall be consistent with the purposes of the type of liner chosen, intended life, safety requirements and design criteria. The plan shall contain requirements including but not limited to:

1. Design capacity and liquid level of the structure.
2. A description of the normal operation, safety concerns and maintenance requirements.
3. Repair procedures.
4. Periodic inspection of the following:

   - Visible portions of the liner for tears punctures, or other damage;

   - Liner interface with inlets, outlets, ramps, or other appurtenances for damage;

   - Liquid level in the structure;

   - Ballooning of the liner indicating presence of gas beneath the liner.

REFERENCES

Quality Assurance and Quality Control for Waste Containment Facilities, EPA/1600/SR-93/182, September 1995, http://www.p2pays.org/ref/07/06484.pdf