NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

RHODE ISLAND

SILAGE LEACHATE COLLECTION AND TRANSFER

(No.)

CODE 765 I

DEFINITION

A planned and designed facility in which all necessary components are installed for collecting and managing leachates and runoff from bunker or trench silos, conventional tower silos and plastic bag silos.

PURPOSE

This standard establishes the minimum locations, setbacks, isolation distances, storage volume requirements, and collection and transfer requirements for silage leachate. The purpose of this standard is not to locate or to design the silo itself

- Improve water quality
- Improve air quality
- Improve aesthetics
- Improve livestock health

CONDITIONS WHERE PRACTICE APPLIES

On agricultural land, where the practice is a component of an approved comprehensive nutrient management plan (CNMP).

- The collection, temporary storage, and transfer components are part of a planned agricultural waste management system.
- Temporary storage is needed for leachates generated from silos.
- Leachate is diluted and/or aerated in the temporary storage facility or
- A transfer conveyance is needed from the temporary leachate storage to another waste storage facility (manure, milkroom wash water, barnyard runoff, etc.)
- The collection, temporary storage, and transfer components can be constructed, operated, and maintained without polluting air or water resources.
- Soils, geology, and topography are suitable for construction of the components.

CRITERIA

General Criteria Applicable to All Purposes

Laws and Regulations. All Federal, state, and local laws, rules, and regulations, including local inland wetland agency regulations, governing the construction and use of this practice as well as setbacks from wells, surface water and property boundaries shall be followed. Planned work shall comply with all federal, state, and local laws and permit conditions and requirements. **The landowner shall obtain all necessary permits prior to construction or any land clearing activities.**

Location. The silage leachate collection and transfer facility shall be located so as to meet all local, state and federal setback requirements including those stated in environmental protection, planning and zoning, wetlands, health department, milk inspection, and stream channel encroachment regulations. To minimize the potential for contamination of streams, silage leachate collection and transfer facilities should be located outside of floodplains. However, if site restrictions require location within a floodplain, they shall be protected from inundation or damage from a 100-year flood event, or larger if required by laws, rules, and regulations. The silage leachate collection and transfer facility

shall be located so the potential impacts from breach of embankment, accidental release, and liner failure are minimized; and separation distances are such that prevailing winds and landscape elements such as building arrangement, landforms, and vegetation minimize odors and protect aesthetic values.

Separation Distances. Separation distances from residences and buildings, property lines, surface water bodies including wetlands, private wells or springs, and/or public wells shall be determined on a case by case basis in consultation with appropriate state or local regulatory agencies.

Use the following separation distances for preliminary planning purposes only.

Residences and businesses – Owner-Operator	250 feet
Residences and businesses - Other	500 feet
Property lines**	250 feet
Public Roads**	250 feet
Drinking Water Supply Lines**	150 feet
Surface water bodies	250 feet
Private well or spring	150 feet
Public water supply well	500 feet
Above seasonal high water table	24 in.
Depth to bedrock	48 in.*
* May reduce with DEM concurrence if lined.	
** For existing silos, this distance may be waived by the Connecticut / Rhode Island State Conservation Engineer if relocation is impractical.	

Temporary Storage Ponds or Tanks

Use the criteria found in Rhode Island NRCS Practice Standard 561, Heavy Use Area Protection for Design Load, Foundation, Surface Treatment, Structures, and Drainage and Erosion Control.

All silage leachate storage structures shall be lined unless a detailed risk assessment determines otherwise. The risk assessment shall include an analysis of subsurface travel time of potential leachates and the predicted environmental effect from those leachates. For earthen pond-type storage facilities, lining shall be provided by clay, bentonite or high-density polyethylene geomembranes conforming to Rhode Island NRCS Practice Standard 521, Pond Sealing or Lining, Flexible Membrane.

Concrete and metal tanks, unless certified watertight and corrosion resistant by the manufacturer, shall have flexible geomembranes installed below and adjacent to them. For those installations, the minimum thickness of the geomembrane shall be 40 mils.

- Concrete corrosion protective barrier coatings including organic resins such as epoxies, polystyrenes, and polyurethanes as well as properly formulated portland-cement based mortar coatings with latex and condensed silica fume additives may be used.
- All fabricated structures shall meet the service life and durability requirements of Rhode Island NRCS Practice Standard 313, Waste Storage Facility.
- Certified watertight and corrosion-resistant tanks such as fiberglass or other plastic/fiber composites will not require a separate geomembrane.
- All covered tanks shall be adequately vented to preclude the build-up of harmful gases such as hydrogen sulfide.
- Pipelines from enclosed buildings shall be provided with a water sealed trap and vent or similar devices to control gas entry into the buildings.

Design Storage Volume

CASE 1 – If leachate is stored for more than two days.

Silage leachate storage structures shall be sized to contain the maximum leachate volume anticipated in the first three weeks after ensiling. In addition, the storage volume shall be doubled to ensure a dilution of at least 1:1 with clean water which is intercepted by the collection system. For the purposes of this case, use 7.48 gallons of leachate produced per ton of silage as recommended in the NRCS Agricultural Waste Management Field Handbook.

The following example is presented for sizing:

Given: silo size = 40’ wide x 120’ long x 12’ high = 57,600 cu. feet

And: silage tonnage = 57,600 cu. feet x 45 lb/ft^3 ÷ 2,000 lb/ton = 1,296 tons

Find: silage leachate = 1296 tons x 7.48 gal/ton = 9,694 gals

Therefore to Ensure Dilution:

Use two 10,000 gallon tanks.

CASE 2 – If leachate is stored for less than two days and transferred within that period either by gravity or pumping to another waste storage facility (manure storage, milkroom wash water, barnyard runoff, etc.), or if transferred to field application via irrigation.

For this case, the temporary silage leachate storage structure shall be either pond type or tank type and shall be sized to hold a minimum of two days of silage leachate. However, in no case shall the temporary storage be less than 2,000 gallons. For the purposes of this case use .36 gal/ton/day of leachate produced.

The following example is presented for sizing:

Given: silo size = 40' wide x 120' long x 12' high = 57,600 cu. feet

And: silage tonnage = 57,600 cu. feet x 45 lb/ft^3 ÷ 2,000 lb/ton = 1,296 tons

Find: 2-day leachate volume: 1296 tons x .36 gal/ton/day x 2 days = 933 gals

Since 933 gals. is less than the minimum required use 2,000 gal minimum volume for storage.

COLLECTION SYSTEM

Leachate may be collected in various ways. Collection troughs may be pre-cast into the concrete floor of the silo, weep holes may be installed in the silo walls, or a collection trench may be installed at one or both ends of the silo. Collection trenches may be pre-cast concrete with steel grating, or stone-filled with perforated plastic conduit. If open grating is used in the collection system, screens or other devices shall be installed to prevent plugging of any conduit or tank components. If the silo floors are gravel, a subsurface drainage system shall be installed in the silo base to collect the leachate.

Leachate from plastic silage bales shall be collected by placement of a durable traffic resistant catchment trap around and under the location where the bale is placed or by another method which assures that leachate does not pose an environmental hazard.

TRANSFER PIPE AND IRRIGATION COMPONENTS

Gravity or pressurized transfer pipes are used to convey the silage leachate from the temporary storage pond or tank to a waste storage facility, to a spreader or hauling unit, or to field application by irrigation. All pipes, pumps, and irrigation components shall be non-corrosive and otherwise conform to Rhode Island NRCS Standards: 533, Pumping Plant; 442, Irrigation System, Sprinkler; and 430, Irrigation Water Conveyance. Gravity transfer pipes shall be non-corrosive, 4" minimum diameter, and designed in accordance with Rhode Island NRCS Standard 634, Manure Transfer.

Pumps and their components shall be designed to withstand the corrosiveness of silage leachate and shall be sized to allow for at least the minimum run and rest times of the pump as recommended by the manufacturer.

SAFETY PROVISIONS

Warning signs, fences, ladders, ropes, bars, rails, and other devices shall be provided, as appropriate, to ensure the safety of humans and livestock.

Safety of the users shall be incorporated into the design of the silage leachate collection and transfer facility. Open structures shall be provided with covers or barriers such as gates, bars, or fencing. Warning signs shall be provided to minimize accidental drowning, explosion, or asphyxiation due to hydrogen sulfide and other poisonous gases. See the operation and maintenance section of this standard for additional safety provisions.

CONSIDERATIONS

Prior to design of a collection and storage system, analyze the ground and surface water conditions at the silo site. If high groundwater or seepage conditions are present, a subsurface curtain drain installation may be

needed. If surface water is a problem, a diversion may be warranted. Consider moving the silo to a more suitable location, if solutions to existing water conditions are impractical.

Cover open silage piles with airtight 6 mil black plastic or equivalent. Coverings need to be weighed down to prevent wind displacement. Plastic silage covers preserve the quality of the silage, minimize dry matter loss, and minimize leachate production from rainfall infiltration. Studies have shown that it is more cost-effective to cover open piles than to leave them uncovered.

In order to reduce the volume of leachate, encourage the farmer to harvest the crop at the correct dry matter content. Refer to NNTC Environmental Quality Technical Note No. 5, August 1995, for guidelines.

To further reduce the volume of leachate, consider adding absorbent materials such as alfalfa cubes, chopped dry hay or beet pulp.

PLANS AND SPECIFICATIONS

Plans and specifications shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. Plans and specifications shall include construction plans, drawings, job sheets or other similar documents. These documents shall as a minimum, specify the requirements for installing the practice and include the kind, quantity and quality of materials to be used.

To the extent practical, specifications shall conform to NRCS National Engineering Handbook Parts 642 and 643 (Section 20).

AS BUILT DRAWINGS

As built drawings shall be prepared showing all pertinent element and elevations as actually installed, and a copy shall be provided to the owner / operator upon construction completion.

OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be prepared for, reviewed and signed by the landowner or operator. The plan shall specify that the facility be inspected annually and after significant storm events to identify repair and maintenance needs.

The O&M plan shall detail the level of repairs needed to maintain the effectiveness and useful life of the practice.

The following items should be addressed in the O&M plan:

- The protective covers or barriers for open structures shall be maintained to provide safety to humans and animals.
- Shields and other safety features shall be installed and maintained on pumps.
- Vent pipes for covered tanks shall be kept clear of obstructions.
- Safety precautions shall be exercised prior to entering confined spaces which may contain asphyxiating gases (i.e. self-contained breathing apparatus, proper ventilation, etc.)
- Grates, screens, or other anti-clogging devices used to exclude solids shall be checked and cleaned as necessary.
- Where storage facilities are emptied by pumping, a detailed pumping plan shall be formulated. Manual or automatic controls shall be maintained in good working order. All pumps, controls, and appurtenances shall be corrosive resistant and periodically maintained or replaced as necessary.
- Land Application shall be in accordance with Rhode Island NRCS Practice Standard 633, Waste Utilization.
- Land application of silage leachates can be environmentally destructive if not properly diluted or pre-treated. Refer to Sections E-3 and E-4 of NNTC Environmental Quality Technical Note No. 5, August 1995, for leachate treatment and land application recommendations.
- Development of an emergency action plan should be considered for waste storage facilities where there is a potential for significant impact from breach or accidental release. The plan shall include site-specific provisions for emergency actions that will minimize these impacts.

- Good recordkeeping is essential for proper O&M and evaluation of the installed facility. Records should be kept showing the dates of ensiling, percent of dry matter in the silage, volume and frequency of leachate production and removal, and application rates and effects on vegetative cover.