

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WASTE FACILITY COVER

(No.)

CODE 367

DEFINITION

A fabricated rigid, semi-rigid, or flexible membrane over a waste treatment or storage facility.

PURPOSE

To cover a waste facility for:

- water quality improvement
- air quality improvement
- capture of biogas for energy production

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- A waste facility cover is a component of a planned animal waste management system.
- A waste facility cover can be installed over an existing or planned waste storage facility meeting the criteria of the 313 standard.
- Exclusion of precipitation from an animal waste storage or treatment facility will improve management of an existing or planned system.
- Capture and controlled release or flaring of emissions from an existing or planned agricultural waste storage will improve air quality.
- Bio-treatment of emissions from an existing or planned waste storage or treatment facility will improve air quality
- Biogas production and capture for energy are components of an existing or planned animal waste system.

CRITERIA

General Criteria Applicable to All Purposes

Laws and Regulations. Cover systems for animal waste facilities must be planned, designed, and constructed to meet all federal, state and local regulations.

Service Life. The cover and appurtenances shall be designed to provide a service life of not less than 10 years.

Materials. The type, thickness and material properties of the cover and any supporting members shall account for all loads and stresses due to operational, environmental, and climatic conditions.

Flexible membrane materials, used for fabrication of inflated and floating covers, shall be certified by the manufacturer as suitable for the intended application.

Loads. Roofs, membrane cover and support system shall be designed to resist snow and wind loads as specified in ASCE 7-02, Minimum Design Loads for Buildings and Other Structures. Roofs, membrane cover and support system shall also be designed in accordance to all applicable local building codes. Roofs shall be designed to withstand all anticipated loads including but not limited to internal and external loads, hydrostatic uplift pressure, concentrated surface and impact loads, water pressure due to seasonal high water table, and frost or ice pressure.

Lateral loading imposed on the side support structure of the facility by the anticipated accumulated manure and other forces shall also be considered. If the facility is to serve as part of a foundation or support for a building, the total load shall be considered in the

Conservation practice standards are reviewed periodically and updated as needed. To obtain the current version of this standard, contact the NH NRCS State Office or visit the Field Office Technical Guide. The NH supplement is underlined.

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structural design.

Biogas Emissions. The cover system shall provide for capture and control of biogas, bio-reduction and direct release of gaseous emissions, or contain and release of gaseous emissions, as appropriate.

Capture and Control

The cover system shall be designed to capture biogas emissions and transfer to point of discharge without mixing with air. The point of discharge shall be equipped with a flare or utilization equipment as appropriate.

Bio-reduction and Direct Release

The cover shall be fabricated of a permeable composite membrane designed to promote biological treatment of gaseous emissions. Gaseous emissions pass through the membrane for direct release to the atmosphere.

Contain and Release

The cover system is designed for rainfall exclusion and not to specifically capture biogas. Therefore special handling or treatment of biogas emissions is not required except as necessary to prevent undue safety hazards.

Anchorage. The cover anchorage system shall be designed in a manner to resist internal gas pressures, corrosive environment, wind loads or other forces as appropriate to the cover system.

Repair. New and aged flexible cover materials shall be readily repairable by solvent, adhesive, or thermoplastic welding. Semi-rigid cover material shall be repairable by sectional replacement.

Precipitation. Impermeable covers shall direct precipitation to collection points for removal by pumping or by controlled release to suitable grassed or otherwise stabilized areas for discharge.

Access. Covers shall be removable or otherwise provided with suitable equipment access as necessary for normal operation and maintenance of the waste facility.

Safety. The cover shall include safety features, including fences and warning signs as appropriate to prevent undue hazards.

As a minimum all covers shall include the following:

- “Warning Flammable Gas” and “No Smoking” signs shall be posted.

Where biogas is captured, the gas collection and control system shall be designed in accordance with standard engineering practice for safely handling a flammable gas.

Flares shall be grounded or otherwise protected to minimize the chance of lightening strikes.

A flame trap device shall be provided in the gas line between the flare and the waste facility.

The location of underground gas lines shall be marked with signs to prevent accidental disturbance or rupture.

Additional Criteria for Rigid Covers

Tank covers shall be designed to withstand both dead and live loads. The live load values for covers contained in ASAE EP378.3, Floor and Suspended Loads on Agricultural Structures Due to Use, and in ASAE EP 393.2, Manure Storages, shall be the minimum used. The actual axle load for tank wagons having more than a 2,000 gallon capacity shall be used.

The cover or cover vessel design shall include provisions for fail safe pressure relief. Maximum pressure shall not exceed 12 inches water column.

Additional Criteria for Roofs

Design assumptions and construction requirements shall be indicated on standard plans. Fabricated structures shall be designed according to the criteria in the latest version of the following references as appropriate:

- Steel: “Manual of Steel Construction”, American Institute of Steel Construction.
- Timber: “ASD/LRFD Manual for Engineered Wood Construction”, American Forest and Paper Association.
- Concrete: “Building Code Requirements for Reinforced Concrete, ACI

318", American Concrete Institute.

- Masonry: "Building Code Requirements for Masonry Structures, ACI 530", American Concrete Institute.
- Hoop type structures shall be designed with truss frame. Single structural tubing support members will not be allowed.
- The building foundation shall be proportioned to safely support all superimposed loads without excessive movement or settlement.
- Where a non-uniform foundation cannot be avoided or applied loads may create highly variable foundation loads, settlement should be calculated from site-specific soil test data. Index tests of site soil may allow correlation with similar soils for which test data is available. If no test data is available, presumptive bearing strength values for assessing actual bearing pressures may be obtained from Table 1 or another nationally recognized building code. In using presumptive bearing values, adequate detailing and articulation shall be provided to avoid distressing movements in the structure.

Table 1 - Presumptive Allowable Bearing Stress Values

Foundation Description	Allowable Stress
Crystalline Bedrock	12000 psf
Sedimentary Rock	6000 psf
Sandy Gravel or Gravel	5000 psf
Sand, Silty Sand, Clayey Sand, Silty Gravel, Clayey Gravel	3000 psf
Clay, Sandy Clay, Silty Clay, Clayey Silt	2000 psf
¹ Basic Building Code, 12th Edition, 1993, Building Officials and Code Administrators, Inc. (BOCA)	

Plans prepared by the roof manufacturer or consulting engineer shall be stamped by a licensed professional engineer in the state of New Hampshire. The stamped drawings need to state the design wind and snow loads. The drawings shall also include the size, lumber grade and embedment details of

the truss support posts, details to address computed knee brace reactions, and other structural details.

Additional Criteria for Inflated Covers

Covers inflated and supported by forced air from mechanical means shall be:

- Equipped with a warning system to notify operator of blower failure.
- Provided with a support system to limit cover collapse in the event the blower fails and for access of equipment.
- Provided with a suitable access port for normal maintenance equipment.

Additional Criteria for Floating Covers

Floating membrane covers shall be supplemented with floatation materials as necessary for proper function, operation, and maintenance.

Minimum membrane or composite membrane thickness shall be 40 mils.

Additional Criteria for Flexible Covers over Dry Stacked Manure

Flexible HDPE, PVC, EPDM or other flexible materials shall be treated and/ or protected to be serviceable while exposed to UV light for the lifespan of the practice. Flexible covers shall be designed to withstand design windloads without displacement by use of battens, ballast (applied or encapsulated within the margins of the membrane) or other means which restrain the cover without causing undue stress to the material nor result in ponding/shedding of rainwater into the waste storage facility. Means to incrementally load the structure while retaining coverage of the existing contents, must be provided for and/or adequately described in the O&M Plan for the cover and facility. Lightweight struts or supports may be incorporated into the flexible lining for the purpose of shedding rainwater only. Snow loads are supported by storage contents. Minimum membrane or composite membrane thickness shall be 40 mils.

Additional Criteria for Energy Production

The cover materials and all appurtenances such as weights and floats shall be designed to capture and convey biogas to the gas collection system. The cover design shall provide for the following:

1. Air Infiltration. The cover system and appurtenances, including perimeter soil slopes above the water line for in-ground digesters, shall be designed to exclude the entrance of air under all operating conditions.
2. Material. The minimum material thickness for flexible geomembrane covers shall be:
 - 40 mils for non reinforced material
 - 36 mils for reinforced materials
3. Gas Collection, Control, and Utilization. The collection of biogas and flaring or other end use shall meet appropriate criteria in Practice Standard 365, Anaerobic Digester – Ambient Temperature.

CONSIDERATIONS

Animal waste storage facilities can release large amounts of biogas at certain times of the year. The cover and gas collection system should be designed for release of this gas.

Storage of biogas should be considered when installing flexible covers over storage impoundments (lagoons) to attenuate gas supply for end use or controlled release.

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.

OPERATION AND MAINTENANCE

A site specific operation and maintenance plan shall be developed that is consistent with the purposes of the practice, its intended life, safety requirements, and the criteria used for its design.

When gas storage is included in the system design, the plan shall contain instructions as to limits of cover ballooning and emergency procedures if control equipment fails.

Warranties. The cover manufacturer and or installer shall warrant the cover for the intended use and design life, provide maintenance instructions, and certify that the cover is properly installed.