United States Department of Agriculture

Natural Resources Conservation Service (NRCS)

CONSERVATION PRACTICE STANDARD

ANIMAL MORTALITY FACILITY

Code 316

(No.)

DEFINITION

An on-farm facility for the treatment or disposal of animal carcasses due to routine mortality.

PURPOSE

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

- reduce pollution impacts to surface water and groundwater resources
- reduce the impact of odors
- decrease the spread of pathogens

CONDITIONS WHERE PRACTICE APPLIES

This standard applies to livestock and poultry operations where routine animal carcass storage, treatment, or disposal is needed.

This standard does not apply to catastrophic animal mortality. In cases of catastrophic animal mortality, use NRCS Conservation Practice Standard (CPS) Code 368, Emergency Animal Mortality Management.

CRITERIA

General Criteria Applicable to All Purposes

Include the facility in the waste management system plan for the operation.

Meet the structural and foundational requirements of NRCS CPS Code 313, Waste Storage Facility, when designing slabs, walls, and support structures.

Use NRCS CPS Code 367, Roofs and Covers, for animal mortality storage facility covers and roofs.

Use NRCS CPS Code 342, Critical Area Planting, to revegetate all areas disturbed by construction.

Include provisions for closing and/or removing the facility where required.

Safety. Provide warning signs, fences, refrigeration unit locks, and other devices as appropriate, to ensure the safety of humans and livestock.

Address biosecurity concerns in all aspects of planning, installation, operation, and maintenance of an animal mortality facility.

Utilities and Permits. The landowner/contractor is responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

All applicable county and local zoning permits must be obtained prior to construction of the facility.

Approval for facilities must be obtained from the South Dakota Animal Industry Board.

For facilities that have a Concentrated Animal Feeding Operations (CAFO) permit from the South Dakota Department of Environment and Natural Resources (SD DENR), if manure or process wastewater is used in the composting process, plans and specifications are required to be submitted to SD DENR for review and approval prior to construction of the animal mortality facility. If manure or process wastewater will not be used in the composting process, a site plan showing the animal mortality facility shall be submitted to SD DENR.

Location. Locate the facility so that prevailing winds and landscape elements minimize odors and protect visual resources.

Animal Mortality facilities shall not be located within the 100-year flood plain unless the structure is protected from inundation and damage that may occur during the 100-year flood event. For a structure to be protected from inundation, the lowest part of the top of the storage structure or floor of a building shall be at least 1 foot above the water surface elevation of the 100-year flood.

The water surface elevation of the 100-year flood can be determined by using Federal Emergency Management Agency (FEMA) 100-year floods, U.S. Geological Survey (USGS) 100-year flood prone maps, and/or completing a hydrologic and hydraulic analysis. If no FEMA or USGS 100-year flood delineation is available for the location of the waste storage structure, the 100-year flood elevation must be determined by completing a hydrologic and hydraulic analysis.

To determine the 100-year flood elevation using a hydrologic and hydraulic analysis, a 100-year flow must first be estimated by using USGS published peak-flow 100-year frequency estimates, using USGS flow-frequency regression equations, or utilizing a rainfall runoff model. If using a rainfall runoff model, a 100-year frequency – 24-hour duration storm peak flow estimate shall be determined. Manning's equation or a step-backwater program such as Hec/Ras must then be used to determine the 100-year flood elevation corresponding to the 100-year flow estimate.

Locate the facility down-gradient from springs or wells where possible or take steps necessary to prevent contamination of groundwater supply sources. Investigate hydrogeological conditions.

Direct surface runoff away from the animal mortality facility. Direct contaminated runoff from the animal mortality facility to an appropriate storage or treatment facility for further management.

Select a location for the animal mortality facility that is consistent with the overall site plan for the livestock or poultry operation. Locate the onsite mortality facility for acceptable ingress and egress and where it will not interfere with other travel patterns on the farm, such as livestock pathways and feed lanes.

Locate the facility as close to the source of mortality as practical, considering biosecurity issues and the need to keep the facility out of sight of the general public.

Seepage Control. Where seepage will create a potential water quality problem, provide a liner which meets the requirements of the NRCS National Engineering Handbook (NEH), Part 651, Agricultural Waste Management Field Handbook (AWMFH), Appendix 10D, for clay liner design criteria or other acceptable liner technology.

Temporary Storage. Where the mortality management system depends on periodic or cyclic operation (including, but not limited to, offsite disposal such as rendering), provide a facility with adequate capacity for temporary storage of carcasses until they can be processed or picked up. The temporary storage may be implemented as a pad or bin, a refrigeration unit, or other.

Additional Criteria Applicable to Composters

Location. Locate on a base of low-permeability soils, concrete, or other liner material that will not allow contamination of groundwater. The floor of the composting facility shall be at least two feet above the seasonal high water table.

Locate so that water is available to the facility during dry periods to ensure proper moisture and acceptable curing times to meet the management goals.

Facility Type. Base the selection of the composting facility/method on availability of raw material, desired quality of final compost, equipment, labor, time, and land available.

Facility Size. Size the compost facility to accommodate the amount of raw material planned for active composting plus space required for curing. Base the size of the facility on normal mortality loss records for the operation. If this data is not available, use locally established mortality rates for the type of operation. Ensure that the final product of the composting process has no visible pieces of soft tissue remaining.

The facility shall have the capacity to maintain the compost temperature greater than 130° F for at least 5 days as an average throughout the compost mass followed by a compatible time for secondary composting. For a windrow system, the temperature of the compost shall be above 130° F for 15 days with a minimum of 5 turnings of the compost.

Size the animal mortality composting facility using one of the methods provided in the NRCS NEH, Part 637, Chapter 2, Composting; and NRCS NEH, Part 651, Chapter 10, Section 651.1007, Mortality Management; or comparable extension publication or state rules. Dimensions selected for elements of the compost facility shall accommodate equipment used for loading, unloading, and aeration.

Use of Finished Compost. Spread finished compost according to NRCS CPS Code 590, Nutrient Management, or provide for other acceptable means of disposal.

Additional Criteria Applicable to Incinerators and Gasifiers

General. Use a Type 4 (human and animal remains) (as defined by the Incinerator Institute of America) incinerator that has been approved for use within the state. Gasification, which is a high temperature method of vaporizing the biomass with no direct flame with oxidation of the fumes in an after-burning chamber, gasifiers shall meet all applicable state air quality/emissions requirements.

The SD DENR's Air Quality Program should be contacted to determine if an air quality permit is needed for the equipment that is planned to be used.

Capacity. Size the incinerator/gasifier to handle the average maximum daily animal mortality during a growing cycle. Refrigeration units may be used in conjunction with the incinerator/gasifier to improve the loading cycle and fuel use efficiency of the incineration/gasification unit.

Ashes. Remove ashes daily or according to manufacturer recommendations. Spread ash according to NRCS CPS Code 590, Nutrient Management, or provide for other acceptable means of disposal.

Location. Locate the incinerator/gasifier a minimum of 20 feet from any structure. Place the unit on a concrete pad with the fuel source as distant as practical. If the incinerator/gasifier is covered with a roof, provide a minimum air space between the chimney and any combustible roof part of at least 6 inches, or as recommended by the manufacturer, whichever is greater.

Additional Criteria Applicable to Refrigeration Units

General. Refrigeration units used shall be compatible with the emptying mechanism. Protect the refrigeration unit from precipitation and direct sun as deemed appropriate.

Unit design, construction, power source, and installation shall be in accordance with manufacturer's recommendations and all applicable building and electrical codes. Refrigeration units shall be constructed of durable material, be leak proof, and have has a life expectancy compatible with other aspects of the waste management system.

Place the refrigeration units on a pad of suitable strength to withstand loads imposed by vehicular traffic used to load or remove the box or tray.

Temperature. The refrigeration units will be self-contained units designed to freeze animal carcasses before decomposition occurs. Carcasses to be rendered should be maintained between 22° and 26° F. Carcasses that will be composted, incinerated, or gasified should be stored a few degrees above freezing in order to facilitate burning and to reduce the composting time or amount of fuel needed to incinerate or gasify the carcasses.

Capacity. Size the refrigeration units to accommodate the normal maximum volume of mortality to be expected in the interval between emptying. When calculating the volume required, include the expected daily mortality rate of the animal, the period of time between emptying, the average weight of the animal, and a conversion factor for weight to volume. Use a weight to volume conversion of 45 pounds per cubic foot unless a local volume conversion factor has been documented.

Power Source. Provide an alternative source of power, where available, to maintain the integrity of the freezing process during power outages. Where an alternative power source is not available, identify the contingencies for disposal of the animal carcasses in the Operation and Maintenance Plan.

If the alternative power source is a generator, contact the SD DENR's Air Quality Program should be contacted to determine any requirements that apply.

CONSIDERATIONS

Major considerations in planning animal mortality management are:

- The management capabilities of the operator.
- Available equipment and land application area at the operation.
- The economics of the available alternatives.

- The degree of pollution control required by state and local agencies.
- Effect on wildlife and domestic animals.

Take measures to maintain appropriate visual resources, reduce odor, and provide dust control. Vegetative screens and topography can be used to shield the animal mortality facility from public view, to reduce odors, and to minimize visual impact.

For facilities that are organic producers or that sell compost to organic producers, ensure that the treated lumber used in the facility meets the requirements for organic production. It may be best to have the producer consult with the organic certifier as to the use and acceptability of treated lumber.

Additional Considerations for Composting

Initial planning of site suitability should include referring to the Web Soil Survey's soil interpretations for "composting facility" http://websoilsurvey.nrcs.usda.gov/.

Composting of any mortality will be hindered if the carcasses are allowed to freeze. Dead animals or birds should be placed in the compost mix as quickly as practical or kept in a dry, nonfreezing environment until added to the compost mix. Composting frozen carcasses will lengthen the amount of time needed for composting to occur and will likely require added management to ensure that proper composting temperatures are reached.

Poultry operations often experience higher rates of mortality as the birds reach maturity.

To reduce offensive odors increase the carbon nitrogen ratio. A carbon-nitrogen ratio of 30:1 in the initial mix should have minimal odors.

Minimize odors and nitrogen loss by selecting carbonaceous material that, when blended with the nitrogenous material, provides a balance of nutrients and porous texture for aeration.

A chemical neutralizing or other additive agent should be used if structural components do not provide adequate odor reduction.

Maximize solar warming by aligning piles north to south configured with moderate side slopes.

Orient windrows to prevent ponding of surface runoff.

Protect compost facilities from the wind in cold or dry climates. Wind protection may help prevent excess drying of the compost.

Minimize blown-in rain by providing roof overhang.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for animal mortality facilities that describe the requirements for applying the practice according to this standard. As a minimum the plans and specifications shall include:

- A plan view showing the location and extent of the practice.
- Description of facility.
- Size, type, and number of animals that will be the feedstock.
- Pertinent elevations of the facility, if applicable.
- Soil and foundation findings, interpretations, and reports.

- Location of electrical lines, gas lines, water supply, and other utilities.
- Requirements for burial.
- Quality of materials.
- Drainage/grading plan, if needed.
- Structural details of all components.
- Temporary erosion control measures during construction.
- Vegetative requirements.
- Safety requirements for the facility.

OPERATION AND MAINTENANCE (O&M)

The O&M Plan developed for the animal mortality facility will become part of the overall Comprehensive Nutrient Management Plan (CNMP). The plan should document needed actions to ensure that the practice performs adequately throughout the expected life.

As a minimum, include the following information in the O&M Plan:

- Method and procedures of mortality disposal for normal losses
- Odor management or minimization requirements
- Biosecurity protocols
- Safety measures and procedures
- Periodic inspections
- Need for prompt repair or replacement of damaged components
- Site references and/or manufacturer or installer for troubleshooting

Additional O&M for Composters

Compost Recipe. Include a recipe of ingredients which gives the ingredient quantities and layering/mixing sequence.

Carbon-Nitrogen Ratio. The initial compost mix shall result in a carbon-to-nitrogen (C:N) ratio between 25:1 and 40:1. Compost with a lesser C:N ratio can be used if nitrogen mobilization is not a concern.

Carbon Source. Store a dependable source of carbonaceous material with a high C:N ratio to mix with nitrogen-rich waste materials.

Bulking Materials. Add bulking materials to the mix as necessary to enhance aeration. The bulking material may be the carbonaceous material used in the mix or a non-biodegradable material that is salvaged at the end of the compost period. Make provision for the salvage of any non-biodegradable material used in the composting process.

Compost Mix. Develop a compost mix that encourages aerobic microbial decomposition and avoids nuisance odors.

Moisture Level. Maintain adequate moisture in the compost mix throughout the compost period within the range of 40 to 65 percent (wet basis). Prevent excess moisture from accumulating in the compost in high precipitation climatic regions. This may require the facility to be covered.

Temperature of Compost Mix. Closely monitor temperatures above 165° F. Take action immediately to cool piles that have reached temperatures above 185° F. If the pile is too hot, turn it to aerate the pile and release heat build-up.

Turning/Aeration. The frequency of turning/aeration shall be appropriate for the composting method used, and to attain the desired amount of moisture removal and temperature control while maintaining aerobic degradation.

Monitoring. The O&M Plan shall state that composting is a biological process that needs monitoring and management throughout the composting period to insure proper composting processes. The operation may need to undergo some trial and error in the start-up of a new mortality composting facility. Manage the compost piles for temperature, odors, moisture, and oxygen, as appropriate. Test the finished compost as appropriate to assure that the required decomposition has been reached. Include the method, procedure, and record -keeping requirements for proper utilization of compost.

Additional O&M for Incinerators and Gasifiers

Use the incinerator and gasifier only for the disposal of animal carcasses.

Operate the unit properly to maximize equipment life and minimize emission problems.

Load the unit according to the manufacturer's recommendations.

Remove ashes frequently to maximize combustion and prevent damage to equipment. Include methods for collecting and disposing of the ash material remaining after incineration.

Inspect the unit periodically to ensure that all components are operating as planned and in accordance with the manufacturer's recommendations.

Additional O&M for Refrigeration Units

Operate the refrigeration unit properly to maximize equipment life and minimize potential problems.

Load the refrigeration unit according to manufacturer's recommendations and do not exceed the design capacity.

Use the refrigeration unit only for the dead animals associated with the planned operation.

Inspect the refrigeration unit periodically for leaks, structural integrity, and temperature.

REFERENCES

Nutsch, A., J. McClaskey, and J. Kastner (Eds.). 2004. Carcass disposal: a comprehensive review. National Agricultural Biosecurity Center, Kansas State University, Manhattan, KS.

USDA, NRCS. NEH, Part 651, Agricultural Waste Management Field Handbook. Washington, D.C.

USDA, NRCS. NEH, Part 637, Chapter 2, Composting. Washington, D.C.