**NATURAL RESOURCES CONSERVATION SERVICE**

**CONSERVATION PRACTICE STANDARD**

# COMPOSTING FACILITY

**(No.)**

**CODE 317**

## DEFINITION

A structure or device to contain and facilitate the controlled aerobic decomposition of manure or other organic material by micro-organisms into a biologically stable organic material that is suitable for use as a soil amendment.

## PURPOSE

To reduce the pollution potential and improve the handling characteristics of organic waste solids and to produce a soil amendment that adds organic matter and beneficial organisms, provides slow-release plant-available nutrients, and improves soil condition.

## CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- Organic waste material is generated by agricultural production or processing.
- The facility is a component of a planned waste management system.
- The facility can be constructed, operated, and maintained without polluting air and/or water resources.
- The compost can be applied to the land or marketed to the public.

## CRITERIA

### General Criteria Applicable to All Purposes

**Laws and regulations.** Install and operate the facility in compliance with all federal, state, and local laws, rules, and regulations.

Composting facilities located at an animal feeding operation are covered under the animal feeding operations permit issued by the Kansas Department of Health and Environment (KDHE). Composting facilities not located at an animal feeding operation are required to be either registered or permitted (depending on size) by KDHE.

**Safety.** Incorporate safety and personal protection features and practices into the facility and its operation as appropriate to minimize the occurrence of equipment and biosecurity hazards during the composting process.

**Facility siting.** 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 2 feet above the seasonal high water table.

Locate outside of floodplains when practical; otherwise, protect the facility from inundation or damage from a 25-year flood event.

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

Direct surface runoff away from the compost facility. Direct contaminated runoff from the composting operation to an appropriate storage or treatment facility for further management.

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.** Select the type of composting facility or method based on the type and availability of raw material, the desired quality of finished compost, equipment, labor, time, and land available.

Manure is typically composted using windrows, static piles, and in-vessel methods. Dead animal carcasses are typically composted using in-vessel and compost bin methods.

Meet the structural requirements of Conservation Practice Standard (CPS) 313, Waste Storage Facility, when designing slabs, walls, and support structures. Meet the requirements of CPS 367, Waste Facility Cover, when designing roofs.

**Facility size.** Size the composting facilities to accommodate the amount of raw material planned for active composting. Make sure the capacity is consistent with the composting processes that will be used and with sufficient finishing time needed to produce the desired compost product characteristics. Space for compost storage may be included in the finishing space or in a separate facility. Select dimensions to accommodate handling and processing.

A facility for manure and other agricultural organic waste that is to be used on the farm shall have the capacity to produce compost that can be safely stored without undesirable odors. This requires the temperature of the compost to be maintained above 104$^{o}$F for 5 days with at least 4 hours above 130$^{o}$F during that time period.

A facility to produce compost for use off the farm or for sale shall have the capacity to significantly reduce pathogens. For a static pile or within-vessel facility, this requires the temperature of the compost to be maintained above 130$^{o}$F for 3 days. The total compost period shall include time for the initial primary stage of composting and time for secondary stage composting. For a windrow system, this requires the temperature of the compost to be above 130$^{o}$F for 15 days with a minimum of 5 turnings of the compost.

In-vessel composters provide the primary stage of composting. Additional composting space shall be provided for secondary stage composting, and the compost should remain in this facility until its temperature has become stable. Final curing of the compost material can take place in an additional storage facility.

If the facility is to be used to compost animal carcasses, it shall have the capacity to maintain the compost temperature greater than 130 $^{o}$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$^{o}$F for 15 days with a minimum of 5 turnings of the compost. Size animal mortality composting facilities according to the methods provided in Section 637.0213 in National Engineering Handbook Part 637 (NEH 637), *Environmental Engineering*; Section 651.1007 in National Engineering Handbook Part 651 (NEH 651), *Agricultural Waste Management Field;* or an applicable Research and Extension publication. Base the size of dead animal composting facilities on normal mortality loss records for the operation. If these data are 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.

Refer to CPS 316, Animal Mortality Facility, for more information on treatment and disposal of dead animal carcasses.

**Use of finished compost.** Land application of finished compost shall be in accordance with CPS 590, Nutrient Management, or CPS 633, Waste Recycling.

## CONSIDERATIONS

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.

For producers with composting facilities who also raise organic products or who sell compost to others who raise organic products, ensure that the treated lumber used in the stacking 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 for litter and compost storage.

## PLANS AND SPECIFICATIONS

Prepare plans and specifications in accordance with the criteria of this standard and describe the requirements for applying the practice to achieve its intended use, including the following:

- Layout and location of livestock facilities, waste collection points, and/or waste transfer.
- Size, type, and number of animals or other sources of organic feedstock.
- Grading plan showing excavation, fill, and drainage, as appropriate.
- Size and capacity needed.
- Design requirements.
- Safety requirement for operation.

## OPERATION AND MAINTENANCE

Develop an operation and maintenance plan that is consistent with the purpose of this practice and the life of the composting facility. Recipe ingredients and the sequence that they are to be layered and mixed shall be given in the plan.

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

**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 carbon to nitrogen 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.

**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.** Manage the compost to attain and then maintain the internal temperature for the duration required to meet management goals. It may be necessary for the compost to reach 145$^{o}$F to adequately destroy weed seeds. Closely monitor temperatures above 165$^{o}$F. Take action immediately to cool piles that have reached temperatures above 185$^{o}$F.

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

**Monitoring.** The operation and maintenance plan shall state that composting is a biological process that needs monitoring and management throughout the composting period to ensure proper composting processes. The operation may need to undergo some trial

and error in the start-up of a new composting facility. Manage the compost piles for temperature, odors, moisture, and oxygen (as appropriate). Test the finished compost as appropriate to ensure that the required decomposition has been reached.

**REFERENCES**

USDA, NRCS. 2010. National Engineering Handbook, Part 637, Chapter 2, Composting. Washington, D.C.

Northeast Regional Agricultural Engineering Service, Cooperative Extension "On-Farm Composting Handbook," NRAES-54.