

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

COMPOSTING FACILITY

(No.)

CODE 317

DEFINITION

A facility to process raw manure or other raw organic by-products into biologically stable organic material.

PURPOSE

To reduce the pollution potential of organic agricultural wastes to surface and ground water.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- Organic waste material is generated by agricultural production or processing.
- A composting facility is a component of a planned agricultural waste management system;
- A composting facility can be constructed, operated and maintained without polluting air and/or water resources;
- There is a need to improve air quality by reducing the emissions of odorous gases; and,
- The facility is operated as a component of an agricultural management system.

CRITERIA

General Criteria Applicable to All Purposes

Laws and Regulations. The installation and operation of the composting facility shall comply with all federal, state and local laws, rules and regulations.

Safety. Safety and personal protection features and practices shall be incorporated

into the facility and its operation as appropriate to minimize the occurrence of equipment hazards and biological agents during the composting process.

Facility Siting. The bottom elevation of the composting facility shall be above the seasonal high water table and on soils with a permeability that does not allow materials to contaminate the ground water, and meets all applicable regulations, or the facility shall be installed on concrete slabs or other appropriate liners.

Ideally, compost 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 25-year flood event, or larger.

Locate compost facilities so prevailing winds and landscape elements such as building arrangement, landforms and vegetation minimize odors and protect the visual resource

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

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 greater carbon to nitrogen ratio can be used if nitrogen immobilization is not a concern.

Carbon Source. A dependable source of carbonaceous material with a high C:N ratio shall be stored and available 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. If a non-biodegradable material is used, provision shall be made for its salvage.

Moisture Level. Provision shall be made for maintaining adequate moisture in the compost mix throughout the compost period within the range of 40 to 65 percent (wet basis).

In high precipitation climatic regions, care shall be taken to prevent excess moisture from accumulating in the compost. Facility covers may be required to provide for a suitable product.

For compost bedded packs, the top twelve inches of the pack shall be tilled regularly to maintain moisture and aeration.

Temperature of Compost Mix. The landowner is responsible for managing the compost to attain and then maintain the internal temperature for the duration required to meet management goals.

When the management goal is to reduce pathogens, the compost shall attain a temperature greater than 130°F for at least 5 days as an average throughout the compost mass.

This temperature and time criterion may be achieved during either primary or secondary composting stages or as the cumulative time of greater than 130°F in both stages.

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.

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

Facility structural elements such as permanent bins, concrete slabs and roofs shall meet the requirements of Waste Storage Facility (313).

Facility Size. Size the compost facility to accommodate the amount of raw material planned for active composting plus space required for curing.

Dimensions selected for elements of the compost facility shall accommodate equipment used for loading, unloading, and aeration.

Facility sizing for compost bedded pack barns shall consider the average number and size of animals contributing to the compost bedded pack barns. Recommendations for size are based on a square footage per animal (Manure Management Technology Development Team, Composted Bedded Pack Dairy Barns).

Animal	Area per Animal
	(sq ft)
Mature Healthy Holstein	85-100
Convalescing or Close-up Holstein	100-140
Mature Average Jersey	65-85

Table 1. Average Area Needed

Sizing of facilities for composting dead animals shall be based on normal mortality loss records for the operation. If this data is not available, locally established mortality rates for the type of operation shall be used.

Compost Period. Continue the composting process long enough for the compost mix to reach the stability level where it can be safely stored without undesirable odors. It shall also possess the desired characteristics for its use, such as lack of noxious odor, desired moisture content, level of decomposition of original components and texture. The compost period shall involve primary and secondary composting as required to achieve these characteristics.

Test the finished compost as appropriate to assure that the required stabilization has been reached.

Use of Finished Compost. Land application of finished compost shall be in accordance with Nutrient Management (590) and Waste Utilization (633).

CONSIDERATIONS

Develop an initial compost mix with a carbon to nitrogen ratio of at least 30:1 to reduce most offensive 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 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.

In humid areas, do not locate piles (windrows) across the slope to prevent ponding and soginess.

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

For compost bedded packs, the preferable carbonaceous material is sawdust particularly for use with mature dairy cows. Sawdust works best to maintain moisture and aide in the composting process (Manure Management Technology Development Team, Composted Bedded Pack Dairy Barns). It is critical to maintain a proper operation and maintenance plan to control moisture. The suggested method is to turn/aerate the top twelve inches of the pack twice a day. For livestock groups other than dairy cows, the operation and maintenance plan may include less frequent turning of the manure material such as once a day or once every other day in order to control moisture. To maintain proper moisture levels in a compost bedded pack, monitor the consistency of the bedding material. When the manure/bedding starts to stick to the animals, it is a sign that more carbonaceous material is needed (Manure Management Technology Development Team, Composted Bedded Pack Dairy Barns).

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

An O&M Plan will be developed that is consistent with the purposes of this practice, and the life of the composting facility.

The O&M Plan will include the recipe, ingredients and sequence that material is layered and mixed. Safety requirements for operation of the composting facility shall be provided in the plan.

Manage the compost piles for temperature, odors, moisture, and oxygen, as appropriate. Make adjustments throughout the composting period to insure proper composting processes.

Closely monitor temperatures above 165°F. Take action immediately to cool piles that have reached temperatures above 185°F.

The operation and maintenance plan shall state that composting is a biological process. It requires a combination of art and science for success. Hence, the operation may need to undergo some trial and error in the start-up of a new composting facility.

REFERENCES

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

Manure Management Technology Development Team. East National Technology Support Center. *Composting Manure – What's Going On In The Dark?*. May 2007 Manure Management Info Sheet Number 1.

Manure Management Technology Development Team. East National Technology Support Center. *Managing for Better Compost*. June 2007 Manure Management Info Sheet, Number 2.

Manure Management Technology Development Team. East National Technology Support Center. *Compost Bedded Pack Dairy Barns*. June 2007 Manure Management Info Sheet, Number 3.

Manure Management Technology Development Team. East National Technology Support Center. *Manure Chemistry – Nitrogen, Phosphorus, and Carbon*. August 2007 Manure Management Info Sheet, Number 7