

NATURAL RESOURCES CONSERVATION SERVICE
VIRGINIA CONSERVATION PRACTICE STANDARD
COMPOSTING FACILITY

(No.)

CODE 317

DEFINITION

This is a treatment component of an agricultural management system for the biological stabilization of organic material.

PURPOSE

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

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; and
- A composting facility can be constructed, operated, and maintained without polluting air and/or water resources.

CRITERIA

LAWS AND REGULATIONS

The siting, installation, and operation of the composting facility shall comply with all federal, state, and local laws, rules, and regulations. The producer will be responsible for securing any necessary permits to install structures and for properly managing the facility on a daily basis.

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 facility shall be installed on concrete slabs or other appropriate liners. All liners shall have a permeability of 1×10^{-6} cm/s. Facilities with earth floors must be installed with the elevation of the top of the floor at least 2 feet (0.6m) above the seasonal high water table. The top of the floor elevation for structures with concrete floor shall be no lower than the seasonal high water table. The foundation materials and depth to water table shall be identified as part of the site investigation.

Compost facilities should be located outside the floodplain. However, if site restrictions require location within a floodplain, they shall be protected from inundation or damage from a 100-year flood event.

Composting facilities shall be located as near as practical to the source of the organic material. Locate compost facilities so prevailing winds and landscape elements such as building arrangement, landforms, and vegetation minimize odors and protect the visual resource. The location selected must meet the minimum distances described in Table 1 of Virginia Conservation Practice Standard *Waste Storage Facility (Code 313)*. A greater separation distance of 200 feet from private wells is recommended for animal mortality composters.

Direct surface runoff away from the compost facility. Contaminated runoff from compost

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

317-VA-2

facilities shall be directed 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 ratio between 25:1 and 35:1. See Table 10-6 in the Animal Waste Management Field Handbook (AWMFH) for typical C:N ratios of common composting amendments. 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 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. Moisture content should be within the range of 40 to 65 percent. Water used for moisture control must be free of deleterious substances.

Care shall be taken to prevent excess moisture from accumulating in the compost. Facility covers may be required to provide for a suitable product.

Temperature of Compost Mix

Manage 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.

When the management goal is to destroy weed seeds, the compost shall attain a temperature of 145°F. The microbial activity necessary to the composting process will slow down at temperatures greater than 145° F. Aeration or turning should be used to reduce pile temperature to a lower range after achieving the desired temperatures.

Long stem thermometers shall be used for managing the composting material.

Turning/Aeration

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

Appropriate equipment must be available for initial mixing, turning, and hauling composted material and carbonaceous material.

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 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.

Finished Compost

Utilization of finished compost shall be in accordance with the Virginia Conservation Practice Standards *Nutrient Management (Code 590)* and *Waste Utilization (Code 633)*.

Poultry litter and finished compost may be stored in the same location but shall not be mixed together if there is a significant difference in moisture content due to the potential for spontaneous combustion.

Facility Type

Selection of the composting facility/method shall be based on the availability of raw material, the desired quality of final compost, and the equipment, labor, time, and land available. The composting method (aerated windrow, static pile, in-bin, rotary drum, etc.) shall meet the requirements of the AWMFH, Chapter 10 and National Engineering Handbook, Part 637, Chapter 2, Composting.

Types

Four types of composting operations are covered in this standard: aerated windrows, static piles, in-vessel (bins), and rotary drum.

Aerated windrows are long piles of compost materials. This method is used for large volumes of organic material that are managed by power equipment used to turn the composting material periodically. Periodic turning re-aerates the windrows, promoting the composting process.

Organic material in static piles is initially mixed to a homogeneous condition and not turned again throughout the composting process. Static pile material must have the proper moisture content and bulk density to facilitate air movement throughout the pile. Forced air might be necessary to facilitate the composting process.

In-bin composting in an enclosed structure is carried out on a blended organic material under conditions where temperature and airflow are strictly controlled. In-bin composting also includes naturally aerated processes where organic materials are layered in the vessel in a specified sequence. Layered in-bin materials are usually turned once to facilitate the process. Bin

dimensions must be consistent with equipment to be used for management of compost.

Rotary drum composting uses a round, enclosed drum which can be mechanically rotated. The unit may be stationary or portable. Rotation of the drum aids in aeration and mixing of the material and facilitates the composting process. If properly managed, this method can result in faster decomposition and a smaller volume of compost than other methods.

Facility structural elements such as permanent bins, concrete slabs, and roofs shall meet the requirements of Virginia Conservation Practice Standard *Waste Storage Facility (Code 313)*.

Facility Size

Size the compost facility to accommodate raw material planned for active composting, the space required for curing, and storage of the finished compost for the maximum length of time anticipated between emptying events. Facility size may also include an allowance for storage of carbon source material and/or bulking material necessary for the composting process. The minimum size in-bin facility for composting mortality shall be 2 primary bins and 2 secondary bins.

The minimum storage period shall be based on the timing required for the composting process and environmentally safe waste utilization considering the climate, crops, soil, equipment, and local, state, and Federal regulations. Composted material shall be protected from the weather by roofs or other suitable covers.

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

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

Engineering Technical Note #6, *Composting Swine Mortality* shall be used to size composters for swine and other large animals. Engineering Technical Note #7, *Composting Poultry Mortality – Bin Sizing Worksheet*, shall be used to size dead bird composters.

CONSIDERATIONS

Develop an initial compost mix with a Carbon to Nitrogen ratio of at least 30:1 to reduce most offensive odors.

Secondary compost material can be used to provide up to 50% of the carbon source in a primary bin. This practice will result in a faster activation time for new bins and is strongly recommended for animal mortality composting. However, it is possible to “mine” out the carbon with repeated usage. Smaller proportions of recycled compost should be used with older material.

To control odors, the top layer of material in a primary composter bin should be a minimum of one foot thick.

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.

Maximize solar warming by aligning piles north to south configured with moderate side slopes. To prevent ponding and soggy, do not locate piles (windrows) across the slope.

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

Evaluate site paving needs in terms of effects of equipment operation on trafficability, soil compaction, and potential for contamination from compost and petroleum products.

Buffer area, vegetative screens, and natural landscape features can help minimize the effects of odors. The facility should be located in such a manner as to not interfere with vehicle traffic.

Composting operations require close management. Management capabilities of the operator and availability of labor should be assessed as part of the planning and implementing process.

Benefits associated with the ultimate use of the composted material should be compared to the capital expenditure and operating costs of the composting operations. In addition to cost return, benefits can include environmental protection, improved handling, disposal of dead poultry and

other farm animal carcasses, odor control, and reduced need for storage volume.

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.

DESIGN DATA

1. Site plan or sketch showing location of facility in relation to wells, streams, drainage ways, neighbors, adjacent buildings, and traffic patterns.
2. Field survey.
3. Record the soil and foundation findings, interpretations, and reports include information used to determine high water table.
4. Waste storage volume calculations for a storage period in agreement with a current Nutrient Management Plan.
5. Detail plans showing structural details, i.e.: member materials and sizes, dimensions, strength, or grade, construction notes or details, design limitations, etc.
6. Loading conditions and structural design computations unless a standard detail drawing that meets NRCS requirements and site conditions is used.
7. If the design is by a PE registered in Virginia, written certification that the design meets Virginia Conservation Practice Standard *Waste Storage Structure (Code 313)*.
8. Provisions made for grading, protecting area, and providing separation from water table.
9. Special safety requirements.
10. Temporary erosion control measures during construction.
11. Operation and Maintenance requirements.

12. A completed Waste Management System Plan for the owner's total livestock operation that addresses types and numbers of animals.
13. Environmental Evaluation Form VA-EE-1.

CHECK DATA

1. As-built drawings showing changes from the design.
2. As-built storage volume.
3. NRCS or PE storage facility certification.
4. Statement that disturbed areas have been stabilized and fencing is adequate.
5. Certifications of components provided by others (e.g., truss certificates).

OPERATION AND MAINTENANCE

Develop operation and maintenance requirements that are consistent with the purposes of this practice, and the life of the composting facility. The requirements shall include:

- Recipe ingredients and the sequence in which they are layered and mixed.
- Safety requirements for operation of the composting facility.
- Instructions for managing the compost piles for temperature, odor, moisture, and oxygen, as appropriate and suggestions for making adjustments throughout the composting period to ensure proper composting processes.
- Maximum and minimum operating temperatures and a plan for monitoring temperatures. Document the daily temperatures of each bin to ensure that adequate heat has been achieved and maintained for the compost period. Closely monitor temperatures above 165°F. Take action immediately to cool piles that have reached temperatures above 185°F.

The operation and maintenance requirements shall include a statement 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.

The compost facility should be inspected regularly when the facility is empty. Replace deteriorated wooden materials or hardware. Patch concrete floors and curbs as necessary to assure water tightness. Roof structures should be examined for structural integrity and repaired as needed. Exposed metal components should be inspected for corrosion. Corroded metal should be wire brushed and painted as necessary.

REFERENCES

1. Virginia Field Office Technical Guide, Section IV.
2. On-Farm Composting Handbook, Northeast Regional Agricultural Engineering Service, Cooperative Extension, NRAES-54, 1992.
3. National Engineering Handbook, Part 651, Animal Waste Management Field Handbook.
4. Engineering Technical Note #5, *Management of Animal Mortality Composters*.
5. Engineering Technical Note #6, *Composting Swine Mortality*.
6. Engineering Technical Note #7, *Composting Poultry Mortality-Bin Sizing Worksheet*.

NATURAL RESOURCES CONSERVATION SERVICE
VIRGINIA CONSERVATION PRACTICE STANDARD
COMPOSTING FACILITY

Approved Practice Narrative

(No.)

CODE 317

317 D1 Composting Facility: A
composting facility shall be constructed for use in
the treatment of animal manure or other organic
agricultural wastes.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD.)

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC, 20250-9410 or call (202) 720-5964 (voice and TDD.) USDA is an equal opportunity provider and employer.