

NATURAL RESOURCES CONSERVATION SERVICE  
VIRGINIA 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, and/or
- There is a need to improve air quality by reducing the emissions of odorous gases.

**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 facility shall be installed on concrete slabs or other appropriate liners. All liners shall have a permeability of  $1 \times 10^{-6}$  cm/s, or less. 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 of floodplains. However, if site restrictions require location within a floodplain, they shall be protected from inundation or damage from a 100-year flood event, or larger.

Composting facilities shall be located as near as practical to the source of the organic material. The Virginia Conservation Practice Standard *Animal Mortality Facility (Code 316)* lists the specific separation distances that must be used when composting animal mortality.

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 or recirculate within the composting process.

**Surface Runoff Control.** For uncovered sites, surface water control features shall be based on the 10-

year, 1-hour storm event.

**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 C:N 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 may be made for maintaining adequate moisture in the compost mix throughout the compost period within the range of 40 to 65 percent (wet basis).

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 131°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 131°F in both stages.

A temperature of 140°F is recommended when the management goal is to destroy weed seeds.

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.

**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.

**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 Virginia Conservation Practice Standard *Waste Storage Facility (Code 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.

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.** Utilization of finished compost shall be in accordance with

the Virginia Conservation Practice Standards Nutrient Management (Code 590) or Waste Utilization (Code 633).

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

### 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 sogginess.

Evaluate site paving needs in terms of effects of equipment operation on traffic, 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.

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

### 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.

Record all required information in an engineer field book, on a plan sheet or design

computation sheet, or in another appropriate location.

### DESIGN DATA

1. Completed Environmental Evaluation (Form VA-EE-1) and subsequent requirements.
2. Record the soil and foundation findings, interpretations, and reports. Include information used to determine high water table.
3. Survey and plot data: profile, cross-sections, topography, as needed.
4. Design computations, including purpose of practice and references used.
  - a. Waste storage volume calculations for a storage period in agreement with a current Nutrient Management Plan.
  - b. Detailed plans showing structural details such as member materials and sizes, dimensions, strength or grade, construction notes or details, design limitations, etc.
  - c. Loading conditions and structural design computations unless a standard detail drawing is used that meets NRCS requirements and site conditions.
  - d. Certification by NRCS or SWCD personnel with appropriate Engineering Job Approval Authority or by a PE registered in Virginia that the design meets all applicable Standards.
  - e. Provisions for providing separation from the water table.
5. Plan view of site with existing and planned features, including relationship to wells, streams, drainage ways, neighbors, adjacent buildings, traffic patterns, etc.
6. Standard Cover Sheet (VA-SO-100A).
7. Materials and quantities needed. Identify borrow material and/or spoil area, as needed.

8. Vegetation and/or ground cover requirements.
9. Identification of needed Erosion & Sediment Control measures.
10. Supplemental practices required.
11. Virginia Conservation Practice Specifications (700 Series).
12. Nutrient Management Plan or Waste Utilization Plan.
13. A completed Waste Management System Plan for the owner's total livestock operation that addresses types and numbers of animals.
14. Operation and Maintenance Plan.
15. Special safety requirements.

#### CHECK DATA

1. As-built survey.
2. As-built plans including dimensions, types and quantities of materials installed, and variations from design. Include justification for variations.
3. NRCS or PE storage facility certification.
4. Certification of components provided by others in accordance to NRCS Engineering Policy, such as the truss certificate.
5. Locations of appurtenant practices.
6. Adequacy of vegetation and/or ground cover.
7. Complete as-built section of Cover Sheet.

#### OPERATION AND MAINTENANCE

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

Safety requirements for operation of the composting facility shall be provided.

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

Never allow temperatures to get above 165°F. Take action immediately to cool piles that have reached this temperature.

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.

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. USDA-Natural Resources Conservation Service. Virginia Electronic Field Office Technical Guide (eFOTG), Section IV. [On-line]. Available at: <http://www.nrcs.usda.gov/technical/eFOTG>
2. National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook.
3. USDA-Natural Resources Conservation Service. National Engineering Handbook – Part 650, Engineering Field Handbook.
4. USDA-Natural Resources Conservation Service. Virginia 700 Series Construction Specifications. [On-line]. Available at: <http://www.nrcs.usda.gov/technical/eFOTG>

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