USDA
NATURAL RESOURCES
CONSERVATION SERVICE

MARYLAND CONSERVATION
PRACTICE STANDARD

# COMPOSTING FACILITY

CODE 317
(Reported by No.)

## 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 by-products to surface and ground water.

## CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

1. Organic waste material is generated by agricultural production or processing;

2. A composting facility is a planned component of a comprehensive nutrient management plan (CNMP) or a Waste Management Plan;

3. The composting facility can be constructed, operated and maintained without polluting air or water resources; and,

4. It is desirable to reduce the risk of the spread of disease, and to reduce nuisances such as flies, vermin, and scavenging animals.

## CONSIDERATIONS

### Location

Composting facilities should be located as near to the source of organic material as practical, with consideration given to:

1. The location of neighboring dwellings and how they will be affected by prevailing winds;

2. Location of ingress and egress so as not to interfere with traffic flow or utilities;

3. Location of the access for easy loading and unloading of compost.

The location, layout, and design of the facilities should be compatible with the surrounding landscape. Consider existing landforms and vegetation, along with land shaping and vegetative plantings to minimize any adverse impact on visual resources.

### Orientation and Wind Protection

If possible, orient windrows north and south to maximize solar warming, particularly in the colder counties. For unroofed static piles or windrows, consider using windbreaks to prevent compost from blowing away, help prevent drying out, and help maintain a warmer compost temperature in colder climates.

## CRITERIA

### Facility Siting

Locate the composting facility where movement of odors toward neighbors will be minimized. Buffer areas, vegetative screens, and landscaping can help minimize negative effects of odors and visual resources.

Locate the facility a minimum 2 feet above the high water table. Soils that have a rapid permeability (>6.0 inches/hour) in the upper 40 inches of the soil profile require a concrete pad, clay, or synthetic liner. The compost area and access

must be kept free of standing water and rutting.

Locate the composting facility outside the 100-year, 24-hour floodplain when possible. If the only practical alternative is to locate the facility within the 100-year floodplain, design the facility to protect from inundation and damage from the 25-year, 24-hour flood event. Divert runoff from outside drainage areas and maintain positive drainage away from the facility.

Construction activity within the 100-year floodplain requires permits or authorizations from the Maryland Department of the Environment and/or the U.S. Army Corps of Engineers. Obtain all applicable permits and authorizations prior to start of construction.

The area surrounding the composting facility will be subject to a high traffic load during loading, mixing, and unloading. Design these areas to meet the requirements of the Maryland conservation practice standard for Heavy Use Area Protection, Code 561.

Contaminated runoff from any composting facility without a roof must be controlled. This may be accomplished with distribution over a Wastewater Treatment Strip (Maryland conservation practice standard, Code 635) or transfer to a storage facility or other approved treatment method.

Leachate should not occur from any composting facility. If leachate does occur, this means the mix is too wet. Make adjustments to the composting mix by adding dry matter to eliminate leachate. Address this issue in the operation and maintenance plan.

**Facility Type, Size, and Design**

***Type*** - Select the type of facility and composting method based on the availability of raw materials, the desired quality of the final compost, available equipment, manpower, management time, and available land.

The following additional requirements apply to all dead bird composters:

1. A roof to provide year round operation and to control rain water and percolation. Design the roof for applicable wind and dead loads for agricultural buildings;

2. A concrete floor designed for the anticipated loads;

3. Pressure treated lumber for all posts and planks and treated metals to prevent rust for the roof, nails, and other metal appurtenances.

Dimension all structures to accommodate the equipment used for loading and unloading. Determine the minimum bin width by adding 1 foot to the maximum width of the equipment used. However, 2 feet is generally recommended.

***Size and Design*** - Size all composting facilities in accordance with the Agricultural Waste Management Field Handbook, Part 651 Chapter 10, appropriate NRCS Design Worksheet(s), Extension Fact Sheet(s), or other methods as approved.

For dead animal and bird composting, establish the size of the composting units on the basis of known or published normal mortality rates. Dead animal or bird facilities require a minimum of 2 primary stages and 1 secondary stage, except for mini-composters used for small animals or during periods of less than normal mortality rates. The volume of the second stage is site specific but generally greater than or equal to the first stage.

To decrease the chances of fire, bin walls may be no higher than 5 feet, and static piles or windrows may be no higher than 7 feet at the peak.

***Materials*** - Conform to the requirements of Maryland conservation practice standard for Waste Storage Structure, Code 313, for materials and structural design of composting facilities. On a case by case basis, the designer may determine material requirements not covered in that conservation practice standard.

**Composting**

***Compost Mix*** - Develop a compost mix that encourages aerobic microbial decomposition and minimizes nuisance odors.

***Carbon-Nitrogen Ratio*** – Microorganisms use Carbon for energy and growth, and Nitrogen for protein and reproduction. In general, biological organisms need 25 times more Carbon than Nitrogen. The ratio of Carbon to Nitrogen is referred to as the C:N ratio. For short composting periods (7 to 28 days), the initial compost mix should result in a (C:N) ratio between 25:1 and 40:1. The "mix" for this system must be managed closely for the C:N ratio, moisture, and temperature.

Dead animal composting is usually an inconsistent mix with a large mass of material (the animal) having a low C:N ratio, a high moisture content, and nearly zero porosity surrounded by a material (the carbon source) with a high C:N ratio, low moisture levels, and good porosity. This is a bio-filter system, or possibly better described as an above ground burial in a biomass filter with pathogen kill by high temperature. Bio-filter systems require less management time and skills then typical composting systems using C:N ratios of 25:1 to 40:1.

***Carbon Source*** - Choose a carbon source compatible with the organic by-product being composted. A good carbon source will mix well with the organic matter, provide air space for aerobic decomposition, and enhance aeration. Therefore, a good carbon source also acts as a good bulking agent.

Most carbon sources will work well in a mix to compost manure. Dead animals or birds require a friable material such as chicken litter or sawdust because contact with the animal or bird and absorption of decomposing matter encourages microbial decomposition and avoids nuisance odors.

***Bulking Agents*** - Bulking agents are ingredients used to improve the structure and porosity of a mix. Bulking agents are typically dry and vary in particle size (e.g., straw and sawdust), but could be old finished compost.

Add bulking agents to the mix as necessary to enhance aeration. The bulking material may be the carbon source used in the mix or a non-biodegradable material. If a non-biodegradable bulking material is used, provisions must be made for its salvage at the end of the composting period.

***Moisture Content*** - The moisture range during the composting period should range from 40 to 60 percent. Moisture contents above 70 percent invite fly production, anaerobic decomposition, and objectionable odors. For dead animal or bird composting, the carbon source should be as dry as practical. Water should be added during the mixing process of most composting materials. When water is needed add water directly to birds, dead animals, or other organic matter to be composted.

Maintain moisture levels such that materials are thoroughly wetted without being waterlogged or dripping excessive water. In general, material is too wet if water can be squeezed out and too dry if the mix doesn't feel moist to the touch.

***Temperature Control*** - Design the facility and compost mix to reach and maintain the internal temperature for the duration of the composting process to meet the management goals.

For reduction of pathogens, the compost temperature must be maintained for a minimum of 5 cumulative days at or above 130°F during the composting process. Monitoring internal temperatures is a good indicator of pathogen kill. A temperature log of the temperature profiles should be maintained.

***Turning/Aeration*** - Mix or agitate the compost material to improve aeration to attain the desired amount of moisture removal and temperature control. Turning and aeration are functions of the composting process chosen and should follow the requirements of that system.

***Pile Configuration*** - Windrows and static piles should be triangular to parabolic in cross-section and rounded on top to shed rainfall. Align windrows and static piles to avoid accumulation of precipitation. Maintain positive drainage parallel to the windrows.

***Use of Finished Compost*** - Follow the requirements of the Maryland conservation practice standards for Nutrient Management, Code 590, and Waste Utilization, Code 633, for land application.

**Federal, State, and Local Laws**

Adhere to all federal, state, and local laws, rules and regulations for composting and utilization of the compost. It is the responsibility of the producer to secure any permits necessary to install structures and for properly managing the facility on a daily basis.

**Safety**

Incorporate safety and personal protection features and practices into the facility design and operation as appropriate, to minimize the occurrence of hazards during the composting process. These features may include warning signs, fences, ladders, ropes, bars, rails, and other safety devices to protect humans and livestock.

**Control of Scavenging Animals**

The cover requirements of composting are important to discourage animals from scavenging in the compost piles, and to prevent the spread of disease. For dead animal composters, two feet of bulking agent cover over dead carcasses is required for static pile and windrow composting. Bin composting requires one foot of cover over the carcasses.

If scavenging animals become a problem, use additional measures such as fencing or bin composting to control scavenger access. This is to be addressed in the Operation and Maintenance Plan.

**Biosecurity**

It is very important for anyone working on or about poultry or animal farms to follow biosecurity techniques to prevent the spread of diseases. Follow biosecurity measures when working in or around poultry or animal buildings and where animal, manure, debris, and poultry litter exists. If possible, avoid entry into poultry houses or animal facilities. However, if entry is necessary, obtain the farm operator's permission.

## SPECIFICATIONS

Plans and specifications for the composting facility shall be in keeping with this standard and describe the requirements for applying the practice to achieve its intended purpose.

All phases of construction shall comply with the appropriate standards and specifications for the work items including, but not restricted to:

The contractor should furnish a certification statement that he has constructed/assembled any non-NRCS designed structure in accordance with the requirements/specifications of the designer/manufacturer.

## OPERATION AND MAINTENANCE

Develop an operation and maintenance plan prior to design approval that is consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for its operation. The plan must include but is not limited to the following:

1. Objective of the landowner or operator and the operation requirements;
2. The mix proportions, moisture requirements, and materials used;
3. The sizing requirements;
4. The timing of the composting process including loading, unloading, and turning or aeration of the material;
5. Temperature monitoring requirements, including a temperature log;
6. What must be done to prevent scavenging animals and leachate problems;
7. Biosecurity requirements;
8. If available, frequently encountered mistakes in composting and brief “fix it” scenarios or a reference to;
9. References of sources of information or a reference to where they can be found.

The operation and maintenance plan may be part of the Comprehensive Nutrient Management Plan (CNMP) or a Waste Management Plan which will include locations, times, rates, and volumes of application on the land. Waste handling equipment shall be available to remove waste materials from the composting facilities.

## SUPPORTING DATA AND DOCUMENTATION

### Field Data and Survey Notes

The following is a list of the minimum data needed:

1. System plan sketch;
2. Topographic survey of the site showing building locations, elevations at structure location and location of dwellings, wells, floodplains, etc.;
3. Soils investigation showing seasonal high water table;
4. Operator data used to size the facility and documentation of the landowners decisions.

### Design Data

Record on appropriate engineering paper. For guidance on the preparation of engineering plans see chapter 5 of the EFH, Part 650. The following is a list of the minimum required design data:

1. Comprehensive Nutrient Management Plan or Waste Management Plan including the Operation and Maintenance Plan;
2. Plan view including, location map, all system components, material and construction specifications;
3. Construction drawings, and component details;
4. Structure sizing computations;
5. Structure and component design and details;
6. Area grading plan;
7. Quantities estimate;
8. Job Class on plan;
9. Details of foundation drainage, when required;
10. Planting plan. This must meet the criteria, specifications, and documentation requirements of the Maryland conservation practice standard, Critical Area Planting, Code 342.

### Construction Check Data/As-built

Record on survey notepaper, SCS-ENG-28, or other appropriate engineering paper. Survey data will be plotted on plans in red. The following is a list of minimum data needed for As-Builts:

1. Documentation of site visits on CPA-6. Include the date, who performed the inspection, specifics as to what was inspected, all alternatives discussed, and decisions made and by whom;
2. Actual dimensions of installed structure;
3. Verification of adequate foundation preparation;
4. Documentation of installation of foundation drainage;
5. Documentation of reinforcing steel and proper concrete installation, if applicable;
6. Condition of precast panels, if applicable;
7. Certification statement from the contractor(s) that they have constructed/assembled the structure in accordance with the plans and specifications.
8. Statement on seeding and fencing;
9. Final quantities and documentation for quantity changes, and materials certification;
10. Sign and date checknotes and plans by someone with appropriate approval authority. Include statement that practice meets or exceeds plans and NRCS practice standards.

## REFERENCES


1. Arkansas Cooperative Extension Service. *Basic Operating Procedures*. University of Arkansas, 2201 Brookwood Drive, P.O. Box 391, Little Rock, Arkansas 72203. (501) 671-2000.

2. Arkansas Cooperative Extension Service. *Recommended Operating Procedures (for) Swine Composting (Recipe)*. University of Arkansas, 2201 Brookwood Drive, P.O. Box 391, Little Rock, Arkansas 72203. (501) 671-2000.

3. Arkansas Cooperative Extension Service. *Suggested Composter Size.* University of Arkansas, 2201 Brookwood Drive, P.O. Box 391, Little Rock, Arkansas 72203. (501) 671-2000.

4. Delaware Cooperative Extension Service, Delaware *Two-Stage Composter*; Construction Details, 1988.

5. Fulhage, C., Water Quality Publication # 225, *Composting Dead Swine*, Extension Publications, University of Missouri-Columbia, 2800 Maguire, Columbia, MO 65211.

6. Maryland Cooperative Extension Service, 1988. Maryland Free-Standing 2-Stage Composter; Isometric Poultry Composting Shed.

7. Murphy, D.W, (unpublished). *Composting of Dead Birds*. University of Maryland, Cooperative Extension Service; Handout.

8. Murphy, D.W. *Composting Poultry Mortality* (video). University of Maryland, Video Resource Center, 0120 Symons Hall, College Park, Maryland. 20742.

9. Murphy, D.W.and L.E. Carr. *Composting Dead Birds, Fact Sheet 537.* Cooperative Extension Service, University of Maryland System.

10. Murphy, D.W. and T.S. Handwerker, April, 1988. *Preliminary Investigation of Composting as a Method of Dead Bird Disposal*. Proc. National Poultry Waste Mgt. Symp., Columbus, Ohio.

11. USDA, Natural Resources Conservation Service. *Animal Waste Management Field Handbook*, Chapter 10, pages 58 - 62.