NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

COMPOSTING FACILITY

(No.)
Code 317

DEFINITION

A facility for the biological stabilization of waste organic material. Waste organic material for composting may include livestock and poultry manure, dead animal carcasses, and food processing wastes where food is processed as part of normal farming operation. Municipal sludge, solid waste, and other non-farm type wastes are not included in this standard.

PURPOSE

This practice may be applied as a component of a waste management system to support one or more of the following:

- Treat waste organic material biologically, producing a humus-like material free of pathogenic organisms and weed seeds
- Reduce waste volume
- Reduce air pollution
- Reduce water pollution
- Provide a soil amendment
- Provide a fertilizer substitute
- Provide alternative disposal for dead poultry and other small animals.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

a. Waste organic material (animal manures, dead animal carcasses, and food processing wastes) is generated by agricultural production or processing.

b. Composting is needed to manage the waste organic material properly.

c. An overall waste management system has been planned that accounts for the end use of the composted material.

CRITERIA APPLICABLE TO ALL PURPOSES

All planned work shall comply with all Federal, State, and local laws and regulations. Composting facilities may need to be approved or permitted by the Florida Department of Environmental Protection. Refer to Chapter 62-709 Florida Administrative Code (F.A.C.) for permitting requirements. The producer will be responsible for securing any necessary permits to install structures and for properly managing the facility on a daily basis. The composting facility shall be operated in accordance with NRCS Conservation Practice Standard, Waste Management System, Code 312.

Soils. Composting facilities shall be sited on soils having slow to moderate permeability to minimize seepage of dissolved substances into the soil profile and movement toward groundwater. Consideration should be given to use of an impermeable liner for sites which do not have slow to moderate permeability.

Runoff. Runoff shall be diverted from outside drainage areas around the compost facility. Runoff from the compost facility shall be collected, treated, and disposed of properly.

Facility Size. The composting facility shall be designed to provide storage for the maximum length of time anticipated between emptying events or storage period. 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.

Composting Method. The composting method must fit the individual farm operation. The composting method (aerated windrow, static pile and in-vessel) shall meet the requirements of the Agricultural Waste Management Field Handbook (AWMFH), Chapter 10. Compost piles for windrowed and static piles should be triangular to parabolic in cross-sectional form with a base width to height ratio of approximately 2 to 1.

Location. Composting facilities shall be located near the source of organic waste as practical. Composting operations shall be located where movement of any odors toward neighbors will be minimized.

The composting facility shall not be located on a floodplain unless protected from inundation or damage from a 25-year frequency flood event.

Odor. Select carbonaceous material that, when blended with the nitrogenous material, will result in the desired pH. The blended material should have a pH at or slightly below neutral for best odor control. Where odors do not present a problem, pH of 8 to 9 is acceptable, but strong ammonia and amine related odors will be present for up to the first 2 weeks.

Moisture. A source of water must be available for compost pile moisture control from start-up through completion. Water used for moisture control must be free of deleterious substances. The moisture content of the blended material at start-up of the composting process should be approximately 60 percent (wet weight basis) and maintained between 40 and 60 percent during the composting process.

Carbon Source. A dependable source of carbonaceous material must be available. The material should have a high carbon content and high carbon-nitrogen (C:N) ratio. Wood chips, sawdust, peanut hulls, straw, corn cobs, peat moss, and well bedded horse manure are good sources of carbon.

Bulking Materials. Bulking materials may be added to enhance air flow within the composting material. Piles that are too compact will inhibit the composting process. The carbonaceous material can be considered as a bulking agent. Where it is desirable to salvage carbonaceous material, provisions for removing the material, such as screening, must be made.

Carbon-Nitrogen Ratio. The amounts of the various ingredients shall be calculated to establish the C:N ratio of the mix to be composed. The C:N ratio should be between 25:1 and 40:1. See Table 10-6 in the AWMFH for typical C:N ratios of common composting amendments. Use the higher range of C:N for organic materials that decompose at a high rate (or are highly unstable) with associated high odor production.

Where more than two ingredients are to be blended, the two main ingredients are to be used in the analysis for the desired C:N and, mixed accordingly. Adding up to 50 percent by weight of other ingredients to improve workability and air movement is permissible as long as the C:N of the added ingredient does not exceed the target C:N of the compost.

Composting Period. The time needed for completion of the composting process varies with the material and must continue until the material reaches a stability level at which it can be safely stored without creating undesirable odors and poor handling features. Acceptable stability occurs when microbial activity diminishes to a low level. Stability can be obtained in about 21-28 days but can require up to 60 days to produce the desired quality. Visual inspection and temperature measurements will provide needed evaluation of compost status.

Land Application of the Compost. Land application of compost shall be in accordance with NRCS conservation practice standard, Waste Utilization, Code 633. The compost should be applied to the land at recommended agronomic rates. The compost should be tested to determine the nutrient content. In the absence of local laboratory analysis, compost nutrient values contained in the AWMFH shall be used to determine the maximum land application rates for compost.

Equipment. Compost facilities shall be designed to accommodate the operators equipment. Equipment must be available for initial mixing, turning, and applying the compost on the land. Appropriate long stem thermometers should be available for managing the composting material.

Additional Criteria for Dead Bird Composting

All dead bird composters shall have the following features:

a. Roof: While composting of some material may be accomplished in the open, it does not work well with dead bird composts. A roof ensures year round operation and controls rain water and percolation. The roof structure shall be designed for applicable wind and dead loads for agricultural buildings according to local building codes. Wind loads shall be calculated using ASAE practice standard ASAE EP288.4. Post and beam design shall be in accordance with procedure described in the National Forest Products Association's *National Design Specification for Wood Construction.* Post embedment design shall be in accordance with ASAE practice standard ASAE EP486.

b. Concrete Floor: This is critical to all weather operations, secures the composter against rodents, dogs, etc., and prevents contamination of the surrounding area. Concrete slab design shall consider the required performance and the critical applied loads along with both the subgrade material and material resistance of the concrete slab. Where applied point loads are minimal and the subgrade is uniform and dense, the minimum slab thickness shall be 4 inches with a minimum joint spacing of 10 feet. Joint spacing can be increased if steel reinforcing is added based on subgrade drag theory.

c. Building Materials: All lumber in contact with the ground or compost shall be pressure-treated in accordance with Federal Specification, Wood Preservation: Treating Practices, TT-W-5711. All metal used in the structure shall be galvanized or otherwise protected from corrosion.

d. Facility Size: The volume required for composting is dependent upon estimated mortality rates, market weight, number of animals, days to reach market weight, and a volume factor. Volume shall be calculated using equation 10-22 in the AWMFH. Table 10-7 of the AWMFH provides suggested mortality rates for various poultry types. A volume factor of 2.5 is recommended for use in Florida. Composting facilities shall include a primary composting unit into which alternate layers of low moisture content manure, carbon source material (straw is common), and dead animal carcasses are placed. A secondary composting unit is often necessary to complete the composting process.

e. Temperature: A minimum temperature of 130° F shall be reached during the composting process. If this temperature is not reached, the resulting compost shall be incorporated immediately after land application.

CONSIDERATIONS

Composting of waste organic materials should improve water quality by eliminating alternative methods of disposal which could pollute ground and surface water. Soil amended with compost will have an increased available moisture content, which will result in some additional storage of water in the soil profile resulting in less leaching. Caution must be taken to prevent spreading compost near surface waters because high organic matter content could cause oxygen depletion problems and other related problems.

Evaluate the effects of changed infiltration conditions on groundwater recharge, and evaluate changes in volumes and rates of runoff caused by the location of the operation. Properly manage movement of organic material, soluble substances, and substances attached to solids carried by runoff.

Evaluate site paving needs in terms of effects of equipment operation on trafficability, soil compaction, and potential for contamination from compost and petrol 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 is accomplished by mixing an energy and structural component

(carbonaceous material), a nutrient source (nitrogenous material), water, and oxygen in a prescribed manner to meet aerobic microbial metabolic requirements. The process is carried out under specific moisture and temperature conditions for a specified period of time. The composting process may become inhibited when moisture falls below approximately 40 percent. Correct proportions of the various compost ingredients are essential to minimize odors and to avoid attracting flies, rodents, and other small animals.

Increased surface area favorably affects evaporation and natural aeration and increases the area exposed to infiltration from precipitation in uncovered stacks. Aligning piles north to south and maintaining moderate side slopes maximizes solar warming. Windrows should be aligned to avoid accumulation of precipitation.

It is possible, though unlikely, for the temperature to rise above the normal range and create conditions suitable for spontaneous combustion. If temperature rises above 165° F, the material should be removed from the bin and cooled. If temperature falls significantly during the composting period and odors develop, or if material does not reach operating temperature, investigate piles for moisture content, porosity, and thoroughness of mixing. Compost managed at the required temperatures will favor destruction of any pathogens and weed seeds.

Heat generated by the process causes the compost pile to dehydrate. As the process proceeds, material consolidates, and the volume of voids through which air flows decreases. Materials selected for the composting mix should provide for adequate air movement throughout the composting process. Periodically turning the pile and maintaining proper moisture levels for windrows and static piles will normally provide adequate aeration.

Keep compost well aerated to minimize nitrogen loss by denitrification. Keep pH at neutral or slightly lower to avoid nitrogen loss by ammonification. High amounts of available carbon will aid nitrogen immobilization. Phosphorus losses will be minimized when the composting process is managed according to the requirements of this standard.

Test compost material for carbon, nitrogen, moisture, and pH if compost fails to reach desired temperature or if odor problems develop. The finished compost material should be periodically tested for constituents that could cause plant phytotoxicity as the result of application to crops. Composted materials that are prepared for the retail market will require testing for labeling purposes.

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.

Consideration should be given to providing additional storage for manure and carbon source material for dead bird composting,

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 carcass, odor control, and reduced need for storage volume.

PLANS AND SPECIFICATIONS

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

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan shall be developed that is consistent with the purposes of this standard, its intended life, safety requirements, and the criteria for its design. The O&M plan shall include compost mixture requirements, maximum and minimum temperature for operation, land application rates, moisture level, etc.

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

AWMFH
NRCS Conservation Practice Standard,
Waste Utilization, Code 633
Waste Management System, Code 312
Waste Storage Facility, Code 313
ASAE EP288.4, EP486
Chapter 62-709 F.A.C.
Federal Specification, Wood Preservation:
Treating Practices, TT-W-5711
“National Design Specification for Wood
Construction,” National Forest Products
Association