NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

COMPOSTING FACILITY

(No.)

CODE 317

DEFINITION

A structure or device to contain and facilitate the controlled aerobic decomposition of manure or other organic material by micro-organisms into a biologically stable organic material that is suitable for use as a soil amendment.

PURPOSE

To reduce the pollution potential and improve the handling characteristics of organic waste solids; and produce a soil amendment that adds organic matter and beneficial organisms, provides slow-release plant-available nutrients, and improves soil condition.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- Organic waste material is generated by agricultural production or processing.
- The facility is a component of a planned waste management system;
- The facility can be constructed, operated and maintained without polluting air and/or water resources; and,
- The compost can be applied to the land or marketed to the public.

CRITERIA

General Criteria Applicable to All Purposes

Laws and Regulations. Install and operate the facility in compliance with all federal, state and local laws, rules and regulations.

Safety. Incorporate safety and personal protection features and practices into the facility and its operation as appropriate to minimize the occurrence of equipment and biosecurity hazards during the composting process.

Facility Siting. Locate on a base of low permeability soils, concrete, or other liner material that will not allow contamination of ground water. The floor of the composting facility shall be at least two feet above the seasonal high water table.

Locate outside of floodplains when practical; otherwise protect the facility from inundation or damage from a 25-year flood event.

Locate so that prevailing winds and landscape elements minimize odors and protect visual resources.

Compost facilities shall not be located within 300 feet of water wells or within 10 feet of property lines or buildings. The distance from a well shall be measured from the well's centerline to the outside perimeter of the compost facility.

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

Locate so that water is available to the facility during dry periods to ensure proper moisture and acceptable curing times to meet the management goals.

Facility Type. Select the type of composting facility or method based on the type and availability of raw material, the desired quality of finished compost,

equipment, labor, time and land available.

Manure and dead animal carcasses are the most common materials composted in agricultural operations. Composting methods and equipment are usually geared toward one or the other. All types of manure can be composted while dead animal carcass composting is usually limited to poultry or swine and cattle nursery stock due to animal carcass size practical constraints.

Methods of composting covered in this standard are:

1. Windrows
2. Static Pile
3. In-Vessel
4. Compost Bin

Manure is typically composted using windrows, static pile, and in-vessel methods. Dead animal carcasses are typically composted using in-vessel and compost bin methods.

Refer to NRCS conservation practice standard Animal Mortality Facility for more information on treatment and disposal of dead animal carcasses.

Meet the structural requirements of conservation practice standard 313, Waste Storage Facility when designing slabs, walls, and support structures. Meet the requirements of conservation practice standard 367, Roofs and Covers when designing roofs.

Facility Size. Size the composting facilities to accommodate the amount of raw material planned for active composting, with a capacity consistent with the composting processes that will be used to produce the desired compost product, and with sufficient finishing time as required to achieve the desired characteristics. Space for compost storage may be included in the finishing space or in a separate facility. Select dimensions to accommodate handling and processing.

A facility for manure and other agricultural organic waste that is to be used on the farm shall have the capacity to produce compost that can be safely stored without undesirable odors. This requires the temperature of the compost to be maintained above 104^{o}F for five days with at least four hours above 130^{o}F during that time period.

A facility to produce compost for use off the farm or for sale shall have the capacity to significantly reduce pathogens. For a static pile or within vessel facility this requires the temperature of the compost to be maintained above 130^{o}F for three days. The total compost period shall include time for the initial primary stage of composting and time for secondary stage composting. For a windrow system this requires the temperature of the compost to be above 130^{o}F for 15 days with a minimum of five turnings of the compost.

If the facility is to be used to compost animal carcasses it shall have the capacity to maintain the compost temperature greater than 130° F for at least 5 days as an average throughout the compost mass followed by a compatible time for secondary composting. For a windrow system the temperature of the compost shall be above 130^{o}F for 15 days with a minimum of five turnings of the compost. Size animal mortality composting facilities according to the methods provided in the National Engineering Handbook Part 637, Chapter 2 – Composting (NEH 637.0213, Dead Animal Composting), National Engineering Handbook Part 651, Agricultural Waste Management Field Handbook, Chapter 10 Mortality Management (NEH 651.1007), NRCS or comparable extension publication. Base the size of dead animal composting facilities on normal mortality loss records for the operation. If these data are not available use locally established mortality rates for the type of operation. Ensure that the final product of the composting process has no visible pieces of soft tissue remaining.

Use of Finished Compost. Land application of finished compost shall be in accordance with conservation practice standard 590, Nutrient Management; or conservation practice standard 633, Waste Utilization.

Criteria Applicable to Prefabricated Rotary Drum Composting Facility for Treatment of Dead Animal Carcasses

Locate the facility as close to the source of mortality as practical, considering bio-

security issues and the need to keep the facility out of sight of the general public.

This is a treatment component of an agricultural waste management system for the biological stabilization of organic material. The selected rotary drum composter(s) must have the capacity for the operation's average weight of dead animals per day. The appropriate size rotary drum composter(s) shall be selected based on the operation's actual average weight of dead animals per day. If these data are not available use locally established mortality rates for the type of operation. The average weight of dead animals per day for swine and large animal operations are determined based on the information contained in the NEH Part 637 - Environmental Engineering. The average weight of dead animals per day for poultry operations can be estimated based on the information contained in the NEH Part 651 - Agricultural Waste Management Field Handbook.

Rotary drum composter(s) provide the initial primary stage of composting. A secondary storage facility shall be provided for secondary stage composting and curing of the compost material and to aid in significant reduction of pathogens. Compost shall remain in the secondary storage facility until the compost has reached a stable temperature and all heating cycles have ceased followed by thirty days in covered storage facility for curing.

CONSIDERATIONS

To reduce offensive odors increase the carbon nitrogen ratio. A carbon nitrogen ration of 30:1 in the initial mix should have minimal 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 or other additive 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.

Orient windrows to prevent ponding of surface runoff.

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

Minimize blown in rain by providing roof overhang.

For facilities that are organic producers or that sell compost to organic producers, ensure that the treated lumber used in the stacking facility meets the requirements for organic production. It may be best to have the producer consult with the organic certifier as to the use and acceptability of treated lumber for litter and compost storage.

PLANS AND SPECIFICATIONS

Prepare plans and specifications in accordance with the criteria of this standard and describe the requirements for applying the practice to achieve its intended use, including:

- Layout and location of livestock facilities, waste collection points, and/or waste transfer
- Size, type and number of animals or other sources of organic feedstock
- Grading plan showing excavation, fill, and drainage, as appropriate
- Size and capacity needed
- Design requirements
- Safety requirement for operation

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 the sequence that they are to be layered and mixed shall be given in the plan.

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 lesser carbon to nitrogen

ratio can be used if nitrogen mobilization is not a concern.

Carbon Source. Store a dependable source of carbonaceous material with a high C:N ratio to mix with nitrogen rich waste materials. Wood chips, sawdust, peanut hulls, rice hulls, bark, peat moss, and well-bedded horse manure are good sources of carbon. Two materials may have the same carbon to nitrogen ration (C:N) but may vary significantly in "readily available" carbon. Rice hulls are an excellent source of readily available carbon while most straw sources are not. Chopped wheat straw is minimally acceptable while most straw hay and prairie hay does not give satisfactory results.

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. Make provision for the salvage of any non-biodegradable material used in the composting process.

Moisture Level. Maintain adequate moisture in the compost mix throughout the compost period within the range of 40 to 65 percent (wet basis). Prevent excess moisture from accumulating in the compost in high precipitation climatic regions. This may require the facility to be covered.

Temperature of Compost Mix. Manage the compost to attain and then maintain the internal temperature for the duration required to meet management goals. It may be necessary for the compost to reach 145^{o}F to adequately destroy weed seeds. Closely monitor temperatures above 165^{o}F. Take action immediately to cool piles that have reached temperatures above 185^{o}F.

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.

Nutrients. 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. A low C:N ratio will cause a loss of nitrogen. Phosphorus losses will be minimized when the composting process is managed according to the requirements of this standard.

Testing Needs. 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 marker will require testing for labeling purposes.

Monitoring: The operation and maintenance plan shall state that composting is a biological process that needs monitoring and management throughout the composting period to insure proper composting processes. The operation may need to undergo some trial and error in the start-up of a new composting facility. Manage the compost piles for temperature, odors, moisture, and oxygen, as appropriate. Test the finished compost as appropriate to assure that the required decomposition has been reached.

REFERENCES

USDA, NRCS. 2000. National Engineering Handbook, Part 637, Chapter 2, Composting. Washington, D.C.

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