

**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 and/or other organic material by microorganisms into a stable humus like product suitable as a soil amendment.

**PURPOSE**

This practice may be applied to achieve one or more of the following purposes:

- To reduce the pollution potential and odors generated by organic waste solids;
- To 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. Final design will address operator safety, biosecurity and fire hazard associated with composting.

**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 the facility as close to the source of wastes as practicable.

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.

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.

Design the facility to enable the management of the moisture content of the compost. 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 operator's goals, type and availability of raw material, the desired quality of finished compost, equipment, labor, time and land available.

**Structures.** For facilities that incorporate storage or structural components, use the appropriate criteria in conservation practice standard 313, Waste Storage Facility

**Surface.** Use the appropriate criteria from conservation practice 561, Heavy Use Area Protection when designing the floor surface of the facility.

**Roof and Cover.** For facilities that incorporate a roof or cover, use the appropriate criteria conservation practice standard 367, Roofs and Covers when designing roofs.

**Facility Size.** Size the composting facility to accommodate the amount of raw material necessary for active composting. Also include appropriate space for curing the compost. Space for compost storage may be included in the finishing space or in a separate facility. Include adequate space to accommodate the handling and processing of the compost.

Facilities for composting 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°F for five days with at least four hours above 130°F during that time period.

**Off Farm Use.** Facilities designed 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°F for three days. The total compost period shall include time for the primary stage of composting as well as time for secondary stage composting.

Windrow systems require the temperature of the compost to be maintained at or above 130°F for 15 days during the composting period. A minimum of five turnings of the compost is necessary to ensure the entire pile is composted.

**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.

#### **Additional Criteria to Reduce Pollution Potential and Odors**

**Carbon Nitrogen Ratio.** Increase the starting Carbon Nitrogen ratio to 30:1

#### **CONSIDERATIONS**

To minimize odors and nitrogen loss, consider increasing the starting carbon nitrogen ratio and select carbonaceous materials that provide a balance of nutrients and porous texture.

Consider the use of a chemical neutralizing or other additive agent to improve odor reduction.

To maximize solar warming, consider aligning piles north to south.

Employ other conservation practices to protect compost facilities from the wind in cold or dry climates.

Reduce blown in rain by providing roof overhang.

Consider the impact of using treated lumber for the construction of composting facilities on the quality and/or acceptability of the compost.

**NRCS, Georgia**

**October 2016**

## 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 and/or waste transfer structures.
- 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.

**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°F to adequately destroy weed seeds. Closely monitor temperatures above 165°F. Take action immediately to cool piles that have reached temperatures above 185°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.

**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**

GA NRCS Conservation Practice Standard, Diversion (362)  
GA NRCS Conservation Practice Standard, Roofs and Covers (367)  
GA NRCS Conservation Practice Standard, Waste Storage Facility (313)  
GA NRCS Conservation Practice Standard, Critical Area Planting (342)  
GA NRCS Conservation Practice Standard, Animal Mortality (316)  
GA NRCS Conservation Practice Standard, Nutrient Management (590)

## **REFERENCES**

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

**NATURAL RESOURCES CONSERVATION SERVICE**  
**GEORGIA**  
**OPERATION AND MAINTENANCE REQUIREMENTS**  
**COMPOSTING FACILITY**

**CODE 317**

Land Owner/Operator \_\_\_\_\_

County \_\_\_\_\_ SWCD \_\_\_\_\_ Farm/Tract No. \_\_\_\_\_

Prepared By \_\_\_\_\_ Date \_\_\_\_\_

**OPERATION AND MAINTENANCE ITEMS**

A properly operated and maintained composting facility is an asset to your farm. This composting facility was designed and installed for temporary storage and treatment of animal wastes. The estimated life span of this installation is at least \_\_\_\_ years. The life of this installation can be assured and usually increased by developing and carrying out a systematic operation and maintenance program.

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.

This practice will require periodic maintenance and may also require operational items to maintain satisfactory performance. Your operation and maintenance program requirements include:

**OPERATION**

**Carbon-Nitrogen Ratio**

The initial compost mix shall result in a Carbon to Nitrogen ratio between 25:1 and 35:1. Compost with a greater carbon to nitrogen ratio can be used if nitrogen immobilization is not a concern.

Typical carbon to nitrogen ratios of common composting amendments:

Material C:N ratios _____	Material C:N ratios _____	Material C:N ratios _____
Alfalfa (broom stage) 20	Cattle manure (with straw) 25-30	Green leaves 30-60
Alfalfa hay 12-18	Cattle manure (liquid) 8-13	Green rye 36
Asparagus 70	Clover 12-23	Horse manure (peat litter) 30-60
Austrian pea straw 59	Clover (sweet and young) 12	Leaves (freshly fallen) 40-80
Austrian peas (green manure) 18	Corn & sorghum stover 60-100	Newspaper 400-500
Bark 100-130	Cucumber 20	Oat straw 48-83
Bell pepper 30	Dairy manure 10-18	Paper 173
Breading crumbs 28	Garden wastes 20-60	Pea vines (native) 29
Cantaloupe 20	Grain rice 36	Peat (brown or light) 30-50
Cardboard 200-500	Grass clippings 12-25	

**Carbon Source**

A dependable source of carbonaceous material shall be stored and available to mix with nitrogen rich waste materials. 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.

**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, provisions shall be made for its salvage.

**Moisture Level**

Provisions 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**

Manage the compost to attain and then maintain the internal temperature for the duration required to meet management goals. For best results, operating temperature of the composting material should be 131°F to 170°F once the process has begun. It should reach operating temperature within about 7 days and remain elevated for up to 14 days to facilitate efficient composting. 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. The material should remain at or above 110°F for the remainder of the designated composting period.

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.

Document the daily temperatures of the compost 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.

If the 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, plant diseases and weed seeds.

**Aeration**

Heat generated by the process causes piles 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 be carefully selected to ensure 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. Appropriate equipment must be available for initial mixing, turning, and hauling composted material and carbonaceous material.

**Pathogens**

When using the in-vessel or static aerated pile type of composting, temperature of the active pile must be maintained at 131°F or higher for 3 consecutive days to achieve pathogen reduction. To achieve pathogen destruction when composting with aerated windrows, the temperature of the active compost pile must be maintained at 131°F or higher for at least 15 consecutive days and the windrow must be turned at least 5 times during the high temperature period.

### **Vectors**

Flies, rats and birds may be attracted to the compost facility. Mosquitoes may reproduce where standing water is present. To minimize vector problems:

- Turn piles frequently to promote rapid decomposition.
- Eliminate standing water.
- Employ good housekeeping to keep the area clean.

### **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. Phosphorus losses will be minimized when the composting process is properly managed. Include compost nutrients in nutrient management plans; determine the effects of use and management of nutrients on the quality of surface water and ground water as related to human and livestock consumption.

### **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 market will require testing for labeling purposes.

### **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 federal, state and local laws. Compost applied to land shall be at the rates outlined in the Nutrient Management Plan and in accordance with state law.

## **MAINTENANCE**

- 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.
- All fences, railings, and/or warning signs shall be maintained to provide warning and/or prevent unauthorized human or livestock entry.
- Maintain all electrical and mechanical equipment in good operating condition by following the manufacturer's recommendations. Maintain grounding rods and wiring in good condition for all electrical equipment.
- Do not compact the material by driving over it or packing it with equipment. Do not allow the operation of any equipment that exceeds the design limit on or within ten feet of the structure.



Quality Assurance Plan (QAP)

**Landowner/Project:** \_\_\_\_\_ **Engineering Job Class<sup>1/</sup>:** \_\_\_\_\_  
**Service Center:** \_\_\_\_\_ **County:** \_\_\_\_\_  
**Conservation Practice(s) & Engineering Job Class Included in this Job:** Composting Facility, Code 317  
**QAP Prepared By:** \_\_\_\_\_ **Job Approved By:** \_\_\_\_\_  
**Est. Construction Start Date:** \_\_\_\_\_ **Est. # Site Visits:** \_\_\_\_\_ **Est. # QA Hours:** \_\_\_\_\_

<sup>1/</sup>The engineering job class for a given job will be based on the most restrictive element or conservation practice included in the job.

Certification Statements

I certify that the items, intensity, and inspection requirements listed in Table 1 is adequate quality assurance (QA) for this project.

\_\_\_\_\_

*Approver of Engineering Plans (Signature)*

*Date*

I certify that \_\_\_\_\_ has the experience necessary to perform the construction inspection for the items shown in Table 1 and has the qualifications as shown in Table 2 for this project. I support this individual as the construction inspector and will allow the individual adequate staff time to perform the QA inspection for this project.

\_\_\_\_\_

*Line Supervisor (Signature)*

*Date*

I certify that I have reviewed the engineering plans and specifications and fully understand the QA requirements of the subject project. I will contact the Project Approver if I have any questions or concerns regarding the QA activities and will notify and obtain approval from the Project Approver if there is need to make any changes to the plans and/or specification during construction.

\_\_\_\_\_

*QA Inspector (Signature)*

*Date*

## Quality Assurance Plan (QAP)

### Table 1 - Items to be Inspected and Verified

Items <sup>2/</sup>	Intensity <sup>3/</sup>	Inspection Requirements <sup>4/</sup>
Preconstruction Meeting	NA	Meet with landowner and contractor, discuss project, sign and date documents; provide all applicable documents including drawings and specifications.
Permits	NA	Verify that the landowner has obtained all required permits prior to construction.
Utility Notification	NA	Verify that landowner has contacted utility companies prior to construction for underground utility location.
Pollution Control	P/F	Inspect to verify that pollution control measures are installed as per the plans and specification and/or as required by the permits.
Clearing and Grubbing	P/F	Limited inspection will be required on clearing and grubbing. The limits for clearing and grubbing will be staked and inspections will be required to verify that the item was completed in accordance with the plans and specifications.
Excavation	P/F	Verify that the subgrade is properly excavated to the neat lines and grades as specified in the engineering plans and specifications.
Earthfill	C	Verify that foundation and all earthfill is of the quality and moisture content specified and compacted to the degree as specified and placed to the neat lines and grades as shown on the plans and specifications.
Concrete	P/F	Verify that the concrete is of the Class as specified and placed to the neat lines and grades as shown on the plans. Check reinforcing steel prior to placing the concrete to ensure it is of the type, size and spacing as shown on the drawings. Verify that the concrete is cured properly in accordance with the specifications.
Structural Components	P	Verify that the concrete slabs, walls, support structures, roofs are of the quality specified and constructed to the neat lines and grades as specified in the construction plans and specifications. Obtain certification of truss from a Georgia registered professional engineer prior to installation.
Spoil Disposal	P	Verify that all spoil material is disposed of at the location and manner shown on the plans or stated in the specifications.
In-Vessel Composter	P/F	As appropriate, verify that the in-vessel composter was constructed in accordance with the manufacturer's plans and specifications.
Vegetative Measures	P/F	Verify that disturbed areas are stabilized and vegetated during and after construction. Verify the type, quality, and quantity of seed mixture.
Quantity Computation	P/F	Perform quantity computations for payment purposes as per the payment schedule and specifications. Quantity computations shall be recorded on standard NRCS forms or NRCS-ENG-523A and <u>checked</u> and <u>initialed</u> by a second person.
Photographs	P	Take photographs of the site, before, during and after construction.
As-built Drawings	P	Keep drawings current during construction and prepare as-built drawings within 14 days of final construction.
Survey Notes	P	All construction checks taken including periodic elevation checks shall be recorded on loose leaf survey notes (form ENG 28, 29) or in a bound survey field book.

<sup>2/</sup> Include items that require quality assurance.

<sup>3/</sup> Intensity of inspection: NA – Not Applicable, C – Continuous, P – Periodic, F– Final. The inspector shall immediately notify the approver of the job if continuous inspection is required and cannot be performed with available staff.

<sup>4/</sup> Inspection requirements shall be to the degree necessary to certify that the project is installed in accordance with the plans and specifications.

**Quality Assurance Plan (QAP)****Table 2 – Required QA Qualifications for Construction Inspector**

<b>QA Qualifications</b>
1. Appropriate EJAA for the engineering job class for construction of the conservation practices to be installed.
2. Knowledgeable of the following references: a) National Engineering Manual (NEM) Part 512 – Construction b) National Engineering Handbook, Part 645, Construction Inspection



**STATEMENT OF WORK**  
**Composting Facility (317)**  
**Georgia**

**These deliverables apply to this individual practice. For other planned practice deliverables refer to those specific Statements of Work.**

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### **Licensure**

Georgia Code Title 43, Professions and Businesses, Chapter 15, Professional Engineers and Land Surveyors, regulates the practice of engineering in Georgia and provides the definition of engineering in Chapter 15 §2(11). Technical assistance for this engineering conservation practice may be considered the practice of engineering and subject to licensure requirements of Georgia Code Chapter 15. It is the responsibility of the individual providing technical assistance to determine and verify whether this practice is subject to Georgia Code Chapter 15.

### **DESIGN**

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#### **Deliverables:**

1. Design documentation that will demonstrate that the criteria in NRCS practice standard have been met and are compatible with other planned and applied practices.
  - a. Practice purpose(s) as identified in the conservation plan.
  - b. List of required permits to be obtained by the client.
  - c. Compliance with NRCS national and state utility safety policy (NEM Part 503-Safety, Subpart A - Engineering Activities Affecting Utilities 503.00 through 503.06).
  - d. List of facilitating practices
  - e. Practice standard criteria related computations and analyses to develop plans and specifications including but not limited to:
    - i. Geology and Soil Mechanics (NEM Subpart 531a)
    - ii. Capacity
    - iii. Structural, Mechanical and Appurtenances
    - iv. Maximize Clean Water Diversion.
    - v. Environmental Considerations (e.g. odors, water quality, distance from wells and other water sources)
    - vi. Bio-security
    - vii. Safety Considerations (NEM Part 503-Safety, Subpart A, 503.06 through 503.12)
2. Written plans and specifications including sketches and drawings shall be provided to the client that adequately describe the requirements to install the practice and obtain necessary permits.
3. Design Report and Inspection Plan as appropriate (NEM Part 511, Subpart B Documentation, 511.11 and Part 512, Subpart D Quality Assurance Activities, 512.30 through 512.32).
4. Operation and Maintenance Plan
5. Certifications that the design meets practice standard criteria and complies with applicable laws and regulations (NEM Subpart A, 505.03(b)(2)).
6. Design modifications during installation as required.

### **INSTALLATION**

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#### **Deliverables**

1. Pre Installation conference with client and contractor.
2. Verification that client has obtained required permits.
3. Staking and layout according to plans and specifications including applicable layout notes.
4. Installation inspection (according to inspection plan as appropriate).
  - a. Actual materials used.
  - b. Inspection records
5. Facilitate and implement required design modifications with client and original designer.
6. Advise client/NRCS on compliance issues with all federal, state, tribal, and local laws, regulations and NRCS policies during installation.
7. Certification that the installation process and materials meets design and permit requirements.

**STATEMENT OF WORK  
Composting Facility (317)  
Georgia**

**CHECK OUT**

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**Deliverables**

1. As-Built documentation.
  - a. Extent of practice units applied
  - b. Drawings
  - c. Final quantities
2. Certification that the installation meets NRCS standards and specifications and is in compliance with permits (NEM Subpart A, 505.03(c)(1)).
3. Progress reporting.

**REFERENCES**

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- NRCS Field Office Technical Guide (eFOTG), Section IV, Conservation Practice Standard - Composting Facility, 317.
- NRCS National Engineering Handbook, Part 637, Chapter 3, Composting
- NRCS National Engineering Manual (NEM).
- NRCS National Environmental Compliance Handbook
- NRCS Cultural Resources Handbook