# **01-001 DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY**

**Chapter 560: STANDARDS FOR COMPOST PRODUCTS**

**Developed by**

**The Maine Department of Agriculture,**

**Conservation and Forestry**

**In Conjunction With**

**The Maine Department of Transportation,**

**The Maine Department of Environmental Protection,**

**and**

**The Soil and Water Conservation Commission**

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**STANDARDS FOR COMPOST PRODUCTS**

**The Maine Department of Agriculture,**

**Conservation and Forestry**

**1. AUTHORIZATION**

 The Department of Agriculture, Conservation and Forestry was given the responsibility for developing compost standards in Public Law 1989. Ch. 585 subsection 1812-C (5 MRSA subsection 1812-C).

**2. PURPOSE**

 These compost standards are intended to be used by state agencies in purchasing compost products made from organic waste Products or for writing specifications for licenses, permits and contracts that may call for the use of such products. These standards have been developed and adopted by the Department of Agriculture, Conservation and Forestry as mandated. They may be voluntarily used or adopted by other agencies for their own programs.

**3. USE OF SPECIFICATIONS REQUIRED**

 All projects supported by funding from the Maine Department of Agriculture, Conservation and Forestry shall use the compost Product specifications outlined in Section 6 of these rules, when purchasing compost products in volumes greater than 10 cubic yards.

**4. DEFINITIONS**

 **Compost** - Organic materials which have undergone biological decomposition, and have been disinfected using composting or similar technologies, and have been stabilized to a degree which is potentially beneficial to plant growth.

 **Compost Grades** - Classifications of compost materials based on nutrient content.

 Some suggested grades are:

 **Nutrient grade compost** - A compost applied to soil as a nutrient source. Nutrient levels are measurable and meet state's minimum levels to qualify for fertilizer status ( see Appendix). Conductivity is greater than 4 mmhos/cm. It may contain appreciable lime equivalent.

 **Topsoil grade compost** - Compost or compost soil mixture with organic content 4 - 40%, conductivity less than 2 mmhos/cm Used as a soil replacement. Density is normally 1000-1600 lbs. per cubic yard.

 **Horticultural grade** - A compost with organic matter greater than 25%. Conductivity is less than 1 mmhos/CM or mixed with other materials to achieve this level. Density is normally less than 1000 lbs. per cubic yard.

 **Composting** - The process by which biological decomposition of organic materials is carried out under controlled aerobic conditions, and which stabilizes the organic fraction into a material which can easily and safely be stored, handled and used in an environmentally acceptable manner. (The presence of anaerobic zones within the composting material will not cause the process to be classified as something other than composting.) Simple exposure of solid waste under uncontrolled conditions resulting in natural decay is not composting.

 **Conductivity** - A measure of the soluble salts in the soil. This is used as an overall indicator of the level of macro and micro nutrients in the soil. Conductivity is measured in units of milli mhos per centimeter (mmhos/cm).

 **D.E.P.** - The Department of Environmental Protection including the Board of Environmental Protection and the Commissioner.

 **Foreign Matter** - Sticks, stones, clods, roots, glass, plastic, metal or other unwanted non-compostable materials that may be present in compost.

 **Heavy Metals** - Those elements that are regulated because of their potential for human, plant or animal toxicity including but not limited to cadmium (Cd), copper (Cu), chromium (Cr), mercury (Hg), nickel (Ni), lead (Pb) and zinc (Zn).

 **Loam**. Soil textural class that consists of a mixture of sand (52% ), silt (28-50%), and clay (7-27%) measured on a weight basis.

 **Mesophilic Stage** - The stage of the composting process in which the rate of biological activity is high enough to maintain an average pile temperature of at least 90 degrees F( 32 c). This stage follows the thermophilic stage. It is in this stage that continued decomposition and stabilization occurs.

 **Mulch** - A protective covering of various substances, especially organic, placed around plants to prevent erosion, compaction, evaporation of moisture, and freezing of roots and to control weeds.

 **On-site mixing** - The practice of creating a soil mixture by spreading compost on the surface of the site to be prepared and tilling it into the top 3 to 6 inches of the existing soil. This practice would be used primarily for establishing grass cover (or other crop) on large open areas.

 **Pathogen** - An organism, chiefly a microorganism, including viruses, bacteria, fungi, and all forms of animal parasites and protozoa, capable of producing an infection or disease in a susceptible plant or animal host.

 **PCB's** - Polychlorinated Biphenyls; A class of chlorinated aromatic hydrocarbons representing a mixture of specific biphenyl hydrocarbons which are thermally and chemically very stable.

 **PFRP - A Process to Further Reduce Pathogens**. The D.E.P. considers the following compost processes to qualify as a PFRP.

**Method Minimum Minimum**

 **Temperature Time**

 Static Aerated Pile 55c 3 days\*

 Within Vessel 55c 3 days\*

 Windrow 55c 15 days\*

 Using the windrow composting method, there will be a minimum of five turnings of the windrow during the high temperature period.

 \* Aerated static piles must remain in the pile for at least 21 days. All three approaches are required to retain compost in a curing pile for at least 21 days following the active composting period.

 Attaining a PFRP is essential for composts containing sludge or septage if the compost is to be distributed to the public.

 **PSRP - A Process to Significantly Reduce Pathogens**. The D.E.P. considers the following composting processes to qualify as a PSRP.

**Method Minimum Minimum**

 **Temperature Time**

 Static Aerated Pile 40c 5 days

 Within Vessel 40c 5 days

 Windrow 40c 5 days

 For four hours during this period the temperature exceeds 55 degrees C.

 Compost attaining a PSRP may be spread only on restricted sites.

 **Putrefactive** - As result of the partial decay of organic matter.

 **Saturated Paste Extract Method** - An approach for analyzing compost materials in which water is added to the compost until it just reaches saturation. This mixture is then allowed to sit for about 1 1/2 hours prior to performing tests. Conductivity, soluble nutrients and pH are often tested using this approach.

 **Stabilized** - Means that the compost has at least passed through the thermophilic stage, and that biological decomposition of the organic materials has occurred to a sufficient degree that will allow beneficial use. See Section 5.A. for a description of stability levels and the methods for distinguishing them.

 **Static Aerated Pile Method** - A method of composting in which materials are piled over perforated pipes or air ducts so that the piles may be aerated using blowers to either force air up through or draw air down through the compost mass.

 **Thermophilic Stage** - The stage of the composting process in which the rate of biological activity is high enough to maintain an average pile temperature of at least 130 degrees F(55C). This stage favors decomposition by thermophilic (heat loving) bacteria. It is in this stage that the most rapid destruction of pathogenic organisms occurs.

 **Topsoil** - Soil that consists of various mixtures of sand, silt, clay and organic matter. Normally considered to be the nutrient rich top layer of soil that supports plant growth.

 **Windrow Method** - A method of composting in which materials are placed in long narrow piles (windrows) and aerated by physically turning the materials.

 **Within-vessel Method** - A method of composting in which compostable materials are placed in an enclosed drum, bin or other vessel. Aeration is accomplished through rotation of the drum or through forced aeration.

**5. COMPOST QUALITY INFORMATION**

 Several quality measures are suggested in the sections describing materials for particular purposes. Some of these quality measures are described here for the convenience of anyone using these standards.

 5.A. **Compost Stability Levels**

 Three compost stability levels are recognized. These are:

 **Mature** - Highly stabilized, generally will not reheat to 20 degrees C above ambient, reduction of organic matter greater than 60 percent by weight.

 **Semimature** - In the mesophilic stage (has passed through thermophilic stage but has not completed the mesophilic stage). Generally will reheat to 20 degrees C above ambient temperature. Reduction of organic matter by 40-60 percent by weight.

 **Fresh** - Through thermophilic stage but still in the early part of the mesophilic stage, partial decomposition. Material will easily reheat to 20 degrees C above ambient level. Reduction of organic matter by 20-40 percent by weight.

 5.B. **Measuring Stability**

 Stability may be determined by checking for reheating and measuring the reduction in organic matter content. An alternative approach that may be used is to have a laboratory perform an oxidation/reduction test or other test that would measure the level of respiration that is taking place.

 5.B.1. **Reheating Test**

 To determine if the material will reheat to 20 degrees C above the ambient temperature, follow the following procedure:

 Re-pile compost into a pile at least six feet in diameter and four feet high. Provide aeration to this pile. Moisture content of the material in this pile must be between 35 and 60% in order for this test to be valid. Three days after the pile has been formed, the temperature of the compost should be measured at a point about two feet into the pile. This temperature should be compared to the ambient temperature.

 5.B.2. **Reduction of Organic Matter**

 The percent reduction of organic matter is a measure of the loss of decomposable material in comparison to the amount present prior to composting. To make this comparison, use the following procedure:

 Prior to composting and again following composting, have material tested for the percent organic matter on a dry weight basis. Use these before and after figures to calculate the percent reduction in organic matter using the following formula:

percentage reduction = % A (100-% B)

 [1- ] x 100

 % B (100-% A)

 Where A is organic matter percentage after composting and % B is organic matter percentage before composting. E.g. using this formula we have calculated the percent of organic matter in the final product necessary to meet various levels of reduction if we started out with 65 percent organic matter.

 **% organic matter % reduction % organic matter in**

 **in original mix in final product**

**(before composting) organic matter (after composting)**

65% 20% 59.8%

65% 40% 52.7%

65% 60% 42.6

 5.C. **pH and CaCO3 Equivalency**

 For most applications, a pH near neutral is desirable so it is important to know the acidity or basicity of the amendment being used. In cases where the pH of the compost material is not close to neutral, ( <6.1 or >7.8 ) the supplier should provide data on either its Liming value or the amount of lime needed to neutralize the product both on a calcium carbonate equivalency basis. For example, if the pH of the material was 5.5, the supplier would be required to indicate how many pounds (CaCO3 equivalents) of liming materials would be needed to bring 100 lbs. of this product to a pH of 7.0. If. on the other hand, the pH was reported to be 8.5, the supplier should indicate how many pounds of CaCO3 equivalents would be provided by 100 pounds of the product.

 **Measurement of pH**. When measuring the pH on compost products, it to test them on an "as is" basis rather than drying them first, since this may affect the results. Given the sample "as is", the pH should be tested by the saturated paste extract method.

 5.D. **Contaminants**

 The contaminants that must be measured are those regulated by D.E.P. These are listed in the table below. Acceptable levels of other contaminants will be determined by the use for the product and are discussed in the sections covering specific uses.

**D.E.P. ALLOWABLE CONCENTRATIONS OF HEAVY METALS AND**

**ORGANIC CHEMICAL POLLUTANTS**

**Maximum Permissible Concentrations (mg/kg dry weight)**

Cadmium (Cd) 10

Chromium (Cr) 1,000

Copper (Cu) 1,000

Lead (Pb) 700

Mercury (Hg) 10

Nickel (Ni) 200

Zinc (Zn) 2,000

**Maximum Permissible Concentrations of**

**Organic Chemical Pollutants**

Polychlorinated Biphenyls (PCB's) 10 ppm

Dioxin Equivalent

Food Chain Crops 27 ppt

Non-Food Chain 27 - 250 ppt

\* See DEP Landspreading Rules (Chapter 567) for restrictions on the use of land on which this material has been spread.

 5.E. **Foreign Matter**

 In many cases, the acceptability of compost based on its foreign matter content can be determined by visually inspecting representative samples of the product. In cases where a more precise approach is needed to determine foreign matter content, the following method, developed by the Florida Department of Environmental Regulations, may be used:

 Foreign matter content may be determined by passing a dried, weighed sample of the compost product through a one-quarter inch or six millimeter screen. The material remaining on the screen is visually inspected, and the foreign matter that can be clearly identified is separated and weighed. The weight of the separated foreign matter divided by the weight of the total sample multiplied by 100 is the percentage dry weight of the foreign matter content.

 5.F. **Reporting Nutrient Content**

 Section 6 of these rules includes requirements that suppliers provide information on nutrient content of their compost product. Maine fertilizer law, however, requires that products labeled with a nutrient analysis or advertised based on nutrient content must be registered as a fertilizer. This registration requires both the provision of guarantees for the nutrient analysis and the payment of a tonnage tax. It is not the intent of these rules to force compost suppliers to register their product as a fertilizer if, in fact, they are selling it as a soil amendment.

 The following standard will be used to determine if a product must be registered as a fertilizer:

1. If the nutrient analysis appears on the product label or any promotional material used to advertise the product, it will be considered to be sold for its nutrient content and so will be required to register as a fertilizer.

2. If the nutrients appear on a fact sheet or laboratory analysis sheet provided to a buyer **upon a buyer's request** so that the buyer may know how to properly mix or apply the material, this will not be considered to constitute making claims based on nutrient content and will not require the material to be registered as a fertilizer.

**6. COMPOST PRODUCT SPECIFICATIONS**

 6.A. **Compost Product - Topsoil/topsoil Substitute Class A**

 Nutrient grade or topsoil grade compost may be mixed with mineral soil to create topsoil. By the appropriate blending, a topsoil of the desired characteristics may be created. The mixture of the compost with mineral soil to create topsoil will depend on nutrients, soluble salt levels and organic matter content. See APPENDIX A for suggested mix ratios.

 **Use for Materials** - Any use for topsoil where public is likely to be in direct contact with the material, e.g. seedbed for slope stabilization, roadside revegetation, backfill for tree and shrub planting, turf establishment on ballfields and playgrounds and other landscaping applications.

 6.A.1. **Characteristics to Consider**

 A good compost material for this purpose will be mature, loose and friable, dark brown or black in color and low enough moisture content to handle easily. Odors should be minimal. It will have virtually no human pathogens. (For composts that contain municipal sludge, septage, or animal manures, this can be achieved by meeting DEP's PFRP requirements. For areas such as playgrounds and ballfields where children may frequently be in close contact with the soil, extra precautions may be warranted. This could include actions such as requiring suppliers to provide additional testing of the material for Shigella sp. and/or E. coli if compost containing sludge or septage is used.) It will also have few or no weeds, viable seeds, roots, or rhizomes. Water holding capacity will normally be quite high in these products. (Vote: Some seeds such as tomato seeds are very resistant and may survive even though PFRP requirements have been met. Most weed seeds, however, will be killed in the composting process.)

 Suppliers should be required to provide a list of all the ingredients in the original compost mix in the order of their relative proportions on a weight basis. (i.e. all bulking agents, nitrogen sources, and other additives, such as ash or stabilizers should be listed.)

 In addition, suppliers of these materials should be asked to provide assurances that they meet DEP heavy metal, PCB and dioxin limits and do not contain levels of any chemicals that are harmful to plants or humans.

 6.A.2. **Measurements to Consider**

 Suppliers of compost products should be expected to provide data based on laboratory analyses for each of the following measurements:

 **pH** - Most composts fall into the 6.1 to 7.8 range. Some plantings require a pH outside this range. See the Horticultural Recommendations for the type of plantings in question.

 **CaCO3 equivalency** - In cases where the pH of the compost material is not close to neutral, ( <6.1 or >7.8 ) the supplier should provide data on either its liming value or the amount of lime needed to neutralize the product on a calcium carbonate equivalency basis. Some composts with a higher pH have very little or no liming ability while others may have a substantial liming effect. The desirability of having a liming capacity will depend on the pH of the native soil and the requirements of the vegetation to be established.

 **Coarseness** - Virtually all particles should pass through a 3/8 inch sieve.

 **Nutrients** - The NPK levels for the compost material should be provided by the supplier.

 **Soluble Salt Concentrations** - < 2 mmho/cm. in the final mix (See Appendix A.)

 **Density/Weight per Cu Yd** - Compost would normally be 1,000-1,300 lbs/cu yd at moisture content of 40 to 60%.

 **Moisture Content** - If the compost has a moisture content between 40 and 60%, handling characteristics should be acceptable.

 **Foreign Matter** - less than 2 percent foreign matter on a dry weight basis.

 6.A.3. **Mixing with Mineral Soil**

 **Organic Matter Content** - When mixed with mineral soil, organic matter should be at least 3 percent of final mix.

 **Premixed vs. On-site mixing** - For many applications such as establishing planting beds for ornamentals or backfill for tree planting, artificial topsoil should be premixed. On-site mixing will be practical when relatively small quantities of compost will be used on large relatively flat areas as is done with turf establishment. See Appendix A for suggested mix ratios.

 6.B. **Compost Product - Topsoil/Topsoil Substitute Class B**

 Nutrient grade or topsoil grade compost may be mixed with mineral soil to create topsoil. By the appropriate blending, a topsoil of the desired characteristics may be created. The mixture of the compost with mineral soil to create topsoil will depend on nutrients, soluble salt levels and organic matter content. See APPENDIX A for suggested mix ratios.

 **Use for Material** - Any use for topsoil where public contact is minimal, e.g. seedbed for slope stabilization, roadside revegetation, tree and shrub planting, gravel pit reclamation, reseeding logging landings, final landfill cover.

 6.B.1. **Characteristics to Consider**

 A good compost material for this purpose will be mature or semimature, loose and friable, brown or black in color and low enough in moisture content to handle easily. It may have an odor as long as it is not foul or putrefactive. It will have few, if any, human pathogens. (For composts that contain municipal sludge, septage, or animal manures, this can be achieved by meeting DEP's PFRP requirements.) It will also have few or no weeds, viable seeds, roots, or rhizomes. Water holding capacity will normally be quite high in these products. (Note: Some seeds such as tomato seeds are very resistant and may survive even though PFRP requirements have been met. Most weed seeds, however, will be killed in the composting process.)

 Suppliers should be required to provide a list of all the ingredients in the original compost mix in the order of their relative proportions on a weight basis. (i.e. all bulking agents, nitrogen sources, and other additives, such as ash or stabilizers should be listed.)

 In addition, suppliers of these materials should be asked to provide assurances that they meet DEP heavy metal, PCB and dioxin limits and do not contain levels of any chemicals that are harmful to plants.

 6.B.2. **Measurements to Consider**

 Suppliers of compost products should be expected to provide data based on laboratory analyses for each of the following measurements:

 **pH** - Most composts fall into the 6.1 to 7.8 range. Some plantings require a pH outside this range. See the Horticultural Recommendations for the type of plantings in question.

 **CaCO3 equivalency** - In cases where the pH of the compost material is not close to neutral, ( <6.1 or >7.8 ) the supplier should provide data on either its liming value or the amount of lime needed to neutralize the product on a calcium carbonate equivalency basis. Some composts with a higher pH have very little or no liming ability while others may have a substantial liming effect. The desirability of having a liming capacity will depend on the pH of the native soil and the requirements of the vegetation to be established.

 **Coarseness** - All particles should pass through a one inch sieve and 90% should pass through a half inch sieve..

 **Nutrients** - The NPK levels for the compost material should be provided by the supplier.

 **Soluble Salt Concentrations** - < 2 mmho/cm. in the final mix (See Table 1.)

 **Density/Weight per Cu Yd** - Compost would normally be 1,000-1,300 lbs/cu yd at moisture content of 40 to 60%.

 **Moisture Content** - If the compost has a moisture content between 40 and 60%, handling characteristics should be acceptable.

 **Foreign Matter** - less than 4 percent foreign matter on a dry weight basis.

 6.B.3 **Mixing with Mineral Soil**

 **Organic Matter Content** - When mixed with mineral soil, organic matter should be at least 3 percent of final mix.

 **Premixed vs. On-site mixing** - For many applications such as establishing planting beds for ornamentals or backfill for tree planting, artificial topsoil should be premixed. On-site mixing will be practical when relatively small quantities of compost will be used on large relatively flat areas as is done with turf establishment. See Appendix A for suggested mix ratios.

 6.C. **Compost Product - Topsoil/Topsoil Substitute Class C**

 **Use for Material - Daily landfill cover**

 Compost may be mixed with mineral soil to create topsoil or may be used as produced. The mixture of the compost with mineral soil to create topsoil will depend on nutrients and soluble salt levels. See APPENDIX A for suggested mix ratios.

 Landfill operators considering the use of materials other than soil for daily cover are required by D.E.P. Solid Waste Management Regulations to obtain D.E.P. approval before use.

 6.C.1. **Characteristics to Consider**

 A good compost material for this purpose may be mature or semimature. (Operators should consult with the D.E.P. Bureau of Solid Waste Management if they wish to use fresh compost.) It should also be loose and friable, and low enough in moisture content to handle easily. It may have an odor as long as it is not foul or Putrefactive. For composts that contain municipal sludge, or septage, DEP's PSRP requirements must be met.

 Suppliers should be required to provide a list of all the ingredients in the original compost mix in the order of their relative proportions on a weight basis. (i.e. all bulking agents, nitrogen sources, and other additives, such as ash or stabilizers should be listed.)

 In addition, suppliers of these materials should be asked to provide assurances that they exceed DEP heavy metal limits by no more than 200 percent, and that they meet the D.E.P. limits for dioxin and PCB's. Should materials exceed these levels, the D.E.P. Bureau of Solid Waste Management should be consulted prior to use.

 6.C.2 **Measurements to Consider**

 Suppliers of compost products should be expected to provide data based on laboratory analyses for each of the following measurements:

 **pH** - Composts falling anywhere in the 5.5 to 8.5 range should be acceptable.

 **Coarseness** - All particles should be less than 12 inches in largest dimension. At least 80 percent should pass through a one-inch sieve.

 **Soluble Salt Concentrations** - < 10 mmho/cm. in the final mix (See Table 1.)

 **Moisture Content** - If the compost has a moisture content under 60%, handling characteristics should be acceptable.

 **Foreign Matter** - less than 50 percent foreign matter on a dry weight basis.

 6.C.3. **Mixing with Mineral Soil**

 Premixed vs. on-site mixing For daily landfill cover, artificial topsoil should be premixed. See Appendix A for suggested mix ratios.

 6.D. **Compost Product - Wetland Substrate**

 Use for Material - Reclamation of wetland areas.

 Compost may be used as is, or mixed with naturally occurring soil to create a wetland substrate. By the appropriate blending, a soil of the desired characteristics may be created. The mixture to create the soil will depend on nutrients, soluble salt levels and organic matter content. Requirements for species to be established should be checked prior to determining the desired mixture.

 6.D.1. **Characteristics to Consider**

 A good compost material for this purpose will be mature or semimature, loose and friable, brown or black in color and low enough in moisture to handle easily. It may have an odor as long as it is not foul or putrefactive. It will have few, if any, human pathogens. (For composts that contain municipal sludge, septage, or animal manures, this can be achieved by meeting DEP's PFRP requirements.) It will also have few or no weeds, viable seeds, roots, or rhizomes. Water holding capacity will normally be quite high in these products. (Note: Some seeds such as tomato seeds are very resistant and may survive even though PFRP requirements have been met. Most weed seeds, however, will be killed in the composting process.)

 Suppliers should be required to provide a list of all the ingredients in the original compost mix in the order of their relative proportions on a weight basis. (i.e. all bulking agents, nitrogen sources, and other additives, such as ash or stabilizers should be listed.)

 In addition, suppliers of these materials should be asked to provide assurances that they meet DEP heavy metal, PCB and dioxin limits and do not contain levels of any chemicals that are harmful to plants. If composts proposed for use in wetlands has been made from materials thought to contain dioxin, the D.E.P. Bureau of Solid Waste Management should be contacted for guidance prior to use.

 6.D.2. **Measurements to Consider**

 Suppliers of compost products should be expected to provide data based on laboratory analyses for each of the following measurements:

 **pH** - Most composts fall into the 6.1 to 7.8 range. Wetland soils normally have a pH of 3.6 to 4.4. To duplicate these soils, most composts would require pH adjustment. The pH of similar naturally occurring soils should be tested and substitute material should be adjusted to achieve the same pH level.

 **CaCO3 equivalency** - For all composts being considered for use in wetland reclamation, the supplier should provide the CaCO3 equivalency. Some composts have very little or no liming ability while others may have a substantial liming effect. For this purpose, composts having little or no liming effect are preferred.

 **Coarseness** - 85 - 95% should be less than 3 inches. Of the fraction less than 3 inches, the normal proportions passing different sieve sizes are as follows:

**Sieve Size Percent**

 4 (0.25 in) 75 - 100

 10 (0.10 in) 60 - 100

 40 (0.025 in) 30 - 80

 200 (0.005 in) 0 - 30

 A similar size distribution should be acceptable in most cases.

 **Nutrients** - The total and soluble NPK levels for the compost material should be provided by the supplier.

 **Soluble Salt Concentrations** - < 1 mmho/cm. in the final mix.

 **Density/Weight per Cu Yd** - Organic soils would normally be between 635 and 1590 lbs/cu yd when moist.

 **Moisture Content** - If the compost has a moisture content between 40 and 60%, handling characteristics should be acceptable.

 **Foreign Matter** - less than 2 percent foreign matter on a dry weight basis.

 6.D.3. **Mixing with Naturally Occurring Soil**

 **Organic Matter Content** - When mixed with naturally occurring soil, organic matter should be 40 percent or more of final mix (if an organic substrate is required).

 **Premixed vs. on-site mixing** - For most applications, artificial organic soil should be premixed. The practicality of on-site mixing may be limited by the ability of the site to support machinery and the depth of the organic layer to be established.

 6.E. **Compost Product – Mulch Class A**

 **Use for Material** - Soil stabilization on slopes.

 6.E.1. **Characteristics to Consider**

 A good compost material for this purpose will be mature, loose and friable, dark brown or black in color and low enough in moisture to handle easily. Unlike composts for other uses, mulch for slope stabilization should be fairly coarse and contain a high proportion of durable materials, such as wood chips. If used in areas where public contact is likely, odors should be minimal and there should be virtually no human pathogens. (For composts that contain municipal sludge, septage, or animal manures, this can be achieved by meeting DEP's PFRP requirements. For areas such as playgrounds where children may frequently be in close contact with the soil, extra precautions may be warranted. This could include actions such as requiring suppliers to provide additional testing of the material for Shigella sp. and/or E. coli if compost containing sludge or septage is used.) It will also have few or no weeds, viable seeds, roots, or rhizomes. (Note: Some seeds such as tomato seeds are very resistant and may survive even though PFRP requirements have been met. Most weed seeds, however, will be killed in the composting process.)

 Suppliers should be required to provide a list of all the ingredients in the original compost mix in the order of their relative proportions on a weight basis. (i.e. all bulking agents, nitrogen sources, and other additives, such as ash or stabilizers should be listed.)

 In addition, suppliers of these materials should be asked to provide assurances that they meet DEP heavy metal, PCB and dioxin limits and do not contain levels of any chemicals that are harmful to plants or humans.

 6.E.2. **Measurements to Consider**

 Suppliers of compost products should be expected to provide data based on laboratory analyses for each of the following measurements:

**pH** - Most composts fall into the 6.1 to 7.8 range. Some applications require a pH outside this range.

**CaCO3 equivalency** - For all composts being considered for use as mulch, the supplier should provide the CaCO3 equivalency. Some composts have very little or no liming ability while others may have a substantial liming effect. For this purpose, composts having little or no liming effect are preferred.

**Coarseness** - Virtually all particles/pieces should pass through a 6 inch sieve but more than 50 percent should be retained by a 1 inch (#1) sieve and more than 75 percent should be retained by a 1/4 inch (#4) sieve.

**Nutrients** - The NPK levels for the compost material should be provided by the supplier. Lower nutrient content is desirable.

**Soluble Salt Concentrations** - < 1 mmho/cm. in the final mix.

**Density/Weight per Cu Yd** - Coarse compost would normally be 8001,300 lbs/cu yd at moisture content of 35 to 65%.

**Moisture Content** - If the compost has a moisture content between 35 and 65%, handling characteristics should be acceptable.

**Foreign Matter** - less than 2 percent foreign matter other than pieces of wood on a dry weight basis.

 6.F. **Compost Product - Mulch Class B**

 **Use for Material** - To conserve moisture; prevent surface compaction or crusting; reduce runoff; control weeds; and help establish plant cover.

 6.F.1. **Characteristics to Consider**

 A good compost material for this purpose will be mature, loose and friable, dark brown or black in color and low enough in moisture to handle easily. Compost based mulch for these purposes should contain a high proportion of durable materials, such as wood chips. If used in areas where public contact is likely, odors should be minimal and there should be virtually no human pathogens. (For composts that contain municipal sludge, septage, or animal manures, this can be achieved by meeting DEP's PFRP requirements. For areas such as playgrounds where children may frequently be in close contact with the soil, extra precautions may be warranted. This could include actions such as requiring suppliers to provide additional testing of the material for Shigella sp. and/or E. coli if compost containing sludge or septage is used.) It will also have few or no weeds, viable seeds, roots, or rhizomes. (Note: Some seeds such as tomato seeds are very resistant and may survive even though PFRP requirements have been met. Most weed seeds, however, will be killed in the composting process.)

 Suppliers should be required to provide a list of all the ingredients in the original compost mix in the order of their relative proportions on a weight basis. (i.e. all bulking agents, nitrogen sources, and other additives, such as ash or stabilizers should be listed.)

 In addition, suppliers of these materials should be asked to provide assurances that they meet DEP heavy metal, PCB and dioxin limits and do not contain levels of any chemicals that are harmful to plants or humans.

 6.F.2. **Measurements to Consider**

 Suppliers of compost products should be expected to provide data based on laboratory analyses for each of the following measurements:

 **pH** - Most composts fall into the 6.1 to 7.8 range. Some applications require a pH outside this range.

**CaCO3 equivalency** - For all composts being considered for use as mulch, the supplier should provide the CaCO3 equivalency. Some composts have very little or no liming ability while others may have a substantial liming effect. For this purpose, composts having little or no liming effect are preferred.

**Coarseness** - Virtually all particles/pieces should pass through a 6 inch sieve but more than 75 percent should be retained by a 1/4 inch (# 4) sieve.

**Nutrients** - The NPK levels for the compost material should be provided by the supplier. A low nutrient horticultural grade compost is desirable.

**Soluble Salt Concentrations** - conductivity < 1 mmho/cm. in the final mix.

**Density/Weight per Cu Yd** - Coarse compost would normally be 8001,300 lbs/cu yd at moisture content of 35 to 65%.

**Moisture Content** - If the compost has a moisture content between 35 and 65%, handling characteristics should be acceptable.

**Foreign Matter** - less than 2 percent foreign matter, other than pieces of wood on a dry weight basis.

**TABLE 3. SUMMARY OF COMPOST ATTRIBUTES FOR DIFFERENT PURPOSES**

 **TOPSOIL TOPSOIL TOPSOIL WETLAND MULCH MULCH**

**ATTRIBUTE CLASS A CLASS B CLASS C SUBSTRATE CLASS A CLASS B**

Purpose High Low Landfill Wetland Stabilize General

 contact contact daily restoration slopes Mulching

 areas areas cover needs

Stability Mature Mature or Mature, Mature or Mature Mature

 semi-mature semi-mature semi-mature

 or fresh

Odor A B B B A,B A,B

Pathogens C,D C,D E C C,D C,D

Heavy metals F F G F F F

PCB's, dioxin

pH 6.1-7.8 H 6.1-7.8 H 5.5-8.5 H 3.6-4.4 H 6.1-7.8 H 6.1-7.8 H

**Texture\* Sieve %Pass Sieve %Pass Sieve %Pass Sieve %Pass Sieve %Pass Sieve %Pass**

 3/8" 100 1.0" 100 12" 100 3" 85-90 6" 100 6" 100

 0.5" 90 1" 80 #4 75-100 1" 0-50 #4 0-25

 #10 60-100 #4 0-25

 #40 30-80

 #200 0-30

Soluble Salt 2 2 10 1 1 1

content (mmhos/cm)

Moisture(%) 40-60 40-60 65 40-60 35-65 35-65

Foreign 2 4 50 2 2 2

matter (%)

Organic Y3 I Y3 I J Y40 K J,L J,L

matter(%)

\* Note: Sieve numbers correspond to the following size openings:

 **Sieve # Opening Size**

 4 0.25 inch

 10 0.10 inch

 40 0.025 inch

 200 0.005 inch

**CODES**:

**A** Minimal odor in areas of high public contact.

**B** - Odors are allowed in areas of low public contact, but must not be foul or putrefactive.

**C** - Materials containing municipal sludge or septage must meet DEP's PFRP requirements.

**D** - Extra cautions may be desired where people will be in direct contact with material containing municipal sludge or septage (e.g. on playgrounds).

**E** - Materials containing municipal sludge or septage must meet DEP's PSRP requirements.

**F** - Meets DEP's requirements for heavy metals, PCB's, and dioxins as established in the *Rules for Land Application of Sludge and Residuals,* Chapter 567.

**G** - Exceeds the DEP limits for heavy metals by no more than 200% and meets the requirements for PCB's and dioxins as established in the *Rules for Land Application of Sludge arid Residual*s, Chapter 567.

**H** - Specific purposes nay require a pH outside this range. See horticultural recommendations for the specific use.

**I** - After mixing with mineral soil, the final topsoil mix should have at least 3% organic matter.

**J** - Organic matter % will be acceptable if other characteristics are net.

**K -** Acceptable organic matter levels will depend on the needs of the types of vegetation to be re-established.

**L** - High proportion of wood or other resistant material Is desirable.

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**APPENDIX A**

**MIX RATIOS FOR CREATING ARTIFICIAL TOPSOIL USING COMPOST**

 **Compost Ratio of Mineral Soil to Compost**

 **Conductivity**

 **mmhos/cm Class A or B Class C**

 .5 or less \* \*

 1 \* \*

 2 \* \*

 3 0.5:1 to 0.75:1 \*

 4 1.0:1 to 1.25:1\*

 5 1.5:1 to 1.75:1 0.25:1 to 0.50:1

 6 2.0:1 to 2.25:1 0.50:1 to 0.75:1

 7 2.5:1 to 2.75:1 0.75:1 to 1.00:1

 8 3.0:1 to 3.25:1 1.00:1 to 1.25:1

 9 3.5:1 to 3.75:1 1.25:1 to 1.50:1

 10 4.0:1 to 4.25:1 1.50:1 to 1.75:1

\* Mixture with mineral soil is not essential at these lower salt concentrations.

**APPENDIX B**

**MAINE DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY**

**FERTILIZER NUTRIENT REQUIREMENTS**

To qualify as a fertilizer, a material must:

 (1.) have at least 1 (one) percent of one of the three plant macronutrients, nitrogen, phosphoric acid or potash measured on a dry weight basis

 or

 (2.) have a minimum percentage of one or more micronutrient as follows:

**Element %**

Calcium 1.00

Magnesium 0.50

Sulfur 1.00

Boron 0.02

Chlorine 0.10

Cobalt 0.0005

Copper 0.05

Iron 0.10

Manganese 0.05

Molybdenum 0.0005

Sodium 0.10

Zinc 0.05