Compost
Research &
Education Foundation

TOPSOIL MANUFACTURING

USING COMPOST AS A COMPONENT

Description:

This work consists of blending compost with mineral soil components to create a landscape and turf grade topsoil. This specification refers to ex-site (off site) and in-situ (on site) topsoil manufacturing.

Key Benefits/Return on Investment:

- Allows for the reuse of substandard soil components,
- In-situ soil blending can reduce the cost of topsoil installation by 40-60%,
- Doubles/Improves water holding capacity of sandy, lighter soils,
- Improves porosity (air, water, nutrient movement) in clay/silt-based soils, and
- May reduce or eliminate the need for pH adjusting agents (e.g., lime, sulfur, gypsum).

Research and field experience has demonstrated compost's ability to reclaim subsoils, sands, rock dusts, etc. into productive landscape, turf, and agricultural soils.

Construction Requirements:

Ex Situ/Pile and Turn Method

- Visually inspect mineral blending components (e.g., imported soil, subsoil, sand, etc.) for physical contaminants and texture (where possible), and test for pH, soluble salts, organic matter content and any plant-toxic components.
- Place existing mineral blending component piles in close proximity to the compost pile.
- Determine compost inclusion rate and convert it into a blending ratio (e.g., 1 scoop of compost to every 3 scoops of soil, yielding a 25% inclusion rate).
  - Common compost inclusion rates are 20 to 33% but can be up to 50% where soils are poor, and the compost is stable and lower in soluble salt content.
- Following the blend ratio, create a bed of compost, then apply the appropriate number of scoops of mineral components evenly on top. Layer blend components from lightest to heaviest.
  - Whenever possible, blend on a hardened surface.
- Using a front-end loader, scoop up the layered material from underneath and dump it forward, past the soil bed.
  - Try to 'feather out' the material from the front-end loader bucket when dumping it so that it blends as it is falling.
- As you work through the middle of the soil bed, incorporate materials from either side of the bed. This should eventually displace the soil bed, moving it forward, as the blending continues.
- Continue to work the pile in this fashion until the materials are adequately mixed, then stockpile.
  - NOTE: Improved and faster blending may be achieved by bucket blending (quick flipping of ingredients), then running the blend through a trommel (or other) screening device. It can often blend and screen in one step.
- Age blended soils for 2-3 weeks and perform a soil test, when possible, before selling/using.

On Site Incorporation/In-Situ Method

- Test existing soil for texture, pH, soluble salts, organic matter content and any plant-toxic components.
  - This will help to determine the compost, and any other component, inclusion rate.
- Cultivate the soil to a 6-to-8-inch depth, and deeper where possible, when ground conditions are reasonably dry.
- Uniformly apply a 1-to-2-inch layer of compost over the treatment area. 3-inch application rates may be used when incorporating to a 12-inch depth.
- Incorporate the compost to a depth of 6-to-8 inches, and deeper, where appropriate.
  - Avoid excessive blending, especially when soil is dry, as it can damage soil structure.
- Smooth treated area, and once leveled, remove any stones or debris from the surface prior to planting.

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Additional Information:

- Testing the blended soil will help to assure that it meets the cultural requirements of the plants to be established.
- The addition of compost will reduce or eliminate the pre-plant fertilization needed before planting.
- Less stable and/or mature compost may be used in this application, but for best results, the blended soil should then be aged.
- Test mineral soil components which will be blended with the compost. This will assist in determining the appropriate compost inclusion rate.

Compost Parameters:

Parameters[1,5]	Reported as (units of measure)	General Range
pH[2]	pH units	6.0 - 8.5
Soluble Salt Concentration[2] (electrical conductivity)	dS/m (mmhos/cm)	Maximum 10
Moisture Content	%, wet weight basis	30 – 60%
Organic Matter Content	%, dry weight basis	30 – 65%
Particle Size	% passing a selected mesh size, dry weight basis	95% pass through 3/8" screen or smaller
Stability Carbon Dioxide Evolution Rate	mg CO2-C per g OM per day	< 4
Maturity (Bioassay) Seed Emergence and Seedling Vigor	 %, relative to positive control %, relative to positive control	 Minimum 80% Minimum 80%
Physical Contaminants (man-made inerts)	%, dry weight basis	< 0.5% (0.25% film plastic)
Chemical Contaminants[3]	mg/kg (ppm)	Meet or exceed US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3 levels
Biological Contaminants[4] Indicator Organisms Fecal Coliform Bacteria, and /or Salmonella	 MPN per gram dry weight MPN per 4 grams dry weight	 Meet or exceed US EPA Class A standard, 40 CFR § 503.32(a) levels

General:

Compost Analysis: All compost products have different characteristics. Before selecting a compost product, a compost analysis should be completed by a reputable laboratory* to determine the characteristics of the material, so that the right material can be used for the appropriate purpose. Once determined, the soil should be appropriately amended to a range suitable for the plant species to be established and results desired.

References:

Alexander, R.A., The Field Guide to Compost Use. The US Composting Council, 1996.

Landschoot, PJ., McNitt, AS. And Hoyland, BF, Evaluation of Compost Products as Soil Amendments for Turfgrasses. The Pennsylvania State University, Agronomy Department, July 1994.

Larsen, D. A., Field Trial Compost-Amended Soil (Manufactured-in-Place) Project 163-141 ROUTE 6, Windham & Chaplin, CT. University of Connecticut, January 1999.

Rawlinson, H., Royal Ordnance Munitions Factory, Chorley Transformed into the Village of Buckshaw. The Waste & Resources Action Programme funded report, January 2008.

***The Seal of Testing Assurance (STA) Certified Compost Program provides a comprehensive history of compost analysis results from proficiency-tested laboratories, list of ingredients, and suggested directions for using that unique product. www.compostingcouncil.org/participants**

[1] Recommended test methodologies are provided in Test Methods for the Examination of Composting and Compost (TMECC, The Compost Research & Education Foundation).

[2] It should be noted that the pH and soluble salt content of the final amended soil is more relevant to the establishment and growth of a particular plant, than is the pH or soluble salt content of the specific compost used to amend the soil. The pH and soluble salt content of the compost is diluted when mixed with the native soil, so testing for these parameters in the amended soil is suggested. Each specific plant species requires a specific pH range. Each plant also has a salinity tolerance rating, and maximum tolerable quantities are known. Most ornamental plants and turf species can tolerate a soil/media soluble salt level of 2.5 dS/m and 4 dS/m, respectively. Seeds, young seedlings and salt sensitive species often prefer soluble salt levels at half the afore mentioned levels. When specifying the establishment of any plant or turf species, it is important to understand their pH and soluble salt requirements, and how they relate to existing soil conditions.

[3] US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3 levels = Arsenic 41ppm, Cadmium 39ppm, Copper 1,500ppm, Lead 300ppm, Mercury 17ppm, Molybdenum 75ppm, Nickel 420ppm, Selenium 100ppm, Zinc 2,800ppm.

[4] US EPA Class A standard, 40 CFR § 503.32(a) levels = Salmonella <3 MPN/4grams of total solids or Fecal Coliform <1000 MPN/gram of total solids.

[5] Landscape architects and project (field) engineers may modify the allowable compost specification ranges based on specific field conditions and plant requirements.

Developed for the CREF by R. Alexander Associates, Inc.