

MANUFACTURED SOIL

****From Cabot-Danville FEGC F 028-3(26) C/1**

- xx. DESCRIPTION. This work shall consist of furnishing and blending manufactured topsoil for upland and wetland habitats using short paper fiber, mineral base, and fertilizer approved for beneficial use at the locations indicated in the Plans and as directed by the Engineer.
- xx. MATERIALS. Upland and wetland manufactured topsoils to differ in finished Carbon:Nitrogen (C:N) ratios.

Identified ingredients and final manufactured topsoil products shall be furnished in accordance with the Plans and shall be approved by the Engineer prior to use.

(a) Ingredients.

(1) Short Paper Fiber (SPF).

- a. Minimum 18% organic carbon content (total carbon minus inorganic carbon as determined in accordance with ASTM D 5291).
- b. Documented current approval for use in manufactured soils in accordance with the VT DEC Short Paper Fiber Management Procedure.
- c. Does not contain any sanitary component.

(2) Mineral Base.

- a. Sand or other mineral base (native material/existing on-site subsoil).

(3) Fertilizer.

- a. Fertilizer shall be added at the appropriate rate to achieve the C:N ratios as applicable for upland or wetland manufactured topsoil and shall be introduced at the time of manufactured soil blending.

(b) Final Products.

(1) Upland and Wetland Manufactured Topsoils.

- a. SPF shall be thoroughly blended one to one (by volume) with mineral base. Blending shall occur by spreading of appropriate thickness of short paper fiber over existing mineral base and mixing into mineral base to appropriate depth using roto-tiller or similar equipment. Alternatively, the Contractor may opt to blend manufactured topsoil in one or more centralized locations, and then spread to specified thicknesses.

- b. Supplemental nitrogen shall be added during blending to bring the (C:N) ratio down to appropriate respective ratios for upland and wetland manufactured topsoils.
 - c. Minimum 50% supplemental nitrogen in a slow-release form, such as biosolids, manure, or sulfur-coated urea.
 - d. Blended topsoil shall be placed to depths of 4 inches or 6 inches, as specified in the Plans.
 - e. SPF shall be spread in a 3 inch layer over mineral base in areas where total manufactured topsoil layer is to be 6 inches thick.
 - f. SPF shall be spread in a 2 inch layer over mineral base in areas where total manufactured topsoil layer is to be 4 inches thick.
 - g. Mineral base, SPF, and fertilizer to achieve C:N ratios shall be thoroughly blended in place by rototiller or similar equipment to produce the appropriate thickness of manufactured topsoil layer.
 - h. The Engineer shall inspect mineral base (native material/existing on-site subsoil) and approve its use prior to commencement of topsoil manufacture.
 - i. Following blending or placement of centrally blended material, manufactured topsoil shall be lightly compacted, then lightly raked to provide grooves for seed lodgement prior to seeding.
- (2) Upland Manufactured Topsoil. The finished C:N ratio of upland manufactured topsoil shall be 45:1.
 - (3) Wetland Manufactured Topsoil. The finished C:N ratio of wetland manufactured topsoil shall be 70:1.
- (c) Testing Requirements for C:N Ratio. The Contractor shall identify, or have identified by an accredited lab, the following source material data for the SPF and the fertilizer components of the manufactured topsoil:
- (1) Solids content.
 - (2) Bulk density.
 - (3) Organic carbon.
 - a. Total carbon (ASTM D 5291) minus inorganic carbon, or
 - b. LOI* (loss on ignition (STM 2540-E).
*In this case, organic carbon is assumed to be LOI x 0.58
 - (4) Total nitrogen.

- a. Total Kjeldahl Nitrogen ([[STM 4500]] plus nitrate/nitrite [[SW-846 9056/4500]]), or
- b. Total nitrogen (AOAC 993.13 or similar combustion method).

Source material data assumed to be available for the SPF component from the SPF supplier.

Nitrogen source material data for the fertilizer may be determined from either the fertilizer guarantee information or from analysis at an accredited laboratory. If nitrogen source is biosolids, compost, or animal manure, the sample sent in for analysis shall be a composite sample made from 15 randomly selected grab samples from a stockpile of the material.

The C:N ratio of the upland manufactured topsoil equals the mass of organic carbon in the SPF and in the nitrogen sources divided by the mass of total nitrogen in the SPF and in the nitrogen sources. The calculation shall be made on a dry weight basis, based on the mix ratio of the SPF and nitrogen sources in the manufactured topsoil.

The organic carbon and nitrogen in mineral base material are not included in the C:N determination.

xx. METHOD OF MEASUREMENT. The quantities of Special Provision (Upland Manufactured Topsoil) and Special Provision (Wetland Manufactured Topsoil) to be measured for payment will be the number of cubic meters (cubic yards) of material placed in the complete and accepted work. Measurement shall be of the square meter (square foot) area of material placed to the specified depth in determining the measured quantity for payment.

xx. BASIS OF PAYMENT. The accepted quantities of Special Provision (Upland Manufactured Topsoil) and Special Provision (Wetland Manufactured Topsoil) will be paid for at the Contract unit price per cubic meter (cubic yard). Payment will be full compensation for furnishing and placing the materials specified; testing to determine C:N ratios; spreading, blending, compacting, and raking; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Excavation required for placing manufactured topsoil will be paid separately under Contract item 203.15.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
900.608 Special Provision (Upland Manufactured Topsoil)	Cubic Meter (Cubic Yard)
900.608 Special Provision (Wetland Manufactured Topsoil)	Cubic Meter (Cubic Yard)