Method of Test for
ORGANIC MATERIAL IN SOIL
DOTD Designation: TR 413-10

I. Scope

A. This method of test is designed to determine the percentage of organic material in soil.

B. Reference Documents
   1. DOTD TR 403 – Determination of Moisture Content
   2. DOTD TR 411 – Dry Preparation of Disturbed Samples for Test

II. Apparatus

A. **Oven** – a fume free gravity convection oven capable of maintaining a temperature of 110°C ± 5°C (230°F ± 9°F).

B. **Balance** - minimum capacity of 100g with accuracy to 0.01g.

C. **Furnace** - a muffle furnace capable of maintaining a temperature of 445°C ± 5°C (833°F ± 9°F), with a combustion chamber capable of handling a 100mm diameter evaporating dish.

D. **Evaporating Dish** – made of high heat resistant porcelain, approximately 100mm in diameter and of sufficient capacity to hold 40g of material.

E. **Desiccator**

F. **Miscellaneous tools** – Tongs, thermal gloves, goggle, apron, and other standard equipment for handling hot materials.

G. **Worksheets** – Soil Soil-Aggregate Form, DOTD 03-22-0723 and Organic Material in Soil.

III. Health Precautions

Proper precautions are to be taken whenever hot materials or equipment must be handled. Use container holder or thermal gloves while handling hot containers or materials. Wear eye protection while stirring or weighing heated materials due to possible shattering of particles. Dry contaminated materials under a vent to prevent exposure to fumes.

IV. Sample

Obtain approximately 40g of material passing the 2.00mm (No. 10) sieve already prepared in accordance with DOTD TR 411.

V. Procedure

A. Place the approximately 40 g of material passing the 2.00mm (No. 10) sieve into a 100 mm evaporating dish of know tared mass.

Note: *Fill the evaporating dish approximately ¾ full, not to exceed 40g of material.*

B. Place the evaporating dish with the sample into the oven at 110°C ± 5°C (230°F ± 9°F) and dry to constant mass as defined in DOTD TR 403.

C. Remove the evaporating dish with the dried material from the oven and immediately place in the desiccator until it is cool.

D. Remove the evaporating dish with the dried material from the desiccator. Determine the mass of the dried material and the evaporating dish and record to the nearest 0.01g.

E. Spread the dried material in a thin layer over the bottom of the evaporating dish.

F. Place the evaporating dish with the layer of material into the muffle furnace at 445°C ± 5°C (833°F ± 9°F) and allow to remain for a minimum of 6 hours. Record the time and combustion temperature on the worksheet.

Note: *For a rapid approximation of the percent organic material, ignite a 10g representative portion of prepared soil for a minimum of 1 hour in a muffle furnace set at 950°C ± 50°C (1742°F ± 90°F) . Results obtained at this temperature, however, shall not be used for the rejection or acceptance of a material. These results are reliable for an approximation of percent organic in soils that do not contain shell or volatile inorganic matter.*

G. Remove the evaporating dish with the material from the muffle furnace and place it in the dessicator until it is cool. Record the time on the worksheet.

H. Remove the evaporating dish and material from the dessicator and immediately determine the mass of the material and the evaporating dish. Record the mass to the nearest 0.01g.

VI. Calculations

A. Calculate the mass of organic matter by subtracting the tare mass of the evaporating dish and material obtained in Step IV.H. from the mass of evaporating dish and material obtained in Step IV.D. Record to the nearest 0.01g.

B. Calculate the organic content in percent using the following formula:

$$\text{Organic Content} = \frac{A - B}{A} \times 100$$

where,

A = mass of oven dried soil prior to combustion, g
B = mass of soil after combustion, g
100 = constant to convert to %

Example:

A = 39.97g
B = 38.77g

$$\text{Organic Content} = \frac{39.97 - 38.77}{39.97} \times 100$$

$$= \frac{1.20}{39.97} \times 100$$

$$= 0.0300 \times 100$$

$$= 3.00$$

$$\text{Organic Content} = 3\%$$

VII. Report

Report the percent organic to the nearest whole percent on the worksheet and Soil Soil-Aggregate Form.

VIII. Normal Test Reporting Time

Normal test reporting time is 1.5 days.

MATT MENU SELECTION - 14

Louisiana Department of Transportation and Development
SOILS/SOIL-AGGREGATE

DOTD 03-22-0723
Rev. 7/98

Metric / English 5 *(M or E - Located on MATT Menu)*
Project No. 999-99-9999
Material Code 802
Lab. No. 22-999/69
Date Sampled 01-11-10
Submitted By 997
Quantity
Purp. Code 3
Pit No.
Spec Code 1
Date Tested 01-22-10
Ident. 5769
Parish No. 17
From Station 10+50
To Station 11+50
Location RT SHOULDER
Hole No.
Depth, m (ft) 0.0 (.5)
Log Distance, km (mi)
Item No.
Sampled by: John Wintz
Remarks 1

Hydrometer Analysis (DOTD TR 407) — Graduate No.

Time	(T) Elapsed Time	Temp°C (0.5° increments)	(h) Hydro Reading (0.5 increments)	(C) Correction (0.5 increments)	Corrected Reading H = h - C	% Finer $P = \frac{H}{W} \times 100$	Effect. Grain Size $D = K\sqrt{\frac{L}{T}}$
	60 Minutes						
	120 Minutes						

Dry Mass of Sample (W), g (1 = 50.0, 2 = 100.0)

RETAINED ON 2.00 µm (10)
Mass Cup + Soil, g
Cup No.
Mass Cup, g
Mass Soil, g

RETAINED ON 425 µm (40)
Mass Cup + Soil, g
Cup No.
Mass Cup, g
Mass Soil, g

RETAINED ON 75 µm (200)
Mass Cup + Soil, g
Cup No
Mass Cup, g
Mass Soil, g

Size	Mass Retained (Wx) Gram	%
Total Mass, g		
25.0 mm (1)		
19.0 mm (3/4)		
12.5 mm (1/2)		
4.75 µm (4)		
2.00 µm (10)		
425 µm (40)		
75 µm (200)		
% Silt		
% Clay & Colloids		
Pass 4.75 µm (#4)		
Pass 2.00 µm (#10)		

(DOTD TR 407)
% Ret. 25.0 mm (1)
% Ret. 19.0 mm (3/4)
% Ret. 12.5 mm (1/2)
% Ret. 4.75 µm (4)
% Ret. 2.00 µm (10)
% Ret. 425 µm (40)
% Ret. 75 µm (200)
% Silt
% Clay & Colloids
% Pass 2.00 µm (#10)
% Pass 4.75 µm (40)
% Pass 75 µm (200)
% Sand (Tot. Material)
% Unadjusted Silt
% Unadjusted Sand
% Unadjusted Clay

LIQUID LIMIT
No. Blows
Mass Cup + Wet Soil, g
Mass Cup + Dry Soil, g
Mass Water, g
Factor
Cup No.
Mass Cup, g
Mass Dry Soil, g
% Moisture

PLASTIC LIMIT
Mass Cup + Wet Soil, g
Mass Cup + Dry Soil, g
Mass Water, g
Cup No.
Mass Cup, g
Mass Dry Soil, g
% Moisture

% Organic Matter (TR 413) 3
Liquid Limit (TR 428)
Plasticity Index (TR 428)
Natural Moisture Content, % (TR 403)
Optimum Moisture Content, % (TR 418)
Maximum Density, kg/m^3 (lb/ft^3) (TR 418)
Laboratory Compaction Method (TR 418)
% Cement (TR 432 or Plans)
% Lime (TR 416)
% Fly Ash
% Other (Additive) Material Code Percent
Soil Group (TR 423)
Classification (TR 423)
pH (TR 430)
Resistivity, ohm-cm (TR 429)
Classification Prefix (TR 423) (G = Siliceous Aggr. N = Non-Siliceous S = Shell)
(Required only if +2.00 mm [No.10, g] material equals or exceeds 5%)

Remarks 2

Tested By: GPC Date: 11/22/10
Checked By: JRW Date: 11/22/10
APPROVED BY: DATE:

Figure 1A
Soil/Soil-Aggregate Worksheet - Front

Project No: 999-99-9999 Lab Number: 22-99969
Sampled By: John Wintz Date Rec'd. at Lab. 11/4/10

Organic (DOTD TR 413)

Oven Dry Soil & Dish	68.87
Mass Dish	28.90
Oven Dry Sample (A)	39.97
Furnace Dry Soil & Dish	67.67
Mass Dish	28.90
Furnace Dry Soil (B)	38.77
	3 % Organic

$\frac{A - B}{A} \times 100$

Tested By: M. Schon Date: 01/22/10
Check By: N. Hill Date: 01/22/10

Natural Moisture Content (DOTD TR 403)

Mass Container & Wet Soil	
Mass Container & Dry Soil	
Mass Water	
Mass Container	
Mass Dry Soil	
% Moisture	

Tested By: _____ Date: _____
Check By: _____ Date: _____

pH Value (DOTD TR 430)

Time	
15 Minutes	
30 Minutes	
45 Minutes	
60 Minutes	
pH Value	

Tested By: _____
Date: _____
Checked By: _____
Date: _____

Resistivity Value (DOTD TR 429)

Dry Mass of Sample, g _____ Liquid Limit _____ PI _____

Water Added for Slaking = Dry Mass × $\frac{(LL - PI)}{100}$ = _____ mL

H_2O Added (mL)	Meter Rdg. (OHM - CM)	H_2O Added (mL)	Meter Rdg. (OHM - CM)

Minimum Resistivity _____ OHM - CM Checked By: _____
Tested By: _____ Date: _____ Date: _____

Moisture-Density Relationship (DOTD 418, Method _____)

									Dens. Opt. Moist.
Wet Mass Density, kg/m^3 (lb/ft^3)	WWD								
Moisture Content, %	MC								
Dry Mass Density, kg/m^3 (lb/ft^3)	DWD								

Tested By: _____ Date: _____ Checked By: _____ Date: _____

Moisture - Density Relationship (DOTD TR 415, Family)

Wet Mass _____ Zone No. _____
Moist. Cont. _____ Max. Dry Density _____ Opt. Moisture _____

Tested By: _____
Date: _____
Checked By: _____
Date: _____

Figure 1B
Soil/Soil-Aggregate Worksheet - Back