Chapter 3 – Chemical/Aggregate Section

Overview

The Chemical/Aggregate Section performs tests on paints, metal, Portland cement, Portland cement concrete and its components, roadside materials aggregates and other miscellaneous materials. Responsibilities of this unit include the satellite (District) Laboratories and Chemical Testing. At the completion of a project, this section is also responsible for preparing a final materials certificate. This certificate states the disposition of all materials permanently incorporated into the project with regard to conformity with the plans and specifications. Examples of this certification are located in Appendix B.

A Transportation Supervising Materials Testing Engineer (TSMTE) is the administrative and technical head of the chemical/aggregate section and reports to the Director of Research and Materials.

The TSMTE initiates and directs the training of all personnel in the techniques of sampling, inspection and testing of materials pertaining to the Chemical/Aggregate Section; prepares and keeps current the Chemical/Aggregate section of the *Materials Testing Manual*; and initiates and aids in the preparation of new specifications.

Duties of the TSMTE also include daily contact with materials producers, contractors, engineers and others about materials and their use; directing the application of statistical techniques to quality control of materials; and preparing or supervising the preparation of technical reports and allied documents.

The overall operations of the Chemical/Aggregate Section shall be the responsibility of the TSMTE. Reporting directly to the TSMTE is a Transportation Engineer III (TE III) who is responsible for the daily routine operations of the section. Reporting directly to the TE III are Transportation Materials Technician III's and Transportation Engineer II's who are responsible for all activities performed by the various units within the Chemical/Aggregate Section.

3.1 Satelite Laboratories

The satelite laboratories are maintained by the Division of Materials Testing in each of the four Transportation Districts to expedite the sampling and testing of materials. These District Laboratories are assigned common materials sampling and testing functions to be performed within the District in which they are located.

The work and the personnel of each District Laboratory are under the immediate supervision of the TE III who reports directly to the TSMTE.

The principle duties of the District Laboratories are as follows:

1. Determine laboratory density of soils and processed aggregates
2. Inspect metal pipe and metal culvert ends at project sites
3. Inspect and sample transportation materials at quarries, gravel banks, Portland Cement Concrete plants, and other sources of supply for ConnDOT projects.
4. Perform gradation analysis of sands, gravels and broken or crushed stone.
5. Perform abrasion testing on gravels and broken/crushed stone.

6. Perform nondestructive strength test of in-place Portland Cement concrete by the Swiss Hammer Method and the Windsor Probe.
7. Inspect concrete batch plants, trucks and transit mixers
8. Observe and/or perform acceptance and assurance sampling and testing for aggregates and Portland Cement Concrete.
9. Obtain samples to be tested and transport them to the Central Laboratory.
10. Field inspect items being on planting projects
11. Research on any new materials
12. Assist Division of Purchasing regarding sampling and testing of road salts and sands for winter cover.
13. The District I Laboratory performs additional tests on coarse aggregates such as soundness, wear, specific gravity, absorption, unit weights, angularity, and elongation.

Sections 3.2 to 3.30 cover items tested by the Chemical Unit, while the remainder of Chapter 3 describes procedures and specifications for material tested by the four District Laboratories.

3.2 PAINT

The test methods indicated below will be used to test paint and will follow the procedure outlined in Federal Test Method Standard No. 141: Paint, Varnish, Lacquer and Related Materials; Method of Inspection, Sampling and Testing.

Sampling and testing will be in accordance with AASHTO, ASTM, Federal Supply Service, or by methods on file in the Laboratory. Modifications to referenced methods are listed in Appendix C.

ALPHABETICAL INDEX OF FEDERAL TEST METHOD STANDARD NO. 141

Title	Method No.
Abrasion Resistance (Falling Sand)	ASTM D 968
Application of Brushed Film	2141 (Modified)
Coarse Particles or Skins	ASTM D 185, FTM 141, B 4092
Condition in Container	3011
Daylight Directional Reflectance	ASTM E 1347
Dry Opacity (Contrast Ratio)	ASTM D 2805
Drying Time	4061
Fineness of Grind	ASTM D 1210
Flexibility	6221
Immersion Resistance (Gasoline and Water)	ASTM D 1308
Kauri Butanol Value	ASTM D 1133
Kauri Reduction	ASTM D 1642
Knife Test (Adhesion)	6304
Leafing Test (Aluminum) or Bleeding Test (Traffic Paint)	ASTM D 480
Involatile Material in Vehicle (Vehicle Solids)	4051 & 4053

Odor	ASTM D 1296
Percentage Pigment	4021 (Modified)
Phtalic Anhydride, Percent by Weight of Nonvolatile Vehicle	ASTM D 563
Preparation of Tin Panels	2012 (Modified)
Reducibility and Dilution Stability	4203
Refractive Index	4371
Rosin and Diluting Resins	ASTM D 1542
Sampling	1022
Self-Lifting Properties	6252
Skinning	3021
Specular Gloss	ASTM D 523
Viscosity (Paints)	ASTM D 562
Volatile Material in Vehicle	ASTM D 2369
Washability	6141
Water Percent by Mass	4081
Weight Per Gallon	ASTM D 1475

3.3 BLACK ENAMEL PAINT

Scope: This section applies to black enamel paint for signs

Sampling: In accordance with Federal Test Method Standard No. 141, Method 1022

Procedure: In accordance with Federal Test Method Standard No. 141

Specification: In accordance with CONNDOT Reference File No. 25

Report - Form MAT-233

3.4 BURNT ORANGE ENAMEL

Scope - This section applies to burnt orange enamel for trucks and maintenance equipment

Sampling: In accordance with Federal Test Method Standard No. 141, Method 1022

Procedure: In accordance with Federal Test Method Standard No. 141

Specification: In accordance with CONNDOT Reference File No. 104

Report - Form MAT-234

3.5 TRAFFIC PAINT, 15-MINUTE DRY, WHITE AND YELLOW

Scope - This section applies to white and yellow pavement marking paint

Sampling: In accordance with Federal Test Method Standard No. 141, Method 1022

Procedure: In accordance with Federal Test Method Standard No. 141

Specification: In accordance with Federal Specification Paint TT-P-85E

Report - Form MAT-236, MAT-237, or MAT-240, whichever applies.

3.6 TRAFFIC PAINT, 3 MINUTE DRY, WHITE AND YELLOW

Scope - This section applies to white and yellow low-heated fast-drying pavement marking paint.

Sampling: In accordance with Federal Test Method Standard No. 141, Method 1022

Procedure: In accordance with Federal Test Method Standard No. 141

Specification: In accordance with Federal Specification Paint TT-P-1952D

Report - Form MAT-235, MAT-238, or MAT-239, whichever applies.

3.7 SAND BLAST DEBRIS

Scope - This section applies to the spent sandblast debris from bridge painting.

Sampling: A 500 ml can sample will be taken in the field by the project inspector

Procedure: In accordance with EPA Method 1311

Specification: In accordance with Connecticut DEP Drinking Water Remediation Standards

Report - Form MAT-231

3.8 CALCIUM CHLORIDE

Scope – This section applies to calcium chloride to be used for dust control and ice removal.

Sampling: In accordance with AASHTO T 143

Procedure: In accordance with AASHTO T 143

Specification: In accordance with AASHTO M 144

Report - Form MAT-209

3.9 SODIUM CHLORIDE (ROCK SALT)

Scope - This section applies to the composition, storage, inspection, acceptance, and delivery of sodium chloride obtained from natural deposits (Rock Salt) or artificially produced (Evaporated, Solar or other) that is to be used for snow and ice control on highways or bridges; or for use in inertia barriers.

Sampling: In accordance with AASHTO T2.

Procedure: Sieve analysis in accordance with ASTM M143, chemical analysis and moisture content in accordance with ASTM D 632.

Specification: In accordance with ConnDOT Reference File No. 139

Report - Form MAT-208

3.10 GLASS SPHERES (GLASS BEADS)

Scope - This section applies to glass spheres (glass beads) for application on pavement markings to improve the night visibility of the marking film.

Sampling: One 50 lb (25 kg) bag will be taken for each Lot Number and forwarded to the DMT

Procedure: In accordance with AASHTO M 247

Specification: In accordance with AASHTO M247, Type 1.

Report - Form MAT-228 or MAT-229

3.11 SWEEPING COMPOUND

Scope - This section applies to oil and water absorbent materials for use on floors and decks of concrete, wood and steel.

Sampling: In accordance with Federal Test Method Standard No. 536

Procedure: In accordance with Federal Specification P-A-1056

Specification: In accordance with Federal Specification P-A-1056

Report - Form MAT-212

3.12 CONCRETE CURING COMPOUND

Scope - This section applies to concrete curing compound.

Sampling: In accordance with AASHTO T 155

Procedure: In accordance with AASHTO T 155, M 148

Specification: In accordance with Standard Specifications, Article M.03.01.10(c) and AASHTO M 148, Type II, Class B.

Report - Form MAT-315

3.13 PORTLAND CEMENT (Chemical Analysis and Fineness of Grind)

Scope - This section applies apply to chemical analysis and fineness of Portland Cement.

Sampling: In accordance with AASHTO T 127

Procedure: In accordance with AASHTO T 105 for chemical analysis and T 98 for fineness of grind.

Specification: In accordance with AASHT0 M 85

Report - Form MAT-315

3.14 PROTECTIVE COMPOUND MATERIAL

Scope - This section applies to antispalling compound used as a protective material for concrete.

Sampling: In accordance with Federal Test Method Standard No. 141, Method 1022

Procedure: In accordance with AASHTO M 223

Specification: In accordance with Standard Specifications, Article M.03.01.11

Report - Form MAT-315

3.15 WATER FOR CONCRETE

Scope - This section applies to water used in the production of Portland cement concrete.

Sampling: A 1 quart (1 liter) representative sample in a clean non-contaminated glass jar will be submitted from each source of supply.

Procedure: In accordance with AASHTO T 26

Specification: In accordance with Standard Specifications, Article M.03.01-4

Report - Form MAT-230

3.16 CHEMICAL ANALYSIS OF ALUMINUM ALLOY METALS

Scope - This section applies to the determination of the chemical composition of Aluminum Alloy metals

Sampling: In accordance with ASTM E 55 for wrought products and ASTM E 88 for cast products.

Procedure: In accordance with ASTM E 34

Specification: In accordance with ASTM B 26, B211, B221

Report - Form MAT-315

3.17 CHEMICAL ANALYSIS OF CHROMINUM-NICKEL ALLOYS

Scope - This section applies to the determination of the chemical composition of Chromium-Nickel Alloys

Sampling: In accordance with ASTM E 59

Procedure: In accordance with ASTM E 353

Specification: In accordance with ASTM A 193 and A 276

Report - Form MAT-315

3.18 CHEMICAL ANALYSIS OF CARBON ALLOYS

Scope - This section applies to the determination of chemical composition of carbon alloys

Sampling: In accordance with ASTM E 59

Procedure: In accordance with ASTM E 350

Specification: In accordance with ASTM A 36, A 108, A 325, A 446, A 490, A 588 or A 606

Report - Form MAT-315

3.19 CHEMICAL ANALYSIS OF BRASS ALLOYS

Scope - This section applies to the determination of chemical composition of brass alloys

Sampling: In accordance with ASTM E 255

Procedure: In accordance with ASTM E 54

Specification: In accordance with ASTM B 584

Report - Form MAT-315

3.20 ANALYSIS OF CARBON STEELS BY LECO ANALYZER

Scope - This section applies to the determination of Carbon in metals

Sampling: In accordance with ASTM E 59

Procedure
Carbon Analysis

1. Turn power on
2. Turn on oxygen flow (41.37-55.16 kPa)
3. Switch clamp to carbon hose
4. Turn buret stopcock to exhaust position - check zero
5. Raise leveling bottle to upper cup until red leveling solution fills buret and seats float valve in buret. Lock it.
6. Turn buret stopcock to furnace position

7. Place sample into crucible (0.2- 0.5-g sample and 1 scoop of copper). Place the sample into the induction furnace.
8. Wait for combustion, then lower leveling fluid. When 2/3 empty, lower crucible from mechanism chamber. Remove sample with TONGS!
9. Turn the buret stopcock to exhaust position and allow the bottom of the meniscus to settle to zero on the buret stem.
10. Turn the buret stopcock to caustic position and raise leveling fluid
11. Wait 15 seconds
12. Lower leveling fluid - matching the menus of both solutions to obtain the carbon reading
13. Final buret reading depends on temperature and barometer reading

$$\text{Percent Carbon} = \frac{\text{buret reading}}{\text{sample mass}} \times \text{standard factor} \times \text{barometer factor}$$

Specification: In accordance with ASTM E 350 and E 353

Report - Form MAT-315

3.21 ANALYSIS OF SULFUR IN STEEL by LECO ANALYZER

Scope - This section applies to the determination of sulfur content in steel

Sampling: In accordance with ASTM E 59

Procedure

1. Prepare titrator
2. Add prewashed standard to crucible
3. Add 1 scoop of iron chips (accelerator) to crucible
4. Add 1 scoop of copper accelerator
5. Put cover on each crucible and place each into the mechanism
6. Set time
7. Put furnace on for 8 to 10 minutes, it will automatically titrate
8. Read buret reading

$$\text{Standard factor} = \frac{\text{(Standard Percent)}}{\text{(buret reading)}}$$

9. Prepare samples as standard (steps 2 - 8)

10. Calculate percent sulfur as follows:

$$\frac{\text{buret reading} \times \text{std. factor}}{\text{sample mass}} = \text{percent sulfur}$$

Specification: In accordance with ASTM E 350 and E 353

Report - Form MAT-315

3.22 CHLORIDE CONTENT IN HARDENED PORTLAND CEMENT CONCRETE

Scope - This section applies to determining total chloride content in Portland Cement concrete

Sampling: In accordance with Federal Highway Administration Report No. FHWA-RD-74-5 Section "Sample Acquisition."

Procedure: In accordance with Federal Highway Administration Report No. FHWA-RD-74-5

Specification- N/A

Report – Form MAT-246

3.23 SEED

Scope - This section applies to seed mixture to establish turf or grass surfaces.

Sampling- N/A

Procedure: In accordance with Standard Specification Article M.13.04

Specification: In accordance with Standard Specification Article M.13.04

Reports: Form MAT-315

3.24 CUT-AND-FILL SOIL MATERIAL

Scope - Tests are required of cut-and-fill slope soil in order to assess the lime requirements for optimum growth of grass and other desirable vegetation.

Sampling

1. Sample cut slopes separately from fill slopes
2. Obtain at least twenty sub-samples from an area to be sampled. Collect sub-samples in a clean container. Mix well in the container or on clean pavement. Submit approximately 25 lb (10 kg) of the composite sample with a properly completed Request for Test to the DMT.
3. Whenever possible, submit all cut-and-fill slope samples from a given project at one time.

Procedure: Upon receipt of a cut-and-fill soil sample, each sample should be well mixed and divided, preferably in a sample splitter. Draw a 1 qt (1 L) working sample and proceed as indicated in Section 3.43 for determination of lime requirement.

Specifications - N/A

Report - Form MAT-232

3.25 TOP SOIL

Scope - Tests are required to ascertain whether or not topsoil meets the specifications for texture and organic content as well as to assess lime requirements for the optimum growth of grass or other desirable vegetation.

Sampling

Obtain at least 20 sub-samples of the loam stockpiles or of an area to be stripped for loam. Sampling depth should not exceed the depth of the topsoil.

1. Mix the sub-samples well on clean pavement or in a clean container
2. Send 20 lb (9 kg) of the composite sample to the laboratory with a properly completed Request for Test. When possible, send topsoil samples for an entire project at one time.

Procedure

1. Upon receipt of the sample, divide in a sample splitter to a 1 qt (l L) working sample.
2. Place 1 lb (500 g) in an oven set for 230° F (110ºC) for at least 12 hours. When dry, rub through a 850 µm sieve. Use this material to conduct mechanical analysis, as in the case of cut-and-fill soil material.

3. Soil Texture Classification by Partial Mechanical analysis: soil classification, that is the determination of whether a soil material physically falls into the category of a loam, a sandy loam, a sand, etc., is rapidly determined by a simplified mechanical analysis employing the Boyocous hydrometer method, which is based upon the velocity of settling particles according to Stokes Law. It is necessary in most soils to assist the dispersion of clay particles, and this is done by using a dispersing agent. A Calgon solution has been found acceptable for Connecticut soils.

    2.1 Calgon Solution: Weigh 571.25 g of Calgon into a 2 L beaker. Add one liter of distilled water, stir and pour clear portion into a clean 19 L bottle. Repeat additions of distilled water until all the Calgon goes into solution, adding to the solution in the 19 L bottle. Add enough distilled water to make 10 L of solution. It is convenient to store the bottle on a high shelf and use gravity feed from the bottle to a 1200 ml dispensing pipette.

    2.2 Sieve the oven dried soil through a 850 µm sieve. Place 10g of the sieved soil into a 400 ml beaker and add 10 ml distilled water and 10 ml 30 percent hydrogen peroxide, place into oven overnight. Wash sample into the soil mixer container along with 10 ml calgon solution and some tap water, mix for 15 minutes. Filter through a 45 µm into a 100 ml hydrometer cylinder. Carefully transfer the retained material into a preweighed 50 ml beaker, place into oven until dry.
    Stopper the cylinder, and thoroughly shake it by completely inverting the cylinder a minimum of 25 times. At the end of the shake, remove the stopper and add 3 drops of Amyl alcohol to reduce foam. After two hours, gently introduce the Boyocous hydrometer or Taylor hydrometer (ASTM 152 H). Read the hydrometer and record the temperature of the soil solution in degrees Fahrenheit.

3. Organic Content of Soil Material: Soil material organic content will be approximated by loss-on-ignition.

    3.1 Equipment
        3.1.1 110 ºC oven, preferable with forced circulation
        3.1.2 Muffle furnace capable of sustaining up to 1100 ºC
        3.1.3 Balance capable of weighing to within 0.1 mg
        3.1.4 Chemical laboratory glass desiccator
        3.1.5 Porcelain crucibles, equivalent to Coors Size 1, 0-22

    3.2 Determine the mass of the crucible and the soil material.

    3.3 Place crucible in muffle furnace that has been preheated to 900ºC and allow furnace to heat up to 1100ºC. Leave in furnace for 2½ hours. Remove crucible and soil material (now mineral ash) and cool for 10 minutes on wire grid; then place in desiccator and allow to cool to room temperature (minimum of 1 hour).

3.4 Remove the crucible from the desiccator and determine mas.

4. Soil reaction of pH: The soil reaction or degree of acidity or alkalinity of a soil can usually be easily determined by the use of a pH meter.

4.1 Preparation of Soil Sample: Fill a 100 ml beaker half full of the air-dried, 850 µm soil material; add distilled water to make a thick but fluid pate; stir and allow to soak for a minimum of 15 minutes.

4.2 Preparation of Instrument: Calibrate instrument according to instruction furnished with the instrument.

4.3 Rinse electrodes, and lower into the prepared soil past. Be sure electrodes do not press side of beaker. Take reading according to directions furnished with instrument.

4.4 Repeat reading at one-minute intervals until constant.

4.5 Record the final pH of the soil paste on Form No. MAT-232

5. Limestone Requirements: In order to assess the limestone requirements of a given soil, the following information must be assembled:

5.1. Soil texture (from the soil textural classification)

5.2. Soil reaction (from the pH determination of the soil)

5.3. Analysis of calcium, magnesium and aluminum (from the Morgan tests of the soil)

FORMULAS TO DETERMINE COMPOSITION OF TOPSOILS

$$\% \text{ Organics} = \frac{[\text{c w/soil} - \text{c w/ash}]}{[\text{c w/soil} - \text{crucible mass}]} \times 100$$

$$\% \text{ Sand} = \frac{[\text{mass B w/sand} - \text{mass breaker}]}{[\text{mass of total sample}]} \times 100$$

$$\% \text{ Clay} = \frac{[(h-f) \times 1000]}{[\text{mass of sample}]} \times 100$$

% Silt = 100 – [% sand + % clay]

where: c = crucible weight in grams, b = beaker weight in grams h = hydrometer reading, f = Correction Factor (see Table 1)

Using the Textural Classification Triangle to plot the % SILT and the % CLAY. Where the two lines intersect within the triangle indicates the texture of the soil tested.

Table 1
Correction Factors for Soil Hydrometer at various Temperatures.

TEMPERATURE (˚F)	FACTOR, F
65	1.002488
66	1.002332
67	1.002272
68	1.002159

69	1.002043
70	1.001923
71	1.001801
72	1.001675
73	1.001546
74	1.001414
75	1.001279
76	1.001141
77	1.001000
78	1.008560
79	1.000709
80	1.000560

LIME CONTENT (tons/c-2)

pH	Sand	Loamy-Sand	Sandy-Loam	Loam
4.5	¼	1	2	2 3/4
4.6	¼	1	1 3/4	2 1/2
4.7	¼	1	1 3/4	2 1/2
4.8	¼	1	1 3/4	2 1/4
4.9	¼	3/4	1 1/2	2 1/4
5.0	¼	3/4	1 1/2	2 1/4
5.1	¼	3/4	1 1/2	2
5.2	¼	3/4	1 1/2	2
5.3	¼	3/4	1 1/4	1 3/4
5.4	¼	1/2	1 1/4	1 3/4
5.5	¼	1/2	1 1/4	1 1/2
5.6	¼	1/2	1	1 1/2
5.7	¼	1/2	1	1 1/4
5.8	0	1/2	3/4	1 1/4
5.9	0	1/4	3/4	1
6.0	0	1/4	3/4	1
6.1	0	1/4	1/2	1
6.2	0	1/4	1/2	3/4
6.3	0	1/4	1/2	3/4
6.4	0	0	1/4	1/2
6.5	0	0	1/4	1/2
6.6	0	0	0	1/4

Specifications - N/A

Report - Form MAT-232

3.26 PEAT

Scope - This section applies to determination of organic content, water-holding capacity, and ph of peat moss.

Sampling: One unopened bale of peat moss

Procedure

1. Organic content of peat

   Determine mass of crucible. Rub the peaty material through a 850 µm sieve to remove large particles, then pack crucible ¾ full. Determine mass carefully, being sure that the peat does not expand and that particles are not lost. If this occurs, empty crucible, blow clean, recheck crucible mass, pack crucible half-full and determine mass. Place crucible in wire triangle under a hood, and gently heat the bunsen burner to slowly begin ashing of the peat. Do not allow to burn with a flame; sure that particles do not escape with smoke. When the material has been oxidized to a black color, place the crucible in a muffle furnace which has been heated to 1000°C, and allow muffle to increase 1100°C. Ignite for 2-1/2 hours. Remove from muffle, cool on a wire grid for 10 minutes; then place in desiccator until cooled to room temperature. Determine mass of crucible and ash. Subtract the mass of the ash from the mass of the 110°C dried peat. The difference will be the loss of mass. Divide the loss of the mass by the mass of the peat, and multiply the result by 100 to obtain the percent organic content. Record all masses and computations on Form MAT-245.

2. Water Holding Test

   2.1 Determine and record the mass of a dry clean 425µm sieve.
   2.2 Fill the sieve with the peat material that passed the 2.00 mm sieve.
   2.3 Set the sieve in a pan of water, being careful that the water does not flow over the top of the sieve. Fill the pan as often as necessary until the water appears at the top surface of the peat in the sieve. Keep the sieve in the pan of water for one hour after the surface of the peat is saturated.
   2.4 Remove the sieve in a pan; set on a grooved drain board, and allow to drain for 4 hours. Determine the mass of the sieve with the wet peat.
   2.5 Place the sieve with the wet peat in an oven set for 110°C; leave in the oven for 24 hours. Remove, cool, the determine the mass of the sieve and the oven-dry peat.
   2.6 Subtract the mass of the sieve from items (2.4) and (2.5)
   2.7 Divide the loss of mass (which is the mass of the water absorbed by the mass of the oven-dry peat); multiply by 100, and report as a percent water-holding capacity. This percentage should be much higher than 1000 percent and might exceed 1300 percent.

Specification: In accordance with Standard Specification Article M.13.07.14

Report - Form MAT-245

3.27 LIMESTONE

Scope - This section applies to the determination of the percent of $CaCO_3$ in limestone

Sampling: In accordance with Federal Test Method Standard No. 141, Method 1022. A 1L composite sample will be submitted with a Request for Test (Referee Method in case of discrepancy involving field inspecting).

Procedure

Gradations:

In the laboratory, a 50 g sample of the original sample will be placed in a 250 ml beaker and dried in an oven set for 110ºC for 12 hours.

Square Mesh Sieves	Percent Passing by Mass
Pass 2.00 mm	100
Pass 850 µm	90
Pass 150 µm	40

Chemical Test:

Analyze a 1-gram sample by the Indicator Titration Method as described in Section 1.005 of the AOAC. Report as percent calcium carbonate equivalence.

Specification: In accordance with Standard Specification Article M.13.02

Note: Limestone shall be agricultural ground dolmitic

Report - Form MAT-315 (gradation and the calcium carbonate equivalence)

3.28 FERTILIZER

Scope - This section applies to fertilizer used on ConnDOT projects

Sampling- A sample is not required. Request for test must have required documentation attached.

Procedure: In accordance with Standard Specification M.13.03

Specification: In accordance with Standard Specification Article M.13.03

Report - Form MAT-315

3.29 WOOD CELLULOSE FIBER MULCHES

Scope - This section applies to Hydroseeding soil to establish quick germinating vegetation to prevent erosion.

Sampling: A minimum of five sealed bags or bales should be selected at Standard No. 141, Method 1022 random from the shipment. Break the bales or bags into two equal portions. A 0.5 in. (13 mm) bat from the center of each bale should be drawn and placed into a clean plastic bag. The sample bag should then be tied closed to prevent the entry of moisture. Send the sample with a Request for Test to the Rocky Hill Laboratory.

Procedure

1. Select a 2 in x 2 in. (50 mm x 50 mm) sample from each of the five bats. Measure and record the mass. Place in an oven at 230 ºF (110 ºC), and dry for a minimum of 12 hours. Remove, cool and determine mass. Subtract oven dry mass from the original mass. The loss of mass is moisture. Divide loss of mass by oven dry mass of sample and multiply by 100. Report as percent moisture as received.
2. Report presence or absence of coloring matter or indicator dye as observed.

3. Select fibers from each bat to fill a 7 oz. (200 ml) beaker, add distilled water, soak for 1/2 hour, and run pH as described for soils.
4. Determine mass of crucible; select fibers from each bat to pack a crucible 3/4 full. Set oven for 230ºF (110ºC), and place in oven for 12 hours. Determine mass of crucible and fiber, and record mass of oven-dry fibers.
5. Ignite under hood with a burner, slowly, so fibers do not burn with a flame. When fibers are reduced in volume to less than half the original volume, place in muffle furnace set for 1650 ºF 900 ºC for two hours. Remove, cool in desiccator and determine mass
6. Compute loss in mass as percent organic content as described for soils

Specification: In accordance with Standard Specification Article M.13.05-4

Report - Form MAT-227

3.30 SOD

Scope - This section covers the testing of sod used for the immediate establishment of a grass surface.

Sampling: Select a roll of the material at random from the shipment after inspecting to assure that all rolls appear uniform. Cut a section one foot (meter) in length (full width) and submit with Request for Test to the Laboratory.

Procedure: Materials Testing personnel should consult the Office Engineering, facilities design section if there is any question as to the acceptability of the material.

Specification: In accordance with Standard Specification Article M.13.08

Report - Form MAT-315

3.31 SAMPLING OF AGGREGATES

Scope - This section covers sampling of coarse and fine aggregates at the source of supply and at the site of use. Typical sampling applications include sampling from flowing aggregate streams (bins or belt discharge), conveyor belts, roadways, stockpiles, or transportation vehicles.

Sampling: Samples for tests to be used in acceptance or rejection decisions are to be obtained by a representative of ConnDOT. Preliminary samples and tests for potential open faced banks or pits are the responsibility of the producer unless an adequate and representative stockpile has been prepared for testing for use on Department projects.

Procedure: In accordance with AASHTO T 2

Specification: N/A

Report: N/A

3.32 REDUCING SAMPLES OF AGGREGATE TO TEST SIZE

Scope – This section covers the reduction of large field samples of aggregate to the appropriate size for laboratory testing by quartering or by use of the mechanical splitter.

Sampling: In accordance with AASHTO T 2

Procedure: In accordance with AASHTO T 248

Specification: N/A **Report:** N/A

3.33 SIEVE ANALYSIS OF AGGREGATES

Scope - This section covers the determination of particle size distribution of fine and coarse aggregates for conformance to specifications. Sieve analysis tests are run on fine and coarse aggregates for Bituminous and PC Concrete, various roadbase and roadbed materials such as subbase and processed aggregate base, special riprap, and coarse aggregates for other incidental construction.

Sampling: In accordance with ASSHTO T 2

Procedure: In accordance with AASHTO T 27

Specification: In accordance with the applicable Standard Specification Article (M.01, M.02, M.03, M.04, M.05 or M.12), or project Special Provisions.

Report: Forms MAT-205, MAT-206, or MAT-207, whichever is applicable.

3.34 MATERIALS FINER THAN THE #200 SIEVE BY WASHING

Scope - This section covers determination of the percentage of material finer than a 75µm sieve in fine or coarse aggregates by washing. Clay and other water soluble materials are removed from the aggregate during this procedure.

Sampling: In accordance with AASHTO T 2

Procedure: In accordance with AASHTO T 11

Specification: In accordance with the applicable Standard Specification Article (M.01, M.02, M.03, M.04, M.05 or M.12), or project Special Provisions.

Report: Forms MAT-205, MAT-206, MAT-207, or MAT-223 whichever is/are applicable.

3.35 RESISTANCE TO DEGRADATION BY L.A. ABRASION

Scope - This section covers the procedure for testing various sizes of coarse aggregate for resistance to degradation by use of the LA Abrasion machine.

Sampling: In accordance with AASHTO T 2

Procedure: In accordance with AASHTO T 96

Specification: In accordance with the applicable Standard Specification Article (M.01, M.02, M.03, M.04, M.05 or M.12), or project Special Provisions.

Report: Form MAT-211

3.36 SOUNDNESS OF AGGREGATE BY USE OF MAGNESIUM SULFATE

Scope - This test method covers the procedure for testing aggregates to determine their resistance to disintegration by repeated immersion of the prepared samples in saturated solutions of magnesium sulfate.

Sampling: In accordance with AASHTO T 2

Procedure: In accordance with AASHTO T 104

Specification: In accordance with the applicable Standard Specification Article (M.01, M.02, M.03, M.04, M.05 or M.12), or project Special Provisions.

Report: Forms MAT-220 or MAT-221, whichever is applicable.

3.37 MOISTURE DENSITY RELATIONSHIP OF SOILS

Scope - This section is for determining the relationship between the moisture content and density of soils and soils-aggregates when compacted in a mold of given size with a 4.54 kg hammer dropped from a height of 457 mm in accordance with AASHTO Designation T 180 Method D.

Sampling: In accordance with AASHTO T 2

Procedure: In accordance with AASTHO T 180, Method D

Specification: N/A

Report: Form MAT-213, and MAT-217 or MAT-218 whichever is applicable.

3.38 TOTAL EVAPORATIVE MOISTURE CONTENT OF AGGREGATE BY DRYING

Scope - This method covers the test procedure to determine the amount of evaporable moisture (surface and moisture in pores) in a sample of aggregate by drying.

Sampling: In accordance with AASHTO T2

Procedure: In accordance with AASHTO T 255

Specification: N/A **Report:** N/A

3.39 FLAT AND/OR ELONGATED PARTICLES IN COARSE AGGREGATE

Scope - This test method is used to determine the amount of flat particles, elongated particles, or flat and elongated particles in coarse aggregates.

Sampling: In accordance with AASHTO T2

Procedure: In accordance with ASTM D4791

Specification: In accordance with the applicable Standard Specification Article (M.01, M.02, M.03, M.04, M.05 or M.12), or project Special Provisions.

Report: Form MAT-104

3.40 FRACTURED PARTICLES IN COARSE AGGREGATE

Scope - This section covers the determination of the amount of a coarse aggregate sample that consists of fractured particles that meet specified requirements.

Sampling: In accordance with AASHTO T2

Procedure: In accordance with ASTM D5821

Specification: In accordance with the applicable Standard Specification Article (M.01, M.02, M.03, M.04, M.05 or M.12), or project Special Provisions.

Report: Form MAT-104

3.41 BULK DENSITY (UNIT MASS) AND VOIDS IN AGGREGATE

Scope - This section covers the determination of the density of coarse, fine, or mixed aggregates in a loose or compacted condition.

Sampling: In accordance with AASHTO T2

Procedure: In accordance with AASHTO T19

Specification: N/A

Report: Form MAT-104

3.42 SPECIFIC GRAVITY AND ABSORPTION OF COARSE AGGREGATE

Scope - This test section covers the determination of specific gravity (bulk, saturated surface dry, and apparent) and absorption of coarse aggregates after 15 hours of soaking in water.

Sampling: In accordance with AASHTO T 2

Procedure: In accordance with AASHTO T 85

Specification: N/A

Report: Form MAT-219

3.43 ORGANIC IMPURITIES IN FINE AGGREGATE FOR CONCRETE

Scope - This section covers the determination of the presence of injurious organic compounds in fine aggregates for PC Concrete and cement mortars.

Sampling: In accordance with AASHTO T 2

Procedure: In accordance with AASHTO T 21

Specification: In accordance with Standard Specification Article M.03 or project Special Provisions.

Report: Form MAT-206

3.44 FIELD INSPECTION OF METAL PIPES AND PIPE ARCHES

Scope - The field inspection of metal and aluminum pipe and structural plate pipe and pipe arches.

Sampling – Depending on the size of the shipment, one or two representative pieces of metal pipe, bands and accessories are selected by DMT and inspection personnel for testing.

Procedure: Procedures and Measurements are shown in the “Field Inspection of Metal and Aluminum Pipe” procedure located in Appendix G. Materials Certificates and certified test reports are also required.

Specification: In accordance with Standard Specification Section Article M.08

Report : Forms MAT-200, MAT-201, MAT-202, MAT-203, or MAT-204, whichever is applicable.

3.45 PENETRATION RESISTANCE TESTS

Scope - This section covers the nondestructive testing of the strength of concrete in finished structures by driving a steel shaft into the surface of the concrete with a precisely governed explosive charge.

Sampling: Working with the Inspection personnel, select the areas to be tested. Whenever possible the area should be large enough to use the triangular template, as opposed to the single probe template.

Procedure : In order to obtain accurate results with this system, it is necessary to know the hardness of the coarse aggregate, as expressed in "Mohs". Generally broken stone is classed as Mohs No. 6 and crushed gravel is Mohs No. 5. However if there are any questions, samples can be checked at the Rocky Hill Laboratory for confirmation. For lightweight aggregate it is only necessary to determine the lb/ft^3 (kg/m^3)of the concrete.

The testing procedure in the field will follow the instructions and guidelines stipulated in the latest edition of the manufactures operators manual, and will be performed only by individuals certified in the use of the equipment.

Specification: In accordance with project specifications

Report - Form MAT-210

3.46 SWISS HAMMER TEST

Scope - This section covers the nondestructive testing of in-place hardened concrete.

Sampling: Working with the Inspection personnel, select the areas to be tested.

Procedure: The testing procedure in the field will follow the instructions and guidelines stipulated in the latest edition of the equipment manufactures operators manual.

Specification: In accordance with project specifications

Report - Form MAT-210

3.47 SAMPLING FRESHLY MIXED CONCRETE

Scope - This section covers the procedures for obtaining representative samples of plastic PC Concrete delivered to Department projects, including sampling from stationary, paving and truck mixers, and sampling from agitating and nonagitating equipment used for delivering central mix concrete.

Sampling: Project personnel are responsible for sampling the concrete at the point of placement.

Procedure: In accordance with AASHTO T 141

Specification: N/A

Assurance Report (DMT Only): MAT-224, or MAT-225, and MAT-222
Acceptance Report (Project Personnel): MAT-308

3.48 MAKING AND CURING CONCRETE TEST SPECIMENS IN THE FIELD

Scope - This section covers fabricating, curing, and transportion of PC Concrete cylinder test specimens. Project personnel are responsible for filling the cylinder molds, determining air content, temperature, and slump. Cylinders must be immediately placed where they can remain undisturbed for at least 24 hours.

Sampling - In accordance with the Standard Method for Sampling Freshly Mixed Concrete, AASHTO T 141.

Procedure - The procedures for molding test specimens and the procedures for curing, unless otherwise specified, will be in accordance with the Standard Method for Making and Curing Concrete Compressive and Flexural Strength Test Specimens in the Field, AASHTO T 23.

Assurance Report(DMT Only):MAT-224, or MAT-225, and MAT-222
Acceptance Report(Project Personnel): MAT-308

3.49 SLUMP OF HYDRAULIC CEMENT CONCRETE

Scope - This section covers the procedure to determine the slump of plastic PC Concrete.

Sampling: In accordance with AASHTO T 141

Procedure: - In accordance with the Standard Method of Test for Slump of Hydraulic Cement Concrete, AASHTO T 119.

Specification: In accordance with Standard Specification Article M.03 or project Special Provisions.

Assurance Report (DMT Only): MAT-224, or MAT-225, and MAT-222
Acceptance Report(Project Personnel): MAT-308

3.50 MASS, YIELD, AND AIR CONTENT (GRAVIMETRIC) OF PC CONCRETE

Scope - This section covers the test procedures for determining the mass (per cubic meter or cubic foot) of plastic PC Concrete delivered to project sites. The method also provides procedures for determining yield, cement content, and air content of the delivered mixture.

Sampling - In accordance with the Standard Method of Sampling Freshly Mixed Concrete, AASHTO T 141.

Procedure - In accordance with the Standard Method of Test for Mass per Cubic Meter (Cubic Foot), Yield and Air Content (Gravimetric) of Concrete, AASHTO T 121

Specification: In accordance with Standard Specification Article 4.01 or 6.01 and M.03 or project Special Provisions.

Assurance Report (DMT Only): MAT-224, or MAT-225, and MAT-222
Acceptance Report(Project Personnel) - Form MAT-308.

3.51 AIR CONTENT OF PLASTIC CONCRETE BY THE PRESSURE METHOD

Scope - This section covers the test procedure for determining the percentage of entrained air in plastic PC Concrete by use of the Type B air meter. This method is used for PC Concrete containing normal weight coarse aggregates.

Sampling: In accordance with the Standard Method of Sampling Freshly Mixed Concrete, AASHTO T 141.

Procedure: In In accordance with the Standard Method of Test for Air Content of Freshly Mixed Concrete
by the Pressure Method, AASHTO T 152.

Specification: In accordance with Standard Specification Article M.03 or project Special Provisions.

Assurance Report (DMT Only): MAT-224, or MAT-225, and MAT-222
Acceptance Report(Project Personnel) - Form MAT-308.

3.52 AIR CONTENT OF PLASTIC CONCRETE BY THE VOLUMETRIC METHOD

Scope - This section covers the test procedure for determining the percentage of entrained air in plastic PC Concrete that contains lightweight or cellular aggregates.

Sampling: In accordance with the Standard Method for Sampling Freshly Mixed Concrete, AASHTO T 141.

Procedure: In accordance with the Standard Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method, AASHTO T 196.

Specification: In accordance with Standard Specification Article 4.01, 6.01, and M.03 or project Special Provisions.

Assurance Report (DMT Only):MAT-224, or MAT-225, and MAT-222
Acceptance Report(Project Personnel) - Form MAT-308.

3.53 TEMPERATURE OF PLASTIC PORTLAND CEMENT CONCRETE

Scope - This section covers the procedure for determining the temperature of plastic PC Concrete delivered to Department sites.

Sampling: In accordance with AASHTO T 141

Procedure: In accordance with AASHTO T 309

Specification: In accordance with Standard Specification Article M.03 or project Special Provisions.

Assurance Report (DMT Only): MAT-224, or MAT-225, and MAT-222
Acceptance Report(Project Personnel) - Form MAT-308.

3.54 INSPECTION OF CONCRETE BATCH PLANTS AND TRUCK MIXERS

Scope - Each year, preferably just prior to the active construction season, the District Laboratories will inspect for approval the portland cement concrete batch plants and truck mixers located within their respective districts, which produce concrete for use by the Department.

Sampling – Samples of plastic concrete are normally not required during the yearly inspection, however they may be requested by DMT personnel.

Procedure: In accordance with current inspection forms for Concrete Plants and Truck Mixers

Specification: In accordance with Standard Specifications, Article 4. 01. 03-2 (a) for Concrete Plants.
In accordance with Standard Specifications, Article 6.01.03-1(b) for Truck Mixers.

Report
Results of inspection will be reported Field Reports: Portland Cement Concrete Truck Mixers and Agitators (MAT-214), Portland Cement Concrete Dry Batch Plant (MAT-215), or Portland Cement Central Mix Plant (MAT-216); whichever applies.