



BUREAU OF MATERIALS MATERIALS PROCEDURES

MP NUMBER: 13-25
EFFECTIVE DATE: 03/03/2025

APPROVAL: Edward Inman

FIELD SAMPLING, INSPECTION & TESTING OF SOIL AGGREGATES

PURPOSE:

To establish standard procedures for field sampling, inspection and testing of soil aggregates.

SUPERSEDES:

Materials Procedure Number 13 - Dated 07/01/2008

GENERAL REFERENCES:

Special Provisions, Addenda and Attachments

NJDOT Standard Specifications

AASHTO R-90, R-76, T-11, T-27, T-19, T-99 (Meth C), T-180 (Meth D), T-191, T-265 & T-310

ASTM Standards C117, D1557 Method D

NJDOT Procedure 4.506 A 'Non Complying Soil Sample Assessment Charge'

FORMS:

LB-9 Report of Analysis of Aggregate

LB-14 Analysis of Miscellaneous Materials

LB-88 Sample Envelope

LB-135 Weekly Report of Material Analysis

LB-200(b) Laboratory Soil Analysis

LB-264 Nuclear Density Moisture - Field Test Data

LB-269 Field Analysis of Soil Aggregate

LB-296 Notice of Noncomplying Materials

INSTRUCTIONS:

I. Assignment Procedures

A. The Team Leader or Supervisor shall:

1. Assure that the Team receives the following:
 - a. Copies of references and test methods pertinent to this MP.
 - b. The proposed sources, as provided by the RE and including the test results of soil aggregate materials to be used for each project.
2. Obtain from the RE or his representative the limits of the area or areas that are complete and ready for sampling/testing.
3. Provide to the inspector the minimum number of randomly selected samples to be taken and the station and offset of each sample location.

B. The Inspector shall:

1. Obtain samples in locations determined by the Team Leader.
2. Test the soil aggregate.

C. The Team Leader shall:

1. Verify calculations on the designated forms.
2. Immediately notify the RE of all failing test results.
3. Randomly inspect the project to determine if a change in the materials has occurred.

NOTE: Personnel sampling and testing soils and aggregates must be certified as New Jersey Soil and Aggregate Technician Level 1 or MARTCP equivalent.

II. Sampling and Testing of Soil Aggregate

A. Random Selection of Sample Locations

1. Determine the volume of each type and class of soil aggregate in the project either from the estimate of quantities in the proposal or from the plan sheets.
2. From the project specifications determine the sampling rate for each type and class of soil aggregate.
3. Determine the number of samples required for each type and class of soil aggregate by dividing the volume for each particular soil aggregate by the specified sampling rate. However, at least one sample BEBF and Porous Fill will be taken for each structural component, regardless of the material quantity specified.
4. On a daily basis, determine the number of samples required.

5. Determine the location of each sample by using Random Numbers.
- B. Obtaining Field Sample
 1. For all soil aggregate types that are required to be sampled in place, proceed as follows:
 - a. Dig (3) neat vertical holes, extending the full depth of the lift across the designated area. The holes shall be large enough to form a field sample whose combined weight equals or exceeds the minimum specified in Table 1.
 - b. For soil aggregate and Zone III materials that are permitted to be placed in lifts greater than 8 inches, the sample shall be taken from a single hole extending into the lift to a practical depth in order to secure the size sample required in Table 1.
 - c. Collect all the material removed from the hole regardless of size or composition and place in large sample bag(s).

| Interagency Designation | Minimum Weight of Field Samples | | Minimum Weight of test Sample | |
|-------------------------|---------------------------------|----------|-------------------------------|----------|
| | Lbs. | (Grams) | Lbs. | (Grams) |
| I-1 | 90 | (40,500) | 44.0 | (20,000) |
| I-2 | 30 | (13,500) | 11.0 | (5,000) |
| I-3 | 30 | (13,500) | 11.0 | (5,000) |
| I-4 | 30 | (13,500) | 22.0 | (5,000) |
| I-5 | 30 | (13,500) | 11.0 | (5,000) |
| I-6 | 30 | (13,500) | 1.3 | (600) |
| I-7 | 30 | (13,500) | 1.3 | (600) |
| I-8 | 30 | (13,500) | 1.3 | (600) |
| I-9 | 30 | (13,500) | 11.0 | (5,000) |
| I-10 | 30 | (13,500) | 11.0 | (5,000) |
| I-11 | 30 | (13,500) | 11.0 | (5,000) |
| I-12 | 30 | (13,500) | 1.3 | (600) |
| I-13 | 30 | (13,500) | 1.3 | (600) |
| DGABC | 30 | (13,500) | 11.0 | (5,000) |
| Zone III | 30 | (13,500) | 11.0 | (5,000) |

2. For soil aggregates placed underwater, other than hydraulically, proceed as follows:

Obtain the sample from the end-dumped material prior to placement using stockpile sampling methods described in AASHTO T-2.

3. For hydraulically placed soil aggregates proceed as follows:

Arrange to obtain a quantity of material by use of suitable equipment with a minimum capacity of .6 cubic yard. The material shall be placed on a suitable surface and sampled using stockpile sampling methods described in AASHTO T-2. (Where the aforementioned is not feasible, a sampling technique shall be determined by the supervisor or the designated representative.)

4. For miscellaneous soil aggregates proceed as follows:

Obtain samples using stockpile-sampling methods as described in AASHTO T-2.

C. Moisture and Gradation

1. Preparation of Form - LB-269

- a. All entries on the form must be legibly recorded by the person or persons grading and washing the sample.
- b. No erasures or white outs. Place a line through errors, initial and correct. Place correct answer adjacent to crossed out answer.
- c. Signatures of each person involved in the sampling and testing of the soil sample and checking of the calculations are required on the form.

2. Moisture

- a. Reduce the sample to the testing size described in Table 1 in accordance with AASHTO T-248.
- b. Weigh the test sample and record on LB-269.
- c. Dry the sample to a constant weight. When heat is applied, prevent aggregate from popping or burning.
- d. Allow sample to cool. Weigh the sample and record on LB-269.
- e. Compute moisture content based on the dry weight according to the following formula:

$$\frac{Ww - Wd}{Wd} \times 100 = \% \text{ moisture} \text{ (Record on LB-269)}$$

Ww = Weight of wet sample

Wd = Weight of dry sample

3. Gradation

- a. If the test sample as specified in Table 1 is 11 pounds (5,000 grams) or more, test as follows: (all weights will be recorded on LB-269)
 1. Weigh the wet soil and pan and record on line A.
 2. Weigh the dry soil and pan and record on line B.
 3. Subtract line B from Line A and record moisture loss on line C.
 4. Subtract weight of pan line D from dry soil and the pan line B and record on line E dry soil.
 5. Divide line C moisture loss by line E dry soil and record in line H as moisture content.
 6. Wash the dried soil over No.200 mesh sieve and record loss on line G after drying.
 7. Separate, using the appropriate coarse aggregate sieves, through a mechanical shaker or hand shaker into + No.4 portions and - No.4 portions.
 8. Record weight of +No.4 on line I and –No.4 on line J.
 9. Split –No.4 through appropriate splitter and record on line K. Sample weight should be approximately 1.3 pounds (600 grams).
 10. Divide line J by K and record on line L as a factor.
 11. Grade +No.4 over required sieves & record.
 12. Grade reduced –No.4 over required sieves & record.
 13. Multiply –No.4 weights by factor and record under column M.
 14. Divide all weights recorded in column M by E x 100. This will give the total % retained on required sieves.
 15. Subtract retained % from 100% on down from previous % passing. This will be total % passing.

16. For the total weight of passing No.200. Wash loss G plus –No.200 in pan N is the total weight O. O divided by E x 100 = % passing the No.200 sieve.

17. Determine the percent passing specified sieves by subtracting from 100. Record on LB-269.

NOTE: If visual inspection indicates there is no +No.4 material then test according to b.

b. If test sample is approximately 1.3 pounds (600 grams) weigh the sample and proceed as described in steps 9 thru 17.

Note: There are situations when it is permissible to wash only the minus No.4 portion of the samples. If the results of the gradation are within 1% of the upper limit on the No.200 sieve, the sample shall be retested by washing the entire sample.

4. Noncomplying Samples

- a. In case of noncomplying samples, obtain a check sample within a 20-foot radius of the original sample. Identify this sample by adding an A after the original noncomplying sample number. Example: 1 and 1A.
- b. If the check sample fails, notify the Team Supervisor immediately. (No further sampling is to be performed until corrective action is taken by the contractor).
- c. After corrective action is performed (blending, etc.), obtain another sample. Identify this sample as 1B. If this sample fails, a check sample (1C) will be taken. If the materials still does not conform to the specification requirements, the contractor shall correct the rejected materials and give certification showing all calculations. After certification, the team will obtain a final sample (1D) and grade the material. If the material still fails, it shall be removed. Use the next sequential number (2) when sampling the replacement material.

5. Reporting Test Results

- a. Report all percentages to the nearest whole number except for material finer than the No.200 sieve, which shall be to the nearest 0.1 percent.
- b. The Team Leader shall complete an LB-135 weekly for each soil type and under remarks list the method of compaction, quantity placed to date and any other pertinent information. Reports should be numbered sequentially each week, for each project. Mark the page number and total number of pages on each sheet. Example: Sheet No.1 of 3, 2 of 3, 3 of 3, or in the case of a single sheet 1 of 1. The Principal Engineer shall approve the LB-135 and forward to the ME for final review and disposition.

- c. Complete form LB-296 for all noncomplying samples.

D. Moisture-Density Relationship of Soil

1. For bridge foundations without piles test in accordance with AASHTO T180, Method D, including the replacement option, except that in determining the moisture content, a gas or electric stove may be used.
2. For all other soil aggregates, test in accordance with AASHTO T-99, Method C, including the replacement option, except that in determining the moisture content, a gas or electric stove may be used.
3. Record test results on LB-200(b) and attach a copy of the LB-269. Notify RE of test results immediately.

E. In-Place Density Test - Nuclear Method

Note: This method may only be used by individuals who are authorized to use Nuclear Gauges.

- a. Determine the wet density and moisture content of the compacted soil in accordance with manufacturers' recommendations and current MP Number 17. Calculate the dry density and percent compaction.
- b. Record all pertinent data and results on LB-264.

F. Additional Tests

1. Method of Test for Rapidly Determining the Breakdown in Size of Dense- graded Aggregate and Soil Aggregate.
 - a. Prior to use on the project the Team Supervisor shall:
 1. For Dense Graded Aggregate Base Course, check the current QPL for approval.
 2. For soil aggregates Type I-1, I-2, I-3, I-4, I-5, I-9, and I-10, perform testing in accordance with the current Standard Specifications.
2. If there is concern regarding composition of soil aggregate, discuss with the Bureau of Materials geologist. Submit sample, if advised, for testing according to NJDOT A-3.

III. Authority and Responsibility

Bring to the attention of the Supervisor any uncertainties regarding the quality of material, equipment, methods of operation or sampling. Document the discussion and the corrective action taken.

IV. Distribution of Forms

It shall be the Team Supervisor's responsibility to ensure forms are distributed as follows:

| <u>FORM</u> | <u>DISTRIBUTION</u> |
|-------------|---|
| LB-9, LB-14 | 1. Original - Bureau of Materials 2. Project Field Office File |
| LB-135 | 1. Original - Laboratory 2. Regional Materials Office 3. Project Field Office File 4. RE |
| LB-264 | 1. Original - Bureau of Materials 2. Regional Materials Office 3. RE 4. Project Field Office File |
| LB-200(b) | 1. Original - Project Field Office File |
| LB-296 | 1. Original - Bureau of Materials Headquarters 2. Resident Engineer 3. Regional Materials Office 4. Regional Construction Engineer 5. Project Field Office File |