ALDOT-292-96
METHOD OF TEST FOR DETERMINING OPTIMUM LIME CONTENT FOR USE IN LIME STABILIZED ROADBED

1. SCOPE

1.1 This test method covers the procedure for preparing and testing laboratory compacted soil-lime mixtures for determining the optimum lime content for lime stabilized roadbed by unconfined compression testing.

2. REFERENCED DOCUMENTS

2.1 ASTM STANDARDS

2.1.1 ASTM D 3551, Laboratory Preparation of Soil-Lime Mixtures Using a Mechanical Mixer

2.2 AASHTO STANDARDS

2.2.1 AASHTO T 89, Determining Liquid Limits of Soils

2.2.2 AASHTO T 90, Determining Plastic Limits and Plastic Index of Soils

2.2.3 AASHTO T 99, moisture Density Relations of Soils Using a 5.5 lb. Rammer and a 12 in. Drop

2.2.4 AASHTO T 208, Unconfined Compressive Strength of Cohesive Soil

2.2.5 AASHTO T 265, Laboratory Determination of Moisture Content of Soils

2.2.6 AASHTO T 307, Standard Test Method for Determining the Resilient Modulus of Soils and Aggregate Materials

3. SUMMARY OF TEST METHOD

3.1 Proctor density tests, AASHTO T 99 dependent of design criteria, are run on the raw soil and soil-lime mixtures of three percent, five percent, and seven percent lime. Five unconfined compression specimens for each of the soil-lime percentages and the raw soil are compacted into a mold, 2.8” in diameter by 9” in length, which produces a 2.8” by 5.6” sample at the

required density and moisture content. The lowest lime percentage that produces a mean unconfined compressive strength gain of 50 psi above the mean unconfined compressive strength gain of 50 psi above the mean unconfined compressive strength of the raw soil is the design lime content. If none produce the desired strength gain, a lime content that produces a significant decrease in the PI should be used. The percent of lime to be added will be determined after consultation with the ALDOT Materials Engineer.

4. APPARATUS

4.1 Oven

4.2 General Purpose Balance

4.3 Plastic Wrap

4.4 Ziplock bags

4.5 AASHTO T 99 equipment (molds, rammers, etc.)

4.6 ASTM D 3551

4.7 AASHTO T 307 equipment (2.5” diameter x 9” mold, spacer plugs, extruder, scarifying tool, etc.)

4.8 AASHTO T 208 equipment (split mold, compression device, etc.)

5. PROCEDURE

5.1 Proctor Density

5.1.1 Determine the maximum dry density and optimum moisture content of the raw soil and each of the soil-lime mixtures using AASHTO T 99.

5.1.2 Determine the Liquid Limit and Plastic Index for raw soil and each soil-lime mixture using AASHTO T 89 and 90.

5.2 Sample Preparation

5.2.1 Raw Soil

5.2.1.1 Weigh out an amount of oven-dried soil passing the No. 16

sieve sufficient to make five unconfined compression tests. Mix the soil with the amount of water required to obtain optimum moisture content plus one percent. Place the material in a ziplock bag or other suitable container to maintain correct moisture.

5.2.1.2 Compact each of the five specimens to 99.5% - 102.0% laboratory reference density at ± 1.0% optimum moisture content following the resilient modulus procedure for compaction (AASHTO T 307, Annex A1) which will produce a specimen at optimum moisture and maximum density that is 2.8" in diameter and 5.6" in length.

5.2.2 Soil-Lime Mixtures

5.2.2.1 Weigh out the required amount of oven-dried soil passing the No. 16 sieve and place in the mechanical mixer (ASTM D 3551). Add three percent, by dry weight of soil, of hydrated lime and place in the bowl. Dry-mix the soil and lime for one minute or until a uniform color is obtained. Add the amount of water required for optimum moisture content plus one percent using an atomizer while the mixer is running. After the water is added, run the mixer or about two and one-half minutes. Turn the mixer off, scrape all parts, and briefly mix the contents of the bowl with a trowel. Quickly place the mixture into an appropriate covered container and allow to mellow for one hour.

5.2.2.2 Compact five unconfined compression test specimens to 99.5% - 102.0% laboratory reference density at ± 1.0% optimum moisture content by following AASHTO T 307, Annex A1 for compaction of Type 2 soils.

5.2.2.3 Repeat 5.2.2.1 and 5.2.2.2 for five and seven percent lime contents.

5.2.3 After extruding each specimen, record its mass, wrap in plastic wrap, and put into a ziplock bag. Store the specimens for 72 hours at 105ºF.

5.3 Unconfined Compressive Strength

5.3.1 Remove the samples from the oven and allow them to reach room temperature before testing.

5.3.2 Test each specimen according to AASHTO T-208.

5.3.3 Calculate the average of the five unconfined compression tests.

5.3.4 Repeat 5.3.1, 5.3.2, and 5.3.3 for the three remaining sets of samples.

5.3.5 The lowest lime percentage which produces a mean unconfined compressive strength gain 50 psi above the mean unconfined compressive strength of the raw soil is the design lime content. If none produce the desired strength gain, the lowest lime content that produces a significant decrease in the soil PI should be used. The percent of lime to be added will be determined after consultation with the ALDOT Materials Engineer.

6. REPORTING

6.1 The final report should include the following information:

6.1.1 Maximum dry density and optimum moisture content for the raw soil and each of the soil-lime mixtures.

6.1.2 Liquid Limit and plastic Index for the raw soil and the soil-lime mixtures.

6.1.3 Mean and standard deviation for each set of unconfined compression tests.

6.1.4 Standard report should include % lime to be added.