Section 319—Lime-Fly Ash Soil Construction

319.1 General Description
General Provisions 101 through 150.

319.1.01 Definitions
General Provisions 101 through 150.

319.1.02 Related References
A. Standard Specifications
   General Provisions 101 through 150.

B. Referenced Documents
   General Provisions 101 through 150.

319.1.03 Submittals
General Provisions 101 through 150.

319.2 Materials

319.2.01 Delivery, Storage, and Handling
General Provisions 101 through 150.

319.3 Construction Requirements
A. Source Approval
   1. The Office of Materials and Research must approve the soil mortar pit before use based on samples obtained and submitted by the District Materials Engineer. If the pit is shown on the Plans as a possible source for use, it may be considered approved and no further approval action is necessary.
   2. If no pit is shown on the Plans or if the Contractor wishes to substitute a source, the District Materials Office shall notify the Office of Materials and Research by letter of the proposed source.
      The State Materials and Research Engineer will approve or disapprove the source after investigation has been conducted.

B. Design Studies
   Before material from the pit may be used in construction, the District Materials Engineer will obtain and submit material for another design analysis by the Office of Materials and Research or Branch Lab.
   If a pit is not shown on the Plans or if a pit is being substituted, notify the Office of Materials and Research by letter on the proposed source.
   The State Materials and Research Engineer will approve or disapprove the pit after the material has been investigated.
   The Office of Materials and Research will report the results of each study to the Area Engineer by letter, and attach Form 408 to show the actual test results.
   1. Preliminary Study
      a. If the field study is favorable, the District Materials Engineer submits to the Office of Materials and Research or Branch Laboratory a 100 lb (45 kg) sample of the soil from the pit to determine how well lime fly ash stabilizes the soil.
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b. If the soil properties vary considerably within the source, the District Materials Engineer submits two samples to the Office of Materials and Research or Branch Laboratory. Take one sample from each of the two soil property extremes.

c. The preliminary study sample cards must be marked “Preliminary Study, Section 319 and Section 814.”

2. Design Study

a. The Office of Materials and Research or Branch Laboratory will perform a mix design study after the Project has been let, but approximately one month before lime fly ash construction is to begin.

   The design study will establish a job mix formula for the soil.

b. The gradation, clay content, and maximum dry density shown on the job mix formula ensures that the material stays within the acceptable limits. If the material fails to meet these requirements during construction the Contractor must:

   1) Make adjustments in the mixing operation.

   2) If changing the mixing or mining operations fails to correct the material, the Engineer may delay further construction until a new design study has been made by the Office of Materials and Research or Branch Laboratory and the job mix formula has been adjusted using the material in question.

c. The District Materials Engineer must mark the sample cards “Design Study, Section 319 and Section 814.2.01.”

d. If the material is from an approved pit, the District Materials Engineer submits a 100 lb (45 kg) composite sample that represents the proposed blending of the soil during construction for the design study.

   1) When preparing the composite sample, The District Materials Engineer must ensure the depth of soil strata to be used is represented along with the pit surface.

   2) If the material is from the roadway and is to be mixed in place, the District Materials Engineer must ensure the composite sample represents the in-place material to the proposed mixing depth for the given number of stations and ensure the soil properties are relatively constant.

C. Acceptance Sampling

1. Soil for Lime-Fly Ash Soil Construction

   a. If the project contains a Special Provision that shows grading and/or quality requirements, the Testing Management Technician must test one acceptance sample for each 1,500 yd³ (1200 m³) or tons, or test 2 per mile (1.6 km) when road mixed, according to GDT 4.

   b. The Testing Management Technician must report the results on Form 495 if mixed in-place, or Form 496 if mixed in a central plant.

   c. If the project proposal does not contain a Special Provision, the Testing Management Technician must test the acceptance samples at a rate of 1 per 1,500 tons (1500 Mg) or 1 per 1,500 linear ft (500 m) per 2 lanes according to GDT 4 and GDT 7, or GDT 67 to assure that the materials being used meet the requirements of the job mix formula.

   d. The Testing Management Technician must report the results on Form 495 if mixed in place, or Form 496 if mixed in a central plant.

   e. The Testing Management Technician must determine the pulverization of the soil by testing one sample from each stockpile of soil-cement material, or at least 1 per project, according to GDT 51.

   f. The Testing Management Technician must perform additional tests when the soil changes significantly or at any time the Engineer desires.

   g. The Testing Management Technician must report the results on Form 495 (use 495 if mixed in place, or use Form 496 if centrally mixed). Show the percent of unpulverized soil in the remarks section of the report.

2. Approved Source
Acceptance samples are not normally required when the lime or fly ash is from a source approved by the Department. Use the following steps as material is delivered to a project.

a. The Engineer will visually inspect the bags (or delivery ticket if in bulk) to verify that the material is from an approved source.

b. The Engineer must document the acceptance on Form 495 if mixed in place or Form 496 if mixed in a central plant. Include the lime type and/or fly ash, percent lime and/or fly ash, producer, and location of the mill.

3. Unapproved Source

Lime or fly ash from an unapproved source may be used if it is tested and found to be satisfactory (unless otherwise directed by the State Materials and Research Engineer).

a. Submit to the Office of Materials and Research a 20 lb (10 kg) sample from stock representing each shipment. The Engineer shall not allow the lime fly ash to be used until satisfactory test results are received.

b. If the Engineer suspects nonuniform or nonspecification material, he or she may submit samples to the Office of Materials and Research for tests. The Engineer may discontinue its use until the Office of Materials and Research determines if the material meets the Specification requirements for the type specified.

c. The tanker used to transport the lime to the plant must be sealed at the loading point.
   1) The Engineer shall verify that the tanker is sealed when it arrives at the plant.
   2) The Engineer will record the seal serial numbers on all tankers received that day in the remarks section of Form 496.

4. Water

a. The Engineer will submit to the Office of Materials and Research a 1 qt (1 L) water acceptance sample from each unpotable source. Submit the samples at least one month in advance so that the results are determined before use.

b. If the condition of the water changes because of rain or drought, submit additional samples to the lab to ensure the water remains satisfactory.

c. If water proposed for use is from a source which is suitable for drinking and ordinary household purposes, report these facts to the Office of Materials and Research on Form 496.

5. Bituminous Prime

For acceptance of material for use as prime, see the procedures in Section 412 of the Sampling, Testing, and Inspection information.

6. Compressive Strength

If mixed in a central plant, the Office of Materials and Research will report the results of spread control on Form 496.

D. Acceptance Testing

1. Spread Control

If mixed in a central plant, the Office of Materials and Research will report results of spread control on Form 496.

2. Density

a. The Testing Management Technician will take samples as frequently as necessary to determine the theoretical maximum dry density.

b. Ensure that the density represents all the soil being used. These samples shall represent the materials used, including the cement incorporated in the base.

c. Within 30 minutes after the initial contact of water and cement, determine the theoretical maximum dry density using GDT 19 or GDT 67. GDT 19 will be conducted in the Office of Materials and Research or Branch Lab,
and **GDT 67** will be conducted on the roadway by the [Office of Materials and Research](#) Testing Management personnel.

d. If **GDT 67** is used to determine the theoretical maximum density, sample and test the soil cement material using the following procedures:

1) Central Plant Mixed Construction
   a. The Testing Management Technician will take the moisture density sample in front of the spreader immediately after a load of lime fly ash soil material has been dumped.
   b. Thoroughly mix this sample of lime fly ash soil in a mixing pan, and test it immediately using **GDT 67**.

2) Mixed In-Place Construction
   a. The Testing Management Technician will take the moisture density sample from the roadway immediately after the final mixing operation is accomplished.
   b. Ensure this sample represents the full depth of the lime-fly ash soil mixture.
   c. Thoroughly mix this sample in a mixing pan. Add water if necessary.
   d. Test the sample using **GDT 67**.
   e. Determine the in-place density of the compacted course using the methods shown in this section.
   f. Use maximum intervals of 1 per 1,500 linear ft (500 m) per 2 lanes of roadway per lift.

      If this material is used as widening, determine in-place density at maximum intervals of 1 per mile (1.6 km) per 2 lanes of roadway per lift.

      If this material is used for shoulder base construction and is placed in a separate operation from the mainline, determine the in-place density at maximum intervals of one per 3,000 linear ft (1000 m) of roadway per lift.

      Stagger the determination between shoulders.
   g. Make the in-place density tests at various points on the cross-section and for the full depth of the lift being compacted.
   h. If the shoulder base and mainline base are placed in an operation, perform the shoulder base in-place density test by using at least one of each five in-place density tests for the mainline in the shoulder areas.

      Shoulder in-place densities “as such” will not be required.
   i. Report the theoretical maximum dry density, optimum moisture, in-place density, and actual moisture results on Form 365 when road-mixed and Form 386 when mixed in a central plant.

e. Thickness Determinations

   1) The Testing Management Technician will measure the actual thickness of the completed base at a maximum interval of 1 per 1,500 linear ft (500 m) per 2 lanes of roadway.

      These measurements will be made at various points on the cross section.

   2) Report the actual measured thickness on the same form as the in-place density results.

f. Surface Finish

   1) The Engineer must check the finished surface with a template or stringline. Place it perpendicular to the centerline.

   2) Use level readings as frequently as necessary to ensure a smooth riding surface that is within the specification tolerance. Take the reading at maximum intervals of 1 per 100 linear ft (30 m) per 2 lanes of roadway.
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319.3.01 Personnel
General Provisions 101 through 150.

319.3.02 Equipment
General Provisions 101 through 150.

319.3.03 Preparation
General Provisions 101 through 150.

319.3.04 Fabrication
General Provisions 101 through 150.

319.3.05 Construction
General Provisions 101 through 150.

319.3.06 Quality Acceptance
General Provisions 101 through 150.

319.3.07 Contractor Warranty and Maintenance
General Provisions 101 through 150.

319.4 Measurement
General Provisions 101 through 150.

319.4.01 Limits
General Provisions 101 through 150.

319.5 Payment
General Provisions 101 through 150.

319.5.01 Adjustments
General Provisions 101 through 150.