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## Item 265

### Fly Ash or Lime-Fly Ash Treatment (Road-Mixed)




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#### 1. DESCRIPTION

Mix and compact water, fly ash (FA) or lime and fly ash (LFA), and subgrade or base (with or without asphalt concrete pavement) in the roadway.

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#### 2. MATERIALS

Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of proposed material sources and of changes in material sources. The Engineer will verify that the specification requirements are met before the sources can be used. The Engineer may sample and test project materials at any time before compaction. Changes in material suppliers may require a new mix design. Use [Tex-100-E](#) for material definitions.

2.1. **Lime.** Furnish lime that meets the requirements of [DMS-6350](#), "Lime and Lime Slurry," and [DMS-6330](#), "Pre-Qualification of Lime Sources." Use hydrated lime, commercial lime slurry, or quicklime as shown on the plans. When furnishing quicklime, provide it in bulk.

2.2. **Fly Ash.** Furnish FA that meets the requirements of [DMS-4615](#), "Fly Ash for Soil Treatment." Use Class CS or FS as shown on the plans.

2.3. **Subgrade.** The Engineer will determine the sulfate content in accordance with [Tex-145-E](#) and organic content in accordance with [Tex-148-E](#) before addition of lime or fly ash. Suspend operations when material to be treated has a sulfate content greater than 7,000 ppm or an organic content greater than 1.0% and proceed as directed.

2.4. **Flexible Base.** Unless otherwise shown on the plans, furnish base material that meets the requirements of Item 247, "Flexible Base," for the type and grade shown on the plans, before the addition of lime or FA.

2.5. **Water.** Furnish water free of industrial wastes and other objectionable matter.

2.6. **Asphalt.** When permitted for curing purposes, furnish asphalt or emulsion in accordance with Item 300, "Asphalts, Oils, and Emulsions," as shown on the plans or as directed.

2.7. **Mix Design.** The Engineer will determine the target FA or LFA content and optimum moisture content in accordance with [Tex-127-E](#) or prior experience with the project materials. The Contractor may propose a mix design developed in accordance with [Tex-127-E](#). Meet strength requirements when shown on the plans. The Engineer will use [Tex-127-E](#) to verify the Contractor's proposed mix design before acceptance and will establish the approved additive blend and quantity. Reimburse the Department for subsequent mix designs or partial designs necessitated by changes in the material or requests by the Contractor. Limit the amount of recycled asphalt pavement to no more than 50% of the mix unless otherwise shown on the plans or directed.

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#### 3. EQUIPMENT

Provide machinery, tools, and equipment necessary for proper execution of the work. Provide rollers in accordance with Item 210, "Rolling." Provide proof rollers in accordance with Item 216, "Proof Rolling," when directed.

- 3.1. **Storage Facility.** Store quicklime, dry hydrated lime, and FA in closed, weatherproof containers.
- 3.2. **Slurry Equipment.** Use slurry tanks equipped with agitation devices to slurry hydrated lime or quicklime on the project or other approved location. The Engineer may approve other slurring methods.
- Provide a pump for agitating the slurry when the distributor truck is not equipped with an agitator. Equip the distributor truck with a sampling device in accordance with [Tex-600-J](#), Part I, when using commercial lime slurry.
- 3.3. **Distribution Equipment.** Provide equipment to spread lime and fly ash evenly across the area to be treated. Provide equipment with a rotary vane feeder to spread lime, when shown on the plans.
- 3.4. **Pulverization Equipment.** Provide pulverization equipment that:
- cuts and pulverizes material uniformly to the proper depth with cutters that will plane to a uniform surface over the entire width of the cut,
  - provides a visible indication of the depth of cut at all times, and
  - uniformly mixes the materials.

#### 4. CONSTRUCTION

Construct each layer uniformly, free of loose or segregated areas and with the required density and moisture content. Provide a smooth surface that conforms to the typical sections, lines, and grades shown on the plans or as directed.

- 4.1. **Preparation of Subgrade or Existing Base for Treatment.** Before treating, remove existing asphalt concrete pavement in accordance with pertinent Items and the plans or as directed. Shape existing material in accordance with applicable bid items to conform to typical sections shown on the plans and as directed.

When shown on the plans or as directed, proof-roll the roadbed in accordance with Item 216, "Proof Rolling," before pulverizing or scarifying existing material. Correct soft spots as directed.

When material is imported from a borrow source, notify the Engineer of the location of the borrow source well in advance to allow time for testing and approval to avoid delay to the project. Stockpile as directed. The Engineer will test the borrow source and determine the sulfate and organic contents. When the borrow source has a sulfate content greater than 3,000 ppm or an organic content greater than 1.0%, proceed as directed.

When new base material is required to be mixed with existing base, deliver, place, and spread the new material in the required amount per station. Manipulate and thoroughly mix new base with existing material to provide a uniform mixture to the specified depth before the addition of lime or FA.

- 4.2. **Pulverization.** Pulverize or scarify material after shaping so that 100% passes a 2-1/2 in. sieve. If the material cannot be uniformly processed to the required depth in a single pass, excavate and windrow the material to expose a secondary grade to achieve processing to plan depth.

- 4.3. **Application and Mixing of FA or LFA.** When treating with LFA, apply, mix, and mellow lime first unless otherwise directed.

Start treatment operations only when the air temperature is at least 35°F and rising or is at least 40°F. Cease operations if the 24-hour projected air temperature is less than 32°F for more than 4 hours. The temperature will be taken in the shade and away from artificial heat. Suspend operations when the Engineer determines that weather conditions are unsuitable.

Minimize dust and scattering by wind. Do not apply lime or FA when wind conditions, in the opinion of the Engineer, cause blowing lime or FA to become dangerous to traffic or objectionable to adjacent property owners.

During the interval between application and mixing, sections treated with hydrated lime or fly ash that have been exposed to the open air for a period of 6 hr. or more, or that experience excessive loss due to washing or blowing, will not be accepted for payment.

After mixing and required mellowing, the Engineer may sample the mixture at roadway moisture and test in accordance with [Tex-101-E](#), Part III, to determine compliance with the gradation requirements in Table 1.

**Table 1**  
**Gradation Requirements (Minimum % Passing)**

Sieve Size	Base	Subgrade
1-3/4"	100	100
3/4"	85	85
#4	–	60

- 4.3.1. **Application of Lime.** Uniformly apply lime using dry or slurry placement as shown on the plans or as directed. Add lime at the percentage determined in Section 265.2.7., "Mix Design." Apply lime only on an area where mixing can be completed during the same working day.
- 4.3.1.1. **Dry Placement.** Before applying lime, bring the prepared roadway to approximately 2 percentage points above optimum moisture content. When necessary, sprinkle in accordance with Item 204, "Sprinkling." Distribute the required quantity of hydrated lime or pebble-grade quicklime with approved equipment. Only hydrated lime may be distributed by bag. Do not use a motor grader to spread hydrated lime.
- 4.3.1.2. **Slurry Placement.** Provide slurry free of objectionable materials, at or above the approved minimum dry solids content, and with a uniform consistency that will allow ease of handling and uniform application. Deliver commercial lime slurry to the jobsite or prepare lime slurry at the jobsite or other approved location by using hydrated lime or quicklime, as specified. When dry quicklime is applied as slurry, use 80% of the amount shown on the plans.
- Distribute slurry uniformly by making successive passes over a measured section of roadway until the specified lime content is reached. Uniformly spread the residue from quicklime slurry over the length of the roadway being processed unless otherwise directed.
- 4.3.2. **Mixing of Lime.** Begin mixing within 6 hr. of lime application. Thoroughly mix the material and lime using approved equipment. When treating subgrade, bring the moisture content above the optimum moisture content to insure adequate chemical reaction of the lime and subgrade materials. Allow the mixture to mellow for 1 to 4 days as directed. When pebble-grade quicklime is used, allow the mixture to mellow for 2 to 4 days as directed. Sprinkle the treated materials during the mixing and mellowing operation, as directed, to achieve adequate hydration and proper moisture content. When the material to be treated has a sulfate content greater than 3,000 ppm but less than or equal to 7,000 ppm, mellow for a minimum of 7 days. Maintain in a continuously moist condition by sprinkling in accordance with Item 204, "Sprinkling." After mellowing, resume mixing until a homogeneous, friable mixture is obtained.
- 4.3.3. **Application of Fly Ash.** Uniformly apply FA in dry form unless otherwise approved. Apply at the percentage determined in Section 265.2.7., "Mix Design." Apply FA only on that area where the mixing and compacting operations can be completed during the same working day. Do not use a motor grader to spread FA.

For LFA treatment, begin FA application within 4 days after the lime mixing operation has been completed unless otherwise approved.

- 4.3.4. **Mixing of Fly Ash.** Thoroughly dry-mix the material and fly ash using approved equipment until a loose, homogeneous mixture is obtained. Sprinkle in accordance with Item 204, "Sprinkling," as directed, to achieve adequate mixing and hydration moisture. Prevent formation of fly ash balls.
- 4.3.5. **Final Mixture.** After mixing and required mellowing, the Engineer may sample the mixture at roadway moisture and test in accordance with [Tex-101-E](#), Part III, to determine compliance with the gradation requirements in Table 1.
- 4.4. **Compaction.** Compact immediately after mixing the last stabilizing agent. Use density control unless otherwise shown on the plans. Complete all compaction operations within 6 hr. of FA application for type FS and within 2 hr. when using type CS. Multiple lifts are permitted when shown on the plans or approved by the Engineer. Sprinkle the treated material in accordance with Item 204, "Sprinkling," or aerate to bring each layer to the moisture content directed. Measure the moisture content of the material in accordance with [Tex-115-E](#) or [Tex-103-E](#) during compaction daily and report the results the same day to the Engineer, unless otherwise shown on the plans or directed.
- Begin rolling longitudinally at the sides and proceed towards the center, overlapping on successive trips by at least 1/2 the width of the roller unit. On superelevated curves, begin rolling at the low side and progress toward the high side. Offset alternate trips of the roller. Operate rollers at a speed between 2 to 6 mph as directed.
- Before final acceptance, the Engineer will select the locations of tests in each unit and measure the treated depth in accordance with [Tex-140-E](#). Correct areas deficient by more than 1/2 in. in thickness or more than 1/2% in target lime or fly ash content by adding lime or fly ash as required, reshaping, recompacting, and refinishing at the Contractor's expense.
- Rework, recompact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish before the next course is placed or the project is accepted. Continue work until specification requirements are met. Rework in accordance with Section 265.4.5., "Reworking a Section." Perform the work at no additional expense to the Department.
- 4.4.1. **Ordinary Compaction.** Roll with approved compaction equipment as directed. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing treated material as required, reshaping, and recompacting.
- 4.4.2. **Density Control.** The Engineer will determine roadway density of completed sections in accordance with [Tex-115-E](#). Perform measurements immediately following completion of layer compaction. The Engineer may accept the section if no more than 1 of the 5 most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.
- 4.4.2.1. **Subgrade.** Compact to at least 95% of the maximum density determined in accordance with [Tex-127-E](#) unless otherwise shown on the plans.
- 4.4.2.2. **Base.** Compact the bottom course to at least 95% of the maximum density determined in accordance with [Tex-127-E](#) unless otherwise shown on the plans. Compact subsequent courses treated under this Item to at least 98% of the maximum density determined in accordance with [Tex-127-E](#) unless otherwise shown on the plans.
- 4.5. **Reworking a Section.** Reworking includes loosening, adding material or removing unacceptable material if necessary, mixing as directed, compacting, and finishing. The Contractor has the option of removing failing material and replacing it with acceptable material.

Add LFA when reworking LFA-treated sections, or FA when reworking FA-treated sections, at the rate of at least 25% of the percentage determined in Section 265.2.7., "Mix Design," as directed. When repulverization of the failing section is not achievable, remove failing material and replace with acceptable treated material.

When density control is specified, determine a new maximum density of the reworked material in accordance with [Tex-127-E](#), and compact in accordance with Section 265.4.4.2., "Density Control." Compact as directed when ordinary compaction is specified.

- 4.6. **Finishing.** Complete finishing operations within 2 hr. after final compaction. Immediately after completing compaction of the final course, clip, skin, or tight-blade the surface with a maintainer or subgrade trimmer to a depth of approximately 1/4 in. Remove loosened material and dispose of it at an approved location. Seal the clipped surface immediately by rolling with a pneumatic tire roller until a smooth surface is attained. When finishing treated base, use a steel wheel roller before rolling with the pneumatic tire roller. Add small increments of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades.

Finish grade of constructed subgrade to within 0.1 ft. in the cross-section and 0.1 ft. in 16 ft. measured longitudinally.

Correct grade deviations of constructed base greater than 1/4 in. in 16 ft. measured longitudinally or greater than 1/4 in. over the entire width of the cross-section in areas where surfacing is to be placed. Remove excess material, reshape, and roll with a pneumatic-tire roller. Correct as directed if material is more than 1/4 in. low. Do not surface patch.

- 4.7. **Curing.** Cure by maintaining in a thorough and continuously moist condition by sprinkling in accordance with Item 204, "Sprinkling." When permitted, cure with an asphalt material applied at a rate of 0.05 to 0.20 gal. per square yard as approved. Do not allow equipment on the finished course during curing except as required for sprinkling, unless otherwise approved.
- 4.7.1. **FA or LFA-Treated Sections with FS.** Cure the finished section for 7 days before adding another course or opening to traffic unless otherwise directed. Apply subsequent courses within 14 calendar days of completion of final compaction of the underlying treated course unless otherwise approved.
- 4.7.2. **FA-Treated Sections with CS.** Cure the finished section for at least 24 hr. before opening to traffic unless otherwise directed. Curing may be accomplished by placing material to be used in the subsequent course instead of moist-curing. Allow the treated course to dry for at least 48 hr. before applying a prime coat.

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## 5. MEASUREMENT

- 5.1. **Lime.** When lime is furnished in trucks, the weight of lime will be determined on certified scales, or the Contractor must provide a set of standard platform truck scales at a location approved by the Engineer. Scales must conform to the requirements of Item 520, "Weighing and Measuring Equipment."
- When lime is furnished in bags, each bag must indicate the manufacturer's certified weight. Bags varying more than 5% from that weight may be rejected. The average weight of bags in any shipment, as determined by weighing 10 bags taken at random, must be at least the manufacturer's certified weight.
- 5.1.1. **Hydrated Lime.**
- 5.1.1.1. **Dry.** Lime will be measured by the ton (dry weight).
- 5.1.1.2. **Slurry.** Lime will be measured by the ton (dry weight) of the hydrated lime used to prepare the lime slurry at the jobsite.

- 5.1.2. **Commercial Lime Slurry.** Lime slurry will be measured by the ton (dry weight) as calculated from the minimum percent dry solids content of the slurry, multiplied by the weight of the slurry in tons delivered.
- 5.1.3. **Quicklime.**
- 5.1.3.1. **Dry.** Lime will be measured by the ton (dry weight).
- 5.1.3.2. **Slurry.** Lime slurry will be measured by the ton (dry weight) of the quicklime used to prepare the slurry, multiplied by a conversion factor of 1.28 to give the quantity of equivalent hydrated lime, which will be the basis of payment.
- 5.2. **Fly Ash.** FA will be measured by the ton (dry weight). When FA is furnished in trucks, the weight of FA will be determined on certified scales, or the Contractor must provide a set of standard platform truck scales at a location approved by the Engineer. Scales must conform to the requirements of Item 520, "Weighing and Measuring Equipment."
- When fly ash is furnished in bags, each bag must indicate the manufacturer's certified weight. Bags varying more than 5% from that weight may be rejected. The average weight of bags in any shipment, as determined by weighing 10 bags taken at random, must be at least the manufacturer's certified weight.
- 5.3. **FA and LFA Treatment.** FA and LFA treatment will be measured by the square yard of surface area. The dimensions for determining the surface area are established by the widths shown on the plans and the lengths measured at placement.

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## 6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid in accordance with Section 265.6.1., "Lime"; Section 265.6.2., "Fly Ash"; and Section 265.6.3., "FA and LFA Treatment."

Furnishing and delivering new base will be paid for in accordance with Section 247.6.2., "Flexible Base (Roadway Delivery)." Mixing, spreading, blading, shaping, compacting, and finishing new or existing base material will be paid for under Section 265.6.3., "FA and LFA Treatment." Removal and disposal of existing asphalt concrete pavement will be paid for in accordance with pertinent Items or Article 4.4., "Changes in the Work."

Asphalt used solely for curing will not be paid for directly but will be subsidiary to this Item. Asphalt placed for curing and priming will be paid for under Item 310, "Prime Coat."

Lime and FA used for reworking a section in accordance with Section 265.4.5., "Reworking a Section," will not be paid for directly but will be subsidiary to this Item.

Sprinkling and rolling, except proof rolling, will not be paid for directly but will be subsidiary to this Item unless otherwise shown on the plans. When proof rolling is shown on the plans or directed by the Engineer, it will be paid for in accordance with Item 216, "Proof Rolling."

Where subgrade is constructed under this Contract, correction of soft spots in the subgrade or existing base will be at the Contractor's expense. Where subgrade is not constructed under this Contract, correction of soft spots in the subgrade or existing base will be in accordance with pertinent Items or Article 4.4., "Changes in the Work."

Where subgrade to be treated under this Contract has sulfates greater than 7,000 ppm, work will be paid for in accordance with Article 4.4., "Changes in the Work."

- 6.1. **Lime.** Lime will be paid for at the unit price bid for “Lime” of the specified type (Hydrated (Dry), Hydrated (Slurry), Commercial Lime Slurry, Quicklime (Dry), Quicklime (Slurry)). This price is full compensation for furnishing lime.
- 6.2. **Fly Ash.** FA will be paid for at the unit price bid for “Fly Ash” of the type specified. This price is full compensation for furnishing FA.
- 6.3. **FA and LFA Treatment.** FA and LFA treatment will be paid for at the unit price bid for “LFA Treated Subgrade,” “FA Treated Subgrade,” “LFA Treatment for Base Courses (Existing Base),” “FA Treatment for Base Courses (Existing Base),” “LFA Treatment for Base Courses (New Base),” “FA Treatment for Base Courses (New Base),” “LFA Treatment for Base Courses (New and Existing Base),” and “FA Treatment for Base Courses (New and Existing Base),” for the depth specified. No payment will be made for thickness or width exceeding that shown on the plans. This price is full compensation for shaping existing material, loosening, mixing, pulverizing, spreading, applying LFA, compacting, finishing, curing including curing materials, water, drying, blading, shaping and maintaining shape, replacing mixture, disposing of loosened materials, processing, hauling, reworking if required, preparing secondary subgrade, equipment, labor, tools, and incidentals.