

ITEM 223

LIME-FLY ASH STABILIZED SUBGRADE

- 223.1 Description. Mix and compact water, lime and fly ash (LFA), and subgrade in the roadway.
- 223.2 Materials. Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer in writing of proposed material sources and of any proposed changes in material sources. The Contractor shall obtain verification from the Engineer that the specification requirements are met before using the sources. The Engineer may sample and test materials at any time before compaction.
- A. Lime. Furnish lime that meets the requirements of TxDOT's DMS-6350, "Lime and Lime Slurry," and DMS-6330, "Lime Sources Prequalification of Hydrated Lime and Quicklime." Use hydrated lime or commercial lime slurry as shown on the plans.
  - B. Fly Ash. Furnish fly ash that meets the requirements of DMS-4615, "Fly Ash for Soil Treatment." Use Class CS or FS as shown on the plans.
  - C. Water. Furnish water free of industrial wastes and other objectionable matter.
  - D. Asphalt. When permitted for curing purposes, furnish asphalt or emulsion in accordance with TxDOT's Item 300, "Asphalts, Oils, and Emulsions," as shown on the plans or as directed.
  - E. Mix Design. Using the material proposed for the project, the Engineer shall determine the target lime-fly ash content and optimum moisture content in accordance with ASTM D698 or based upon prior experience with the project materials. The Contractor may propose an alternative mix design developed in accordance with ASTM D698. The Engineer shall use ASTM D698 to verify the Contractor's proposed mix design before accepting it. The Contractor shall reimburse the County for all expenses incurred due to a change of mix designs or partial designs necessitated by changes in the design requested by the Contractor.
- 223.3 Equipment. Provide machinery, tools, and equipment necessary for proper execution of the work. Provide rollers in accordance with

TxDOT Item 210, "Rolling." Provide proof rollers in accordance with TxDOT Item 216, "Proof Rolling," when directed.

- A. Slurry Equipment. Use slurry tanks equipped with agitation devices to slurry hydrated lime on the jobsite 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.
- B. 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,
  - shows a visible indication of the depth of cut at all times, and
  - mixes the materials uniformly.

223.4

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.

- A. Preparation of Subgrade for Treatment. Shape the subgrade in accordance Item 205 "Subgrade", and applicable bid items to conform to typical sections shown on the plans and as directed.
- B. Pulverization. The Contractor shall pulverize or scarify the existing raw subgrade to allow penetration of the lime to the required depth.
- C. Application and Mixing of LFA. When treating with LFA, apply, mix, and cure 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. The temperature shall be taken in the shade and away from artificial heat. Suspend operations when the Engineer determines that weather conditions are unsuitable.

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, shall not be accepted for payment.

After mixing and required curing, the Engineer shall 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     | Treated Subgrade |
|-----------|------------------|
| 1-3/4 in. | 100              |
| 3/4 in.   | 85               |
| No. 4     | 60               |

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 223.2.E, "Mix Design" above. Apply lime only on an area where mixing can be completed during the same working day.

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 as specified.

Distribute slurry uniformly by making successive passes over a measured section of subgrade until the specified lime content is reached.

2. Mixing of Lime. Begin mixing within 6 hr. of lime application. Thoroughly mix the subgrade and lime using approved equipment. Allow the mixture to mellow for 1 to 4 days as directed. Sprinkle the treated subgrade during the mixing and mellowing operation, as directed, to achieve adequate hydration and proper moisture content. After mellowing, resume mixing until a homogeneous, friable treated subgrade is obtained.
3. Application of Fly Ash. Uniformly apply fly ash in dry form unless otherwise approved. Apply at the percentage determined in Section 223.2.E, "Mix Design" above.

Apply fly ash 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 fly ash.

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

4. Mixing of Fly Ash. Thoroughly dry-mix the material and fly ash using approved equipment until a loose, homogeneous mixture is obtained. Sprinkle as directed, to achieve adequate mixing and hydration moisture. Prevent formation of fly ash balls.
- D. Compaction. Compact immediately after mixing in the fly ash. Use density control unless otherwise shown on the plans. Complete all compaction operations within 6 hr. of fly ash application.

Multiple lifts are permitted when shown on the plans or approved by the Engineer. Sprinkle the treated subgrade as directed or aerate to bring each layer to the moisture content directed. Determine the moisture content of the mixture at the beginning and during compaction in accordance with ASTM D698.

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. Offset alternate trips of the roller.

Operate rollers at a speed between 2 to 6 MPH as directed.

Rework, recompact, and refinish treated subgrade 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 223.4.E, "Reworking a Section" below. Perform the work at no additional expense to the County.

The Testing Laboratory shall determine roadway density of completed sections in accordance with ASTM 6398. The minimum level of testing shall consist of the following:

- at least one test per station per lane of roadway.
- a lane is defined as 12' wide section of pavement regardless of its use.

Compact to at least 95% of the maximum density as determined in accordance with ASTM D698, unless otherwise shown on the plans.

- E. Reworking a Section. Reworking includes loosening, adding material or removing unacceptable material if necessary, mixing as directed, compacting, and finishing. When removal is necessary, the Contractor shall replace failing material with other acceptable material from the project site, or replace with Borrow as approved by the Engineer. Add lime and fly ash when reworking LFA-treated sections, at the rate of at least 25% of the percentage determined in Section 223.2.E "Mix Design" as directed. When repulverization of the failing section is not achievable, remove failing material and replace with acceptable treated material.

Determine a new maximum density of the reworked treated subgrade in accordance with ASTM D698, and compact in accordance with Section 223.4.D above.

- F. Finishing. Immediately after completing compaction of the final layer, clip, skin, or tight-blade the surface to a depth of approximately 1/4 in.

Remove clipped 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. Add small increments of water as needed during rolling. Shape and maintain the layer and surface in conformity with the typical sections, lines, and grades. Complete finishing operations within 2 hr. after final compaction.

Finished grade tolerances for subgrade shall be in accordance with TXDOT's Section 132.3.F.1, "Grade Tolerances."

- G. Curing. Cure by maintaining in a thorough and continuously moist condition by sprinkling in accordance with TxDOT's 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.

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.

223.5 Measurement.

A. Lime. Lime shall be measured by the ton as per Item 221 "Hydrated Lime and Lime Slurry" at the unit price bid for "Lime" for one of the following types:

- Hydrated Lime (Slurry),
- Commercial Lime Slurry,

Commercial Lime Slurry shall 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.

B. Fly Ash. Fly ash shall be measured by the ton (dry weight). When fly ash is furnished in trucks, the weight of fly ash shall be determined on certified scales.

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.

C. LFA Treatment. LFA treatment shall be measured by the square yard of surface area for the specified depth. The dimensions for determining the surface area are established by the widths shown on the plans and the lengths measured at placement.

223.6 Payment. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" shall be paid in accordance with Section 223.5.B, "Fly Ash"; or Section 223.5.C, "LFA Treatment."

Lime and fly ash used for reworking a section in accordance with Section 223.4.E, "Reworking a Section," shall not be paid for directly but shall be subsidiary to their respective Items.

Water for Sprinkling and rolling shall not be paid for directly but shall be subsidiary to this Item unless otherwise shown on the plans. Amendment of subgrade to correct soft spots shall be at the Contractor's expense. Where importation of borrow material is

necessary to correct soft spots, payment shall be made as an extra work item under Item 230 "Borrow".

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

- A. Lime. Lime shall be paid as per Item 221 "Hydrated Lime and Lime Slurry.
- B. Fly Ash. Fly ash shall be paid for under this Item at the unit price bid for "Fly Ash" of the type specified. This price is full compensation for furnishing fly ash.
- C. LFA Treatment. LFA treatment shall be paid for under this Item at the unit price bid for "LFA Treated Subgrade," for the depth specified. No payment shall 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 lime and fly ash, compacting, finishing, curing including curing materials, water, drying, blading, shaping and maintaining, replacing, disposing of loosened materials, processing, hauling, reworking if required, preparing secondary subgrade, equipment, labor, tools, and incidentals.

There are line code(s), description(s), and unit(s) for this Item.

NOTE: This Item requires other Standard Specifications

Item 205 "Subgrade"

Item 221 "Hydrated Lime and Lime Slurry"

Item 230 "Borrow"

Item 310 "Prime Coat"

END OF ITEM 223