SECTION 32 11 29

LIME STABILIZATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. This item shall consist of admixing commercial lime and/or lime slurry with the existing material, and mixing and compacting the mixed material to the required density. All work performed in this item shall be constructed as specified herein and in conformity with the typical cross-sections, lines and grades as shown on the Plans and as directed by the Engineer.

1.2 MEASUREMENT AND PAYMENT

A. Lime stabilized material as described in this section will be paid for at the unit price bid in the Proposal for the lime stabilized treatment, which price shall be full compensation for scarifying, preparation below secondary grade, furnishing, distributing, and mixing the lime and for all labor, supplies, water, fuel, tools, equipment and incidentals necessary to mix and compact the stabilized soil to the density specified in these Specifications. Payment will not be made for unauthorized work.

1.3 SUBMITTALS

Lime series Atterburg Limits

Lime series pH test (ASTM C977-83a-Annex Test Method)

Lime type

% Lime

PART 2 – PRODUCTS

2.1 MATERIALS

A. The lime to be used for stabilization shall meet with requirements of TX DOT DMS-6350: Lime and Lime Slurry" and DMS-6330, "Lime Sources Prequalification of Hydrated Lime and Quicklime". Use ~~hydrated lime~~, commercial lime slurry~~,~~ or pebble grade quicklime. When furnishing quicklime, provide it in bulk. Quicklime can be dangerous. Exercise extreme caution if used for the Work. Contractor shall become informed about recommended precautions in the handling, storage and use of quicklime.

B. The amount of lime required for stabilization will be the percent by weight shown on the Plans, stated in the Special Provisions, or that amount which produces a pH not less than 12.4 and provides for a Plasticity Index less than 18.

2.2 TESTING REQUIREMENTS

A. After final mixing, a pH test, Atterberg Limit test and sieve analysis shall be performed in accordance with Tex-101-E, Part III.

B. Moisture and Density tests shall be taken at every 3000 square foot interval ~~each construction station~~ to ensure a density of at least 98% of maximum dry density at a

moisture content between optimum and 4% wet of optimum in accordance with Standard Proctor (ASTM D698). All tests meeting these requirements shall be paid by the ~~owner~~ City. The City will not pay for failing tests.

C. When requested by the Engineer's Inspector, the contractor will proof roll areas in question with a 25 ton pneumatic tired roller or approved equal after lime stabilization is complete.

PART 3 – EXECUTION

3.1. GENERAL:

A. It is the primary requirement of this specification to produce a completed course of treated material containing a uniform li~~n~~me mixture, free ~~form~~ of loose or segregated areas, of uniform density and moisture content, well bound for its full depth as shown on the detail sheet or specified in the Special Provisions and with a smooth surface suitable for placing subsequent courses. It shall be the responsibility of the Contractor to regulate the sequence of his work, to use the proper amount of lime, maintain the work and rework the courses as necessary to meet the above requirements.

B. The Contractor is required to ensure the existing sub-grade or embankment beneath the course to be lime stabilized is of proper density, uniformity and quality. The Contractor may elect to proof roll, replace and/or compact, areas that exhibit instability. If necessary, the Contractor may need to scarify, dry and compact the existing sub-grade prior to addition of lime. All work for the preparation of the existing sub-grade will not be paid directly, but will be considered a part of "Lime Stabilization".

3.2. APPLICATION:

A. Lime shall be spread only on that area where the first mixing operations can be completed during the same working day.

B. The lime shall be spread by a pre-approved screw type spreader box, ~~bag distribution~~, or a pre-approved truck spreader, in the manner and at the rates directed by the Engineer. The lime shall be distributed at a uniform rate and in such a manner as to reduce the scattering of the lime by wind to a minimum. Lime shall not be applied when wind conditions, in the opinion of the Engineer, are such that blowing lime becomes objectionable. A motor grader shall not be used to spread the lime.

C. When pebble grade quicklime is placed dry, mix the material and lime thoroughly at the time of lime application. Conform to cautionary requirements of Paragraph 2.1A concerning use of quicklime.

3.3. MIXING:

A. The material shall be dried or wetted as directed by the Engineer, until the proper moisture content has been secured. All lime shall be mixed with the material to be treated immediately after application of lime. ~~During the interval of time between application and mixing, hydrated lime that has been exposed to the open air for a period of six (6) hours or more or had excessive loss due to washing or blowing will not be accepted until totally reprocessed, refinished and retested. This will be done at the sole expense of the Contractor.~~

B. The soil-lime mixture shall be sprinkled during the mixing process as directed by the Engineer, to provide optimum moisture plus four (4) percent in the mixing immediately prior to starting the compaction operation.

C. The stabilized soil shall then be lightly sealed to allow for the mixture to mellow for 1 to 4 days. When pebble grade quicklime is used, allow the mixture to mellow for 2 to 4 days. The mixed material shall be kept moist during this period and traffic shall not be allowed on the treated portion. The moisture content of the mixture should be within, optimum and four percent of optimum for the compactive effort specified.

D. After mellowing, resume mixing until a homogeneous friable mixture of material and lime is obtained, such that when all nonslaking aggregates retained on the 3/4" sieve are removed, the remainder of the material shall meet the following requirements when tested from the roadway in the roadway conditions by standard laboratory sieves:

Sieve	Percent Passing
1-3/4"	100%
3/4"	85%
#4	60%

After final mixing, the stabilized soil shall be bladed and compacted as specified below.

3.4. COMPACTION:

A. Compaction of the mixture shall begin immediately after final mixing. The material shall be aerated or sprinkled as necessary to provide the proper moisture. Compaction shall begin at the bottom and shall continue until the entire depth of mixture is uniformly compacted.

B. The course shall be sprinkled as required and compacted to the extent necessary to provide no less than ninety-eight (98) percent of the density measured by ASTM D698 at a moisture content between optimum and +4% wet of optimum moisture content. Grades shall be “blue-topped” during the compaction effort and the lime soil mixture shall be compacted to within 0.1 ft in cross-section and 0.1 ft in 16 ft measured longitudinally. In addition to the requirements specified for density, the full depth of the material shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment. Depth tests shall occur every 200 lf and shall be performed after compliance with density requirements.

C. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements. Throughout this entire operation the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and in conformity with the typical section shown on the plans and to the established lines and grades. Should the material due to any reason or cause, lose the required stability, density and finish it shall be re-compacted, refinished and retested at the sole expense of the Contractor.

3.5 EQUIPMENT

A. The machine, tools and equipment necessary for the proper prosecution of the work shall be on the project and pre-approved by the Engineer prior to the beginning of construction operations.

B. All machinery, tools and equipment used shall be maintained in a satisfactory and workmanlike manner.

C. To insure thorough mixing of the lime into the material to be stabilized, equipment shall be a pulverizer mixer equivalent to a Seaman Mixer, or soil stabilizing machine shall be used.

D. ~~Hydrated lime shall be stored and handled in closed weatherproof containers until immediately before distribution on the road. If storage bins are used they shall be completely enclosed. Hydrated lime in bags shall be stored in weatherproof buildings with adequate protection from ground dampness.~~

E. If lime is furnished in trucks, each truck shall have the weight of lime certified on public scales or the Contractor shall place a set of standard platform truck scales or hopper scales at a location pre-approved by the Engineer. Scales shall be certified as to accuracy by an independent pre-approved testing laboratory.

3.6 FINISHING AND CURING OF LIME-STABILIZED MATERIAL:

A. After the lime treated material has been compacted and brought to the required lines and grades in accordance with the typical sections, the completed section shall then be finished by rolling as directed with a pneumatic or other suitable roller sufficiently light to prevent hair line cracking. Complete finishing operations within 2 hours after final compaction. Rework and recompact at areas where hairline cracking develops.

B. The completed section shall be moist-cured for a minimum of ~~five (5)~~ three (3) days before further courses are added or any traffic is permitted, During this time period the presence of sulphates should be evident by excessive swelling. If sulphates are found, seek direction from Engineer. ~~unless otherwise directed by the Engineer. If the sub-grade sets up sufficiently to prevent objectionable damage from traffic, the layer may be opened to traffic the day following compaction, unless otherwise directed by the Engineer.~~

~~B~~C. Apply seals or additional courses within fourteen (14) calendar days after final compaction, unless otherwise directed by the Engineer.

END OF SECTION