SECTION 02340

LIME/FLY ASH STABILIZATION

1 PART ONE - GENERAL

1.1 COORDINATION

A. Drawings and General provisions of the Contract including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. Provide lime stabilization treatment of the top 6 inches of exposed subgrade under concrete slab and 5 feet beyond the edge of the slab.

1.3 RELATED SECTIONS

A. Section 02310 - Site clearing, grading, excavation and fill.
B. Section 02750 - Concrete paving, curbs and sidewalks
C. Section 01450 - Testing laboratory requirements

1.4 REFERENCES

A. The following publications of the latest issues listed below, but referred to hereafter by basic designation only, form a part of this specification to the extent indicated by references thereto.
1. Harris County Public Infrastructure Department, Engineering Division. Specifications for the Construction of Roads and Bridges within Harris County, Texas.
   b. Item 221, Hydrated Lime and Lime Slurry.
   a. ASTM C977
3. Texas Department of Transportation (TxDOT)
   a. TxDOT Tex-600J - Lime Testing Procedure

1.5 QUALITY ASSURANCE

B. Moisture-Density Relationships on materials secured from stabilized subgrade: ASTM D698.

C. In-place density determination: ASTM D2922 or D1556; 3 tests for each 1000 square feet of stabilized subgrade.

2 PART TWO - PRODUCTS

2.1 MATERIALS

A. A mixture of lime and fly ash: 3% lime by dry soil weight and 8% dry ash by dry soil weight.

B. The use of a mixture of lime and fly ash such as TruBln may be used under this specification. The lime slurry shall be a pumpable suspension of solids in water. The water or liquid portion of the slurry shall not contain dissolved material in sufficient quantity to be injurious or objectionable for the purpose intended. The solids portion of the mixture, when considered on the basis of solids contents, shall consist principally of hydrated lime obtained by treating quicklime with water, of a quantity and fineness sufficient to meet the following requirements.

1. Chemical composition: The solids content of the lime slurry shall have a hydrate alkalinity $\text{Ca(OH)}_2$ of not less than 90 percent by weight. The use of Carbide lime or by-product lime is prohibited.

2. Residue: The percent by weight of the residue in the "solids contents" of the lime slurry shall conform to the following requirements:
   a. Residue retained on a No. 6 Sieve Max. 0.0 percent
   b. Residue retained on a No. 10 Sieve Max. 1.0 percent
   c. Residue retained on a No. 30 Sieve Max. 2.5 percent

2.2 EQUIPMENT

A. Machinery, tools and equipment necessary for the proper execution of the work shall be maintained in satisfactory operating condition. The Contractor shall at all times provide sufficient equipment to enable continuous prosecution of the work. The equipment shall be operated by experienced and capable workmen.

3 PART THREE - EXECUTION

3.1 CONSTRUCTION METHODS

A. Lime/fly ash shall be applied only to such areas that the first mixing operations can be completed during the same working day.

B. The placing and mixing of the lime/fly ash with the subgrade shall be obtained as described below:
   1. Quantity:
      a. 6 percent by dry soil weight or approximately 31 pounds of TruBln per square yard of surface area for a depth of 6 inches, at light traffic areas.
b. 6 percent by dry soil weight or minimum 42 pounds of TruBln per square yard of surface area for a depth of 8 inches at medium traffic areas drives and approaches.

2. Scarifying of subgrade:
   a. Paving subgrade and 12 inches beyond shall be scarified and stabilized to a depth of 6 inches and 8 inches respectively as indicated in subparagraph 1 and 2 above.

3. The required amount of lime/fly ash shall be applied by mixing with water trucks or approved distributor and applied as a mixture of slurry, with the distribution of the lime/fly ash being attained by successive passes over a determined section of ground. The water truck or distributor shall be equipped with an agitator which will keep the lime and water in a consistent mixture.

4. The slurry shall then be placed and thoroughly mixed with a pulverizing mixer until a homogeneous friable mixture of soil and lime is obtained to the required depth by approved road mixers, diskin, harrowing, plowing or other method of pulverizing and mixing approved by the testing laboratory.

5. The lime mixed subgrade shall be allowed to cure from one to four days as determined by the testing laboratory during which time mix shall be kept wet by sprinkling.

6. Stabilize the upper 6 inches of the exposed subgrade soils with a mixture of lime and fly ash (3% lime by dry soil weight or 16 pounds of lime per square yard of surface area for a depth of 6 inches and 8% fly ash by dry soil weight or 42 pounds of fly ash per square yard of surface area for a depth of 6 inches). The blended soil-lime-fly ash mixture should be compacted to an in-place dry density equal to at least 95% of the maximum dry density at a moisture content within 0 to + 3% of the optimum moisture content as determined by ASTM D 698. Stabilization procedures should be performed in accordance with Item 223, "Lime-Fly Ash or Fly Ash Stabilized Subgrade" from the most recent revision of the Harris County Public Infrastructure Department - Engineering Division (HCPID) Specifications entitled "Specifications for the Construction of Roads and Bridges within Harris County, Texas". Lime-fly ash stabilization should extend a minimum of 5 feet beyond the perimeter of the building to preclude moisture migration to the soils below. In lieu of lime and fly ash, a mixture of lime and fly ash such as TruBln may be applied at a rate of 6% by dry soil weight or approximately 31 pounds of TruBln per square yard of surface area for a 6 inch depth.

7. Place/compact imported select backfill over the lime-fly ash stabilized subgrade for a minimum thickness of 3 feet. Select fill should consist of clayey sand or inactive lean clay with a maximum liquid limit of 35 and a plasticity index ranging from 8 to 20. The select fill should be placed in 8-inch thick loose lifts and compacted to an in-place dry density equal to at least 95% of the maximum standard dry density (ASTM D 698) at moisture content within ± 2% of the optimum moisture content. The select fill should be placed/compacted within the perimeter of the proposed building and for a distance of at least 5 feet beyond the perimeter of the proposed building, as applicable.
8. Stabilize the upper 6 inches of the pad using 3% lime and 8% fly ash by dry soil weight (16 pounds of lime and 42 pounds of fly ash per square yard of surface area for a 6 inch depth). In lieu of lime and fly ash, a mixture of lime and fly ash such as TruBln may be applied at a rate of 6 percent by dry soil weight or approximately 31 pounds of TruBln per square yard of surface area for a 6-inch depth. Stabilization will allow construction equipment to operate on the pad with less destruction.

C. The required amount of water necessary to provide the optimum moisture content shall be added uniformly and thoroughly mixed with the soil and lime. The completed soil-lime mixture shall be spread evenly over the processed width of the subgrade and placed in a loose condition ready for immediate compaction by the rollers. The completed soil-lime mixture shall be homogenous and uniform in appearance. The completed soil-lime mixture shall be compacted immediately behind the final mixing operation. Compaction shall begin at the bottom and shall continue until the standard proctor density is achieved. The Contractor shall be permitted to utilize alternate construction methods with the approval of the testing laboratory and Architect, provided such methods result in a mixed subgrade material meeting the specifications herein described. If the total thickness of the stabilized subgrade cannot be mixed in one operation, the previously mixed material then shall be bladed to a window just beyond the area to be stabilized and the next layer mixed with lime as specified above. The subgrade shall be cut to the required lines and grades in accordance with the typical sections. The completed section shall be compacted and rolled.

D. Compaction Requirements: The lime stabilized soil shall be compacted to an in-place dry density equal to at least 95 percent of the maximum standard dry density (ASTM D698) at moisture content from 1 percent below to 3 percent above the optimum moisture content as determined by the testing laboratory.

E. Traffic shall not be permitted on the treated subgrade until it has cured to the satisfaction of the testing laboratory.

F. Construction methods and materials shall comply to those specified in Item No. 220, "Lime Stabilized Subgrade" of the Specifications for Construction of Roads and Bridges within Harris County.

3.2 MEASUREMENTS

A. Stabilized subgrade of the required depth shall be measured by the square yard to neat lines. Lime shall be measured by the ton (2,000 pounds).

B. The weight of the lime slurry shall be calculated from the number of gallons of slurry applied to the subgrade as directed by the testing laboratory. The calculation shall be based upon the solids by weight in the slurry.
3.3 TESTING LABORATORY CONTROL

A. A representative of the testing laboratory shall be present during all lime stabilization operations. Density tests shall be taken of the compacted soil-lime mixture during each operation in accordance with Section 01450.

END OF SECTION