

Subsection 4.04 Lime Stabilized Subgrade

I. Scope: This item includes stabilizing the subgrade by mixing lime with the subgrade material and compacting the mixed material. The stabilized subgrade shall be constructed in accordance with the plans and to the lines and grades as established by the ODR or Engineer.

II. Materials: Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and subsections. Provide a submittal of the lime source. The ODR may sample and test project materials at any time.

A. Lime: Furnish lime that meets the requirements of DMS-6350 "Lime and Lime Slurry," and DMS-6330, "Lime Sources Prequalification of Hydrated Lime and Quicklime." Use hydrated lime, commercial lime slurry, or quicklime, as shown in the plans. When furnishing quicklime, provide it in bulk.

B. Water: Water usage shall conform to Subsection 3.04 "Requirements for Water Usage."

C. Mix Design: The ODR will determine the target lime content. The contractor will submit a proctor of the lime treated material to determine density and moisture content.

III. Equipment: Store quicklime and dry hydrated lime in closed weatherproof containers. Provide rollers in accordance with Subsection 4.27 "Rolling." Provide proof rollers in accordance with Subsection 4.31 "Proof Rolling." Provide Sprinkling according to Subsection 4.32 "Sprinkling."

A. Slurry Equipment: Use slurry tanks equipped with agitation devices to slurry hydrated lime or quicklime on an approved site. The ODR 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:

1. Cuts and pulverizes material uniformly to the proper depth with cutters that plane to a uniform surface over the entire width of the cut;
2. Provides a visible indication of the depth of cut at all times; and
3. Uniformly mixes the material.

IV. Construction Methods: Mix and compact lime stabilized subgrade containing a uniform lime mixture free from loose or segregated areas, of required uniform density and moisture content, well bound from top to bottom, and with a smooth hard surface is required.

A. Preparation of Subgrade for Treatment: Shape existing material to conform to typical sections, lines, and grades shown on the plans.

When shown on the plans or directed, proof roll the roadbed in accordance with Subsection 4.31 "Proof Rolling," before pulverizing or scarifying existing material. Correct soft spots as directed.

B. Pulverization: Scarify or pulverize existing material after shaping so that 100% of the material passes a 1 inch sieve. If material cannot be uniformly processed to required depth in a single pass, excavate and windrow the material to expose a secondary grade to achieve processing to plan depth.

C. Application of Lime: Uniformly apply lime using dry or slurry placement as shown on the plans or directed. Add lime at the percentages shown in the plans. Apply lime only on area where mixing can be completed during the same day.

Lime application can begin only when air temperature is at least 40°F and rising or is at least 50°F. Discontinue operation if temperature is 50°F and falling. The temperature will be taken in the shade and away from artificial heat. Suspend application when the ODR or Engineer determines that weather conditions are unsuitable.

Minimize dust and scattering of lime by wind. Do not apply lime when wind conditions, in the opinion of the ODR, cause blowing lime to become dangerous to traffic or objectionable to adjacent property owners. When pebble quicklime is placed dry, mix the material and lime thoroughly at the time of lime application.

- 1. Dry Placement:** Before applying lime, bring the prepared roadway to approximately optimum moisture content in accordance with Subsection 4.32 "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.
- 2. Slurry Placement:** Provide slurry free of objectionable materials, at or above the approved minimum dry solids, 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.

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.

D. Mixing: Begin mixing within 6 hours of application of lime. Hydrated lime that has been exposed to open air for a period of 6 hours or more, or to moisture for any length of time, will not be accepted for payment. Thoroughly mix the material and lime using approved equipment. Allow the mixture to mellow for 1 to 4 days, as directed. When pebble quicklime is used, allow the mixture to mellow 2 to 4 days, as directed. Sprinkle the treated materials during the mixing and mellowing operation, to achieve adequate hydration and proper moisture content. After mellowing, resume mixing until a homogeneous mixture is obtained.

E. Compaction: Compaction of the mixture shall begin immediately after mixing. The material shall be aerated or sprinkled as necessary to provide the optimum moisture. Compaction shall begin at the bottom and shall continue until the entire depth of mixture is uniformly compacted to required density. When the rolling develops irregularities that exceed 1/2 inch when tested with a 16 foot straightedge, the irregular surface shall be loosened and then refilled with the same kind of material as that used in constructing the course and again rolled as required by these provisions. Along places inaccessible to roller, the material shall be tamped thoroughly with mechanical or hand tampers.

The "Density Control" method of compaction for stabilized subgrade shall apply as follows: The material shall be sprinkled as required and compacted to the extent necessary to provide not less than 95% of the Standard Proctor density for the stabilized material. 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. After each section is completed, tests as necessary will be made by the Engineer. If the material fails to meet the density requirements, it shall be re-worked 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 stabilized material due to any reason or cause, lose the required stability, density, and finish before the next course is placed or the work is accepted, it shall be reworked and refinished at no cost to the City. When a section is reworked within 72 hours after completion, rework the section to provide required density. When a section is reworked more than 72 hours after completion, add additional lime at 25% of the percentage determined. Reworking includes loosening, adding material or removing unacceptable material if necessary, mixing, compacting and finishing. Density must attain not less than 95% of the Standard Proctor density for the stabilized material and $\pm 2\%$ moisture content of the proctor.

F. Finishing: Immediately after completing compaction, clip, skin or tight blade the surface of the lime treated subgrade with a maintainer or subgrade trimmer to a grade. Roll the clipped surface with a pneumatic tire roller until a smooth surface is attained. Shape and maintain the subgrade in conformity with the typical section, lines and grades on the plans.

G. Curing: Cure for a minimum of 2 days by sprinkling in accordance with Subsection 4.32 "Sprinkling." Maintain moisture during curing. Base course must be applied within 14 days or section will have to be reworked.

V. Measurement:

A. Lime: For each load of dry lime placed in the slurry tank, or truck, a weight ticket from an approved weighing station showing the net weight of each load shall be given to the Project Representative. The Contractor may provide at the project site a set of approved standard platform truck scales. Scales must conform to requirements of Subsection 4.26 "Weighing and Measuring Equipment". When lime is furnished in bags, indicate the manufacturer's certified weight. Bags varying by more than 5% will be rejected. At random, 10 bags will be weighed, must be at least certified weight.

1. Hydrated Lime:

- a) Dry. Lime will be measured by the ton (dry weight).
- b) Slurry. Lime slurry will measured by the ton (dry weight) of the hydrated lime used to prepare the slurry.

2. Commercial Lime Slurry: Lime slurry will be measured by the ton (dry weight) as calculated from the minimum percent dry solids of the slurry,

multiplied by the weight of the slurry in tons delivered.

3. Quicklime:

a) **Dry.** Lime will be measured by the ton (dry weight) of the quicklime.

b) **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 equivalent hydrated lime.

B. Lime Treatment: Lime treatment will be measured by the square yard of surface area shown on the plans.

VI. Payment: Work performed and materials furnished as prescribed by this item and measured as provided under "Measurement" will be paid for at the unit price bid per ton for lime and at the unit price bid per square yard for lime stabilized subgrade, which prices shall be full compensation for furnishing all labor, materials, tools, equipment, for loosening, mixing and pulverizing, spreading, shaping, all hauling and freight involved, and all incidentals necessary to complete the work.

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