

CITY OF SAN ANGELO**ITEM 260****LIME TREATMENT FOR MATERIALS USED AS SUBGRADE****260.1 DESCRIPTION.**

This Item shall govern for treating the new or existing subgrade, the existing pavement structure or a combination thereof to be used as subgrade by pulverizing, adding lime, mixing, and compacting the mixed material as specified in this Item. Lime treatment will be required for all materials used as subgrade with a Plasticity Index (PI) greater than twenty (20) or another alternative method approved by the City.

260.2 MATERIALS.

(1) **Lime.** The lime shall meet the requirements of Item 264, “Lime and Lime Slurry”, for the type of lime specified.

The Contractor shall have the option of selecting from the types shown on the Plans, the type of lime to be used. The City shall be notified in writing before changing the source or type.

All lime slurries used in “Slurry Placing” shall be furnished at or above the minimum “Dry Solids” content as approved by the City.

(2) **Water.** Water shall conform to the same water source requirements of Item 160.2(2).

(3) **Asphalt.** Asphalt shall conform to the requirements of Item 300, “Asphalts, Oils, and Emulsions”.

260.3 EQUIPMENT.

(1) **General.** The machinery, tools and equipment necessary for proper prosecution of the work on this Item shall be on the project and approved by the City prior to beginning this Item.

All machinery, tools and equipment used shall be maintained in a satisfactory working condition.

(2) **Lime Storage.** Both quicklime and hydrated lime in dry form shall be suitably stored in closed, weatherproof containers until immediately before use. Storage bins, when used, shall be completely enclosed. Hydrated lime in bags shall be stored in weatherproof buildings with adequate protection from ground dampness. Type C Quicklime, when permitted by the City, shall be shipped only in bulk; bagged material will not be acceptable.

(3) **Lime Weight Verification.** When lime is furnished in trucks, the weight of lime shall be determined on certified scales or the Contractor shall provide a set of standard platform truck scales at a location approved by the City.

When Type A Hydrated Lime is furnished in bags, each bag shall bear the manufacturer's certified weight. Bags varying more than five (5) percent from that weight may be rejected and the average weight of bags in any shipment, as shown by weighing ten (10) bags taken at random, shall not be less than the manufacturer's certified weight.

(4) Slurry Equipment. Type C Quicklime of Grade “DS” or “S”, when used to manufacture slurry on the project, or other location approved by the City shall be slurried in agitated slurry tanks. The slurrying of Type C Quicklime must be handled in such a way as not to generate any dust hazardous to job personnel or to the public or be potentially damaging to any adjacent property.

The distributor truck used for slurry placing need not necessarily be equipped with an agitator; however, the slurry at time of distribution must meet the consistency requirements specified. The Contractor shall, if necessary, use appropriate equipment to achieve the consistency requirements under Section 260.4 (4)(b).

260.4 CONSTRUCTION METHODS.

(1) General. The completed course shall be uniformly treated, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth and shall have a smooth surface.

(2) Preparation of Subgrade or Existing Base. Prior to treating existing material, it shall be shaped to conform to the typical sections, as shown on the Plans or as established by the City. This work shall be removed and will be paid for in accordance with applicable bid items.

Before pulverizing or scarifying an existing material, when shown on the Plans and when directed by the City, the Contractor shall proofroll the roadbed. Soft spots shall be corrected as directed by the City.

When the Contractor elects to use a cutting and pulverizing machine that will process the material to the plan depth, the Contractor will not be required to excavate to the secondary grade or windrow the material. This method will be permitted only if a machine is provided which will insure that the material is cut uniformly to the proper depth and which has cutters that will plane the secondary grade to a uniform surface over the entire width of the cut. The machine shall provide a visible indication of the depth of cut at all times.

In lieu of using the cutting and pulverizing machine, the Contractor shall excavate and windrow the material to expose the secondary grade to the typical sections, lines and grades as shown on the Plans or as established by the City.

(3) Pulverization. The existing pavement or base material shall be pulverized or scarified so that 100 percent shall pass the two (2) inch sieve.

(4) Application. The percentage by weight or pounds per square yard of lime to be added will be as shown on the Plans and may be varied by the City if conditions warrant.

Lime shall be spread only on that area where the mixing operations can be completed during the same working day, except as required for quicklime in Subarticle 260.4 (5).

Unless otherwise approved by the City, the lime operation shall not be started when the air temperature is below 40F and falling, but may be started when the air temperature is above 35F and rising. The temperature will be taken in the shade and away from artificial heat. Lime shall not be placed when weather conditions in the opinion of the City are unsuitable.

CAUTION: Use of the quicklime can be dangerous. Users should be informed of the recommended precautions in handling, storage, and use of quicklime.

The application and mixing of lime with the material shall be accomplished by the methods herein described as “Dry Placing” or “Slurry Placing”. Type A Hydrated Lime shall be applied by “Slurry Placing” unless otherwise shown on the Plans or approved by the City. Type B Commercial Lime Slurry shall be applied by “Slurry Placing”. Type C Quicklime shall be applied by “Slurry Placing” or “Dry Placing” as shown on the Plans. The method of applying Type C Quicklime may be changed if approved in writing by the City. When Type C Quicklime is used for dry placement, it shall be Grade “DS”. When Type C Quicklime is used for slurry placement, it shall be either Grade “DS” or Grade “S”. Grade “S” shall be used in slurry placement only.

(a) Dry Placing. The lime shall be distributed by a spreader approved by the City or by bag distribution for Type A Hydrated Lime at the rate shown on the Plans or as directed by the City.

The lime shall be distributed at a uniform rate and such a manner as to reduce the scattering of lime by wind. Lime shall not be applied when wind conditions, in the opinion of the City, are such that blowing lime becomes objectionable to adjacent property owners or dangerous to traffic.

A motor grader shall not be used to spread Type A Hydrated Lime, but may be used to spread Type C Quicklime, Grade “DS”.

The material shall be sprinkled as approved by the City.

(b) Slurry Placing. When Type A Hydrated Lime is specified and slurry placement is to be used, the Type A Hydrated Lime shall be mixed with water to form slurry with a solids content approved by the City.

Type B Commercial Lime Slurry shall be delivered to the project in slurry form at or above the minimum dry solids content approved by the City. The distribution of lime at the rate(s) shown on the Plans or approved by the City shall be attained by successive passes over a measured section of roadway until the proper lime content has been secured.

When Type C Quicklime is applied as a slurry, the amount of dry quicklime shall be 80 percent of the amount shown on the Plans. The slurry shall contain at least the minimum dry solids content approved by the City. The residue from the slurring procedure shall be spread uniformly over the length of the roadway currently being processed unless otherwise approved by the City. This residue is primarily inert material with little stabilizing value, but may contain a small amount of

quicklime particles that slake slowly. A concentration of these particles could cause the compacted stabilized material to swell during slaking.

Slurry Consistency Requirements:

Slurry shall be of such consistency that it can be applied uniformly without difficulty.

When the distributor truck is not equipped with an agitator, the Contractor shall have a standby pump available on the project for agitating the lime and water as required by the City in case of undue delays in dispersing the slurry.

(5) Mixing. The mixing procedure shall be the same for “Dry Placing” or “Slurry Placing” as herein described.

During the interval between application and mixing, hydrated lime that has been exposed to the open air for a period of six (6) hours or more or to excessive loss due to washing or blowing will not be accepted for payment.

The material and lime shall be thoroughly mixed by equipment approved by the City. The material and lime shall be brought to the proper moisture content and may be left to cure one (1) to four(4) days as approved by the City or the mixing continued until a homogeneous friable mixture of material and lime is obtained.

In addition to the above, when Type C Quicklime, Grade “DS”, is used under “Dry Placing”, the material and lime shall be mixed as thoroughly as possible at the lime application. Sufficient moisture shall be added during the mixing to hydrate the quicklime. After mixing, and prior to compaction, the mixture of material, quicklime and water shall be moist cured for two (2) to seven (7) days, as approved by the City. After curing mixing shall continue until the pulverization requirements are met.

When shown on the Plans or approved by the City, the pulverization requirement may be waived when the material contains a substantial quantity of aggregate.

Following mixing, a sample of the material at roadway moisture will be obtained for pulverization testing. All non-slaking aggregates retained on the 3/4-inch sieve will be removed from the sample. The remainder of the material shall meet the following pulverization requirement when tested by TxDOT Test Method Tex-101-E, Part III / ASTM D 421:

	Percent
Minimum passing 1-3/4” sieve	100
Minimum passing 3/4” sieve	85

(6) Compaction Methods. Prior to compaction, the material shall be aerated or sprinkled as necessary to provide the optimum moisture. Compaction of mixture shall begin immediately after the pulverization requirement is met.

Compaction shall continue until the entire depth of the mixture is uniformly compacted by “Ordinary Compaction” or “Density Control” as shown on the Plans. 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 sections, lines and grades as shown on the Plans or as established by the City.

When shown on the Plans or approved by the City, multiple lifts will be permitted.

(a) Ordinary Compaction. When “Ordinary Compaction” is shown on the Plans the following provisions shall apply:

The material shall be sprinkled and rolled as directed by the City. All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required, reshaping and recompacting by sprinkling and rolling.

Should the material lose the required stability, compaction or finish before the next course is placed or the project is accepted, it shall be reworked in accordance with Subarticle 260.4 (7). However, compaction shall be in accordance with “Ordinary Compaction”.

(b) Density Control. When “Density Control” is shown on the Plans the following provisions shall apply:

Unless otherwise shown on the Plans, each course shall be sprinkled as required and compacted to the extent necessary to provide not less than 95 percent of the optimum density as determined by Test Method Tex-121-E, Part II / ASTM D 1633. Roadway density testing will be as outlined in Test Method Tex-115-E / ASTM D 2922 and ASTM D 3017.

When the material fails to meet the density requirements, or should the material lose the required stability, density or finish before the next course is placed, or the project is accepted, it shall be reworked in accordance with Subarticle 260.4(7).

(7) Reworking a Section. When a section is reworked within 72 hours after completion of compaction, the Contractor shall rework the section to provide the required compaction. When a section is reworked more than 72 hours after completion of compaction, the Contractor shall add 25 percent of the specified rate of lime. Reworking shall include loosening, road mixing as approved by the City, compacting, and finishing. When a section is reworked, a new optimum density will be determined from the reworked material in accordance with Test Method Tex-121-E, Part II / ASTM D 1633.

(8) Finishing and Curing. After the final layer or course of the lime treated material has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections.

The completed section shall then be finished by rolling with a pneumatic tire or other suitable roller as approved by the City. The completed section shall be moist cured or prevented from drying by addition of an asphalt material at the rate of 0.05 to 0.20 gallons per square yard as determined by the City. This material shall be the type shown on the Plans. Curing shall continue for seven (7) days before further courses are added or traffic is permitted, unless otherwise approved by the City.

However, the lime treated material may be covered by other courses, the day following finishing, when approved by the City. When the Plans provide for the treated material to be covered by other courses of material, the next course shall be applied within 14 calendar days after final compaction is completed, unless otherwise approved by the City.

250.5 TOLERANCES.

Tolerances shall conform to the following:

(1) **Density Tolerances.** The City may accept the work providing not more than one (1) out of the most recent five (5) density tests performed is below the specified density, provided the failing test is no more than three (3) pounds per cubic foot below the specified density.

(2) **Grade Tolerances.** Finished grade tolerances shall be in accordance with Subarticle 132.3(2).

260.6 MEASUREMENT.

This Item will be measured as follows:

(1) **Lime.**

(a) **Type A.**

(i) **Hydrated Lime (Dry).** When Type A Hydrated Lime is used under “Dry Placing”, the quantity of lime will be measured by the ton of 2,000 pounds, dry weight.

(ii) **Hydrated Lime (Slurry).** When Type A Hydrated Lime is used under “Slurry Placing”, the quantity of lime will be measured by the ton of 20,00 pounds, dry weight of the hydrated lime used to prepare the lime slurry at the job site.

(b) **Type B.**

Commercial Lime Slurry. When Type B Commercial Lime Slurry is used, the quantity of lime will be calculated from the minimum percent “Dry Solids Content” of the slurry previously agreed upon for the project by the Contractor and City. This figure will be multiplied by the weight of the slurry in tons delivered, which must be at or above the required minimum “Dry Solids Content”.

(c) **Type C.**

(i) **Quicklime (Dry).** When Type C Quicklime is used under “Dry Placing”, the quantity of lime will be measured by the ton of 2,000 pounds, dry weight of the quicklime actually delivered on the road.

(ii) **Quicklime (Slurry).** When Type C Quicklime is used under “Slurry Placing”, the quantity of lime will be measured by the ton of 2,000 pounds, dry weight of the quicklime used to prepare the hydrated lime slurry. The measured tonnage of Type C Quicklime will be multiplied by

a conversion factor of 1.28 to give the quantity of equivalent hydrated lime, which will be the basis of payment.

(2) Lime Treatment. Lime treatment will be measured by the square yard of the depth specified to the lines and grades shown on the typical sections.

260.7 PAYMENT.

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for as follows:

(1) Lime. Lime will be paid for at the unit price bid for "Lime" of one of the following specified types, which price will be full compensation for furnishing all lime.

- (a) Type A (Dry)
- (b) Type A (Slurry)
- (c) Type B
- (d) Type C (Dry)
- (e) Type C (Slurry)

Lime for reworking a section in accordance with Subarticle 260.4(7) will not be paid for directly but will be subsidiary to this Item.

(2) Lime Treatment. "Lime Treated Subgrade (Ordinary Compaction)" or "Lime Treated Subgrade (Density Control)" of the depth specified will be paid for at the unit price bid per square yard. This price shall be full compensation for shaping existing material, loosening, mixing, pulverizing, spreading, drying, applying lime, water content of the slurry, compacting, curing including curing materials, shaping and maintaining, processing, hauling, reworking if required, preparing secondary subgrade, and for all mixing water, tools, equipment, labor, and incidentals necessary to complete the work.

When proofrolling is shown on the Plans and directed by the City, it will not be paid for but will be subsidiary to this bid Item.

When "Ordinary Compaction" is shown on the Plans, all sprinkling and rolling, except proofrolling, will not be paid for directly but will be considered subsidiary to this Item, unless otherwise shown on the Plans.

When "Density Control" is shown on the Plans, all sprinkling and rolling, except proofrolling, will not be paid for directly but will be considered subsidiary to this Item.