

SECTION 165 LIME-TREATED SUBGRADE

165-1 Description.

Construct a lime-treated subgrade composed of designated soils obtained from the roadway or borrow areas and hydrated lime.

165-2 Materials.

For hydrated lime meet the requirements of ASTM C 207, for Type N, except that the requirements for popping, pitting, and water retention will not apply. Hydrated lime produced as a byproduct may be used when tested and approved, provided the calcium oxide content is at least 80% and provided the lime meets the other requirements for ASTM C 207, Type N, as amended above. Ensure that the residue retained on a No. 30 [600 μ m] sieve is not more than 1%, and ensure that the residue retained on a No. 200 [75 μ m] sieve is not more than 15%. If using bulk hydrated lime, provide equipment for handling, weighing, and spreading, as approved by the Engineer.

Apply lime at the rate designated by the Engineer after sampling and testing of the soil. In general, the Engineer will require a period of approximately two weeks, subsequent to the time that the Contractor has substantially constructed a particular section of subgrade to grade, for such testing.

Make hydrated lime slurry by blending water and lime in proportions of 2 to 3 pounds [2 to 3 kilograms] or more of water per pound [kilogram] of hydrated lime. Blend the materials using a pugmill or compressed air or circulating pumps as stirring devices. Blend during or prior to loading the truck tank.

165-3 Construction Methods.

165-3.1 Preparation: Prior to beginning lime treatment, construct the subgrade to an elevation which will provide a subgrade surface conforming to the Contract Documents upon completion of the lime treatment.

Remove all roots, sticks, or other deleterious material from the subgrade.

Prior to adding lime, scarify the surface of the subgrade as directed. Apply water as required when soil conditions are such that prewetting will be beneficial to pulverization and mixing. Construct windrows along each side of the area to be treated to prevent loss of lime. Cut drain openings through the windrows at sufficient intervals to prevent ponding of water on the subgrade, and move the windrowed material, when necessary, to permit the subgrade to dry.

The Contractor may also treat some of the areas to receive lime treatment with cement, in accordance with Section 170. Complete the lime treatment operations a minimum of seven days prior to spreading the cement.

165-3.2 Application of Lime: Uniformly spread the lime either dry or as a slurry.

If adding the lime as a slurry, blade thin layers of the lime and soil to the side as each increment of slurry is added by sprinkling, until windrows are formed. Mixing and compacting may begin after applying the total quantity of lime and blading the windrows back across the road.

If using dry hydrated lime, apply it through the use of mechanical spreaders which are able to provide a uniform distribution of lime across the full width of the subgrade being treated or by other methods approved by the Engineer.

Whether applying the lime in the dry or slurry condition, take proper precautions to protect the workers' eyes and bodies while working with lime.

Do not allow the quantity of lime spread on any section to vary more than $\pm 5\%$ from the quantity ordered. The Engineer will not include lime in excess of the allowable plus tolerance in the measurement for payment. When the quantity spread is deficient by more than the allowable minus tolerance, the Engineer will require an additional application to correct such deficiency.

165-3.3 Mixing: Immediately after spreading the lime over a section to be processed, scarify the soil over the full width and to the depth required. Then, apply water in liberal amounts as necessary, and

incorporate the lime and water uniformly into the soil to be treated by means of a rotary type mixer or other equipment which may be approved by the Engineer. Control the addition of water prior to and in conjunction with mixing such that the moisture content does not exceed the optimum moisture content of the mixture by more than 5%. Supplement a rotary mixer with disk harrows or other approved equipment as needed.

Except as provided hereinafter, continue mixing and applying water until all material will pass a 1 inch [25.0 mm] screen and at least 60% will pass the 1/4 inch [6.3 mm] sieve. Control scarifying and mixing to provide uniform depth within 0.1 foot [30 mm] of the depth specified, and maintain the required elevation and cross-section.

With certain types of soils, if so directed by the Engineer, continue mixing and applying water until all material will pass a 2 inch [50 mm] sieve, then cease operations for a period of seven days to allow the lime and soil to react. Roll the surface of the subgrade to prevent the entrance of air and water to the treatment area. After the seven day period has elapsed, continue mixing and applying water as necessary until all material will pass a 1 inch [25.0 mm] sieve and at least 60% will pass a 1/4 inch [6.3 mm] sieve.

In the event that the operations must be suspended prior to completion, continue mixing and applying water at least until all material will pass a 3 inch [75 mm] screen. After completing this preliminary mixing, compact these sections lightly, and shape them to provide for runoff of surface water until final mixing can be completed.

165-3.4 Compaction: Immediately after mixing the full depth and width receiving lime treatment, begin compacting to not less than 100% of the maximum density as determined by AASHTO T 99. Prior to and during compaction operations, the Contractor may have to perform shaping to obtain uniform compaction and required cross-section and elevation. Do not compact areas which are to subsequently receive cement treatment as part of the work under this Section.

165-3.5 Finishing: After compaction, shape the surface to the required lines, grades, and cross-sections. In order to prevent the formation of surface laminations, lightly scarify the surface with a spring tooth harrow, spike drag, or other approved device, to uniformly loosen the surface. Then, seal the surface by rolling with a traffic roller. Do not finish areas which are to subsequently receive cement treatment as a part of the work under this Section. Seal the surface of such areas by rolling in order to minimize entrance of air and water into the lime-treated material.

165-3.6 Protection and Curing: Protect the finished treated subgrade from rapid drying, for seven days, by sprinkling with water as often as is necessary to prevent drying of the surface of the lime-treated subgrade, by priming at no expense to the Department, or by application of the overlying base course. Do not allow any vehicles or operations which will distort the surface to the extent that proper curing will be affected on the treated subgrade during the curing period.

165-4 Thickness.

During various stages of construction, dig test holes in the mixture to determine the thickness.

Where the deficiency in treatment thickness is (1) in excess of 1/2 inch [13 mm] for plan thickness up to 6 inches [150 mm]; or (2) in excess of 1 inch [25 mm] for plan thicknesses over 6 inches [150 mm], reprocess the treatment in the area of deficiency at no expense to the Department.

165-5 Method of Measurement.

165-5.1 Lime-Treated Subgrade: The quantity to be paid for will be the area, in square yards [square meters], of lime-treated subgrade, completed and accepted.

165-5.2 Hydrated Lime: The quantity to be paid for will be the weight, in tons [metric tons], of the hydrated lime authorized and used in the operation. The weight will be the actual quantity incorporated into the work except that lime spread on any section greater than 5% in excess of the authorized quantity will not be included in the measurement. If using sacked lime, the measurement for unbroken sacks will be taken as the net weight as packed as specified by the manufacturer.

165-6 Basis of Payment.

165-6.1 Lime-Treated Subgrade: Price and payment will be full compensation for all work specified in this Section, including all preparation of the subgrade; furnishing and applying water; scarifying; mixing and remixing the soil (including 2-stage mixing as specified in the third paragraph of 165-3.3), lime, and water; shaping and compacting the mixture; reprocessing of deficient sections; all protection and curing of the completed subgrade; and all equipment, tools, labor, and incidentals necessary to complete the work, but not including the costs of furnishing the hydrated lime.

165-6.2 Hydrated Lime: Price and payment will be full compensation for furnishing, hauling, and spreading the lime.

165-6.3 Payment Items: Payment will be made under:

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| Item No. 165- 70- | Lime-Treated Subgrade - per square yard. |
| Item No. 2165- 70- | Lime-Treated Subgrade - per square meter. |
| Item No. 165- 71- | Hydrated Lime - per ton. |
| Item No. 2165- 71- | Hydrated Lime - per metric ton. |