

ITEM 224

QUICKLIME

224.1 Description. This item establishes the requirements for quicklime of the type and grade considered suitable for use in the treatment of natural or processed materials or mixtures, for subgrade and subbase construction.

224.2 Materials. Quicklime, for stabilization, shall be Type C Quicklime, Grade DS. Pebble quicklime shall only be used for "dry placing"; slurry placing will not be allowed. Quicklime shall meet the requirements of ASTM Designation C977.

When sampled and tested according to prescribed ASTM and THD procedures, quicklime shall conform to the following requirements as to chemical composition:

Unhydrated lime content, percent by weight CaO	Min. 87.0%
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The percent by weight of residue retained shall conform to the following requirements:

Wet Sieve Requirement

Residue retained on a No. 6 sieve	*Max. 8.0%
Residue retained on a No. 30 sieve	No Requirement

Dry Sieve Requirement

Retained on a 1-inch sieve	0.0%
Retained on a 3/4-inch sieve	Max. 10.0%

*The amount of total "active" lime content, as CaO, in the material retained on the No. 6 sieve must not exceed 2.0 percent by weight of the original Type C lime.

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

224.3 Construction Methods. It is the primary requirement of this specification to secure a completed course of treated material containing a uniform lime soil mixture free from loose or segregated areas, of uniform density and moisture

content, well bound for its full depth 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.

The roadbed shall be constructed and shaped to conform to the typical sections, lines, and grades as shown on the drawings or as established by the Engineer. The subgrade shall be firm and able to support, without displacement, the construction equipment at the density herein specified. Any wet or unstable materials below the secondary grade shall be corrected, as directed by the Engineer, by scarifying, adding lime, and compacting, or other methods until satisfactory stability is obtained. The cost of the repair of the secondary subgrade and any materials below the secondary subgrade is incidental to this item.

Lime shall be spread only on that area where the first mixing operations can be completed during the same working day. The application and mixing of lime with the material shall be accomplished by the method of dry placing.

The lime shall be spread by an approved spreader at the rates shown on the Bid Sheet, or as directed by the Engineer.

The lime shall be distributed at a uniform rate and in such a manner as to reduce the scattering of 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 to traffic or adjacent property owners. A motor grader may be used to spread Type C quicklime of Grade DS only.

The material shall be sprinkled until the proper moisture content has been secured.

The material and lime shall be thoroughly mixed by approved road mixers or other approved equipment, and the mixing continued until, in the opinion of the Engineer, a homogeneous friable mixture of material and lime is obtained, such that when all non-slaking aggregates retained on the 3/4-inch sieve are removed, the remainder of the material shall meet the following requirements when tested in accordance with ASTM Method C136, from samples procured from the roadway.

Minimum passing 1-3/4" sieve	100 Percent
Minimum Passing 3/4" sieve	85 Percent

The material and quicklime shall be mixed as thoroughly as possible at the time of the lime application. The material and lime shall be mixed by approved road mixers or other approved equipment and the mixing continued until, in the opinion of the Engineer, a homogeneous friable mixture of material and lime is obtained, free from all clods or lumps. Materials

containing plastic clays or other materials which will not readily mix with lime shall be mixed as thoroughly as possible at time of lime application.

Sufficient moisture is to be added during the mixing to hydrate the quicklime, plus the moisture needed for compaction. After mixing and prior to compaction, the mixture of the material, quicklime and water is to be left to cure for two to seven days, as directed by the Engineer. During the curing period, the material shall be kept moist as directed by the Engineer. After the two to seven day curing period, final mixing shall be done as directed by the Engineer.

Compaction shall begin after the two to seven day curing period, as directed by the Engineer. The subgrade shall be stabilized to a minimum depth of 6-inches and compacted to a minimum of 95-percent of standard proctor density (ASTM D698) at a moisture content of optimum to 3-percent above optimum.

Compaction shall begin at the bottom and shall continue until the entire depth of mixture is uniformly compacted. The material shall be sprinkled, if necessary, and rolled as directed by the Engineer. All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected adding or removing material as required and recompacting by sprinkling and rolling. The surface of the course shall be maintained and cured for a minimum of 3 days, prior to placing a base or surface course or until traffic is allowed to travel thereon.

In addition to the requirements specified for density, the full depth of the material 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 ordered. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements. Throughout the 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, before the next course is placed or the work is accepted, it shall be reprocessed and refinished at the expense of the Contractor.

224.4 Finishing. After the final course of the lime treated subgrade 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, as directed, with a pneumatic tire or other suitable roller sufficiently light to prevent hair cracking. The completed section shall be moist or emulsion cured until covered by base material, unless otherwise directed by the Engineer. If the plans provide for the treated material to be sealed or covered by other courses of material, such seal or course shall be applied within 14 days after final mixing and compacting is completed, unless otherwise directed by the Engineer.

224.5 Quality Assurance. The Testing Laboratory's representative will determine the moisture-density relationships in accordance with ASTM Method D698 on material secured from the roadway after stabilization with lime, for each type of material encountered.

The Testing Laboratory's representative will determine the in-place density in accordance with ASTM Method D2922 or D1556. The minimum level of testing will consist of at least three tests for each 1,000 feet per lane of roadway or 4,000 square feet (500 square yards of embankment or excavation).

224.6 Measurement. Manipulation of lime during the stabilization of the subgrade shall be measured by the square yard of subgrade actually stabilized.

The quantity of Type C Quicklime shall be measured by the ton of 2,000 pounds, dry weight, of the quicklime actually delivered on the road.

224.7 Payment. Payment for manipulation of "Quicklime Stabilized Subgrade" shall be made at the contract unit price per **square yard** of compacted subgrade for the depth specified.

The unit price bid shall be full compensation for loosening, mixing, pulverizing, spreading, drying, application of quicklime and water, compaction, shaping and maintaining; for all manipulations required, for all hauling and freight involved, for all tools, equipment, labor, and all incidentals necessary to complete the work.

Payment for "Quicklime" shall be made at the contract unit price per **ton**, dry weight of lime used for stabilizing the subgrade, which price shall be full compensation for supplying the lime, for all hauling and freight involved, for all tools, equipment, labor, and for all incidentals necessary to complete the work.

END OF ITEM 224