

QUALITY CONTROL AND GUIDE SPECIFICATIONS

Quicklime Plus Chemical Treatment to Sub-Grade Soils

1.01 Description

This work consists of mixing in-place material, Quicklime Plus and water. Spreading, mixing, and compacting the mixture as specified in these specifications or special provisions.

1.02 Materials

In-place material shall be the native material containing no rocks or solids other than soil clods larger than 4 inches in any dimension. Removing and disposing of said rocks or solids larger than 4 inches will be paid for as extra work.

Quicklime Plus – Quicklime Plus (QLP) is a non-proprietary, pre-blended mixture of Hi-Calcium or Dolomitic Quicklime and General Use Ordinary Portland Cement. The quicklime and cement reagents are to be precisely weighed and thoroughly blended to a 50/50 ratio. The cement and lime ratio can be changed by the engineer at no cost to the owner. *The lime and cement components shall not be spread separately.* The delivery truck certified weigh ticket shall confirm the proper blending. Quicklime shall be ASTM Designation: C 977 (Specification for Quicklime and Hydrated Lime for Soil Stabilization). Cement shall conform to ASTM C150. Sampling shall conform to ASTM C 50.

The Quicklime Plus shall be protected from moisture until used and be sufficiently dry to flow freely when handled. *The Quicklime Plus shall be spread in one operation and not show evidence of segregation.*

Water shall be clean and potable and shall be added as needed during mixing and re-mixing operations, during compacting, during the curing period, and to keep the cured material moist until covered.

1.03 Proportioning / Spreading

The QLP shall be spread in *one operation* to the required width, grade and cross section. Quicklime shall be evenly spread at the designated rate. Only a pre-qualified, calibrated spreader able to provide a uniform distribution of the QLP throughout the treatment area shall spread the QLP.

Tailgate spreading of the QLP will not be permitted. Tailgate spreading is defined as having any manual control of the spread rate during the spreading operation. The spreader shall maintain the correct application with automatic computer controls. The spreader truck shall demonstrate the ability to maintain a consistent spread rate over variable travel speeds.

The contractor shall demonstrate the consistency of the spread rate and shall conduct a multiple pan test in the presence of the engineer. *A successful multiple pan test is the application of the correct amount of reagent, within 5%, into three consecutive pans spaced 20' apart at variable travel speeds.*

Quicklime Plus to be mixed with the native material shall be furnished in bulk with certified weight tags showing the amount of lime and cement.

The Quicklime Plus shall be added in a dry state and every precaution shall be taken to prevent dusting. The spreading operations shall be conducted in such a manner that a hazard is not present to construction personnel or the public.

The spreading equipment shall have an operating baghouse with a positive vacuum system.

The rate of QLP spread shall not vary more than +/-Five (5) percent from the designated rate.

All QLP spread shall be thoroughly mixed into the soil the same day Quicklime Plus spreading operations are performed.

In areas where mixer can not access, such as around manholes or curbs, the grading contractor shall process the material the same day by pulling the material away from obstacles immediately after initial mixing.

No traffic other than the mixing equipment or other related construction equipment will be allowed to pass over the spread Quicklime Plus until after completion of mixing.

1.04 Mixing / Re-mixing

The mixer machine shall be a cross-shaft type mixer with automatic grade controls capable of providing a uniform homogeneous mixture throughout the depth indicated on the plans. A Terex RS-600, Wirtgen WR-2500, Roadtec SX-6e or equal.

The mixer machine shall automatically self-adjust itself to maintain a constant depth.

On the initial mix, *the water truck must have a solid (push bar) connection to the mixer.* The water hose shall be a minimum of 4". The water shall be injected directly into the mixing chamber and shall produce a homogenous blend free from streaks or pockets of dry reagent. *Leakage of water from equipment or "dragging " of the water hose will not be permitted.* Care shall be exercised to avoid the addition of any excessive water.

The Engineer shall determine the depth of treatment. Mixing equipment shall be equipped with a visible depth indicator showing mixing depth, an odometer or footmeter

to indicate travel speed and a controllable water additive system for regulating water added to the mixture.

Mixing equipment shall be of the type that can mix the full depth of the desired thickness and leave a relatively smooth bottom of the treated section. Mixing and re-mixing, regardless of equipment used will continue until the material is uniformly mixed, free of streaks or pockets of reagent.

Moisture content shall be approximately 3 percent over optimum and all material other than rock or aggregate complies with the following requirements:

Sieve size	Percent Passing
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1" -----	98 Min.
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No. 4 -----	60 Min.
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Non-uniformity of color reaction when the treated material, exclusive of one inch or larger clods, is tested with the standard phenolphthalein alcohol indicator, will be considered evidence of inadequate mixing.

Treated material shall not be mixed or spread while the soil temperature is below 35 F or below 1.67 C.

The first and final mixings shall not be performed on the same day, unless approved by the engineer. The entire mixing operation shall be completed within 7 days of the initial spreading of Quicklime Plus, unless otherwise permitted by the Engineer.

1.05 Compacting

The Quicklime Plus treated soils shall be compacted to a minimum relative compaction determined by ASTM 1556 , ASTM 1557.

The maximum compacted thickness of a single layer may be any thickness the contractor can demonstrate to the Engineer that his equipment and method of operation will provide the required compacted density throughout the layer.

Initial compaction shall be performed by means of segmented sheepsfoot compactor. Rex, Pactor or equal. Final rolling shall be by means of steel-tired or pneumatic-tired rollers. Areas inaccessible to rollers shall be compacted to the required compaction by other means satisfactory to the Engineer.

Compaction testing by nuclear gauge will be calibrated for inaccurate moisture readings as per the manufacturer owner's manual.

Any compaction issues will be moderated by the use of a sand cone.

1.07 Curing

The surface of each compacted layer of treated material shall *be kept moist until covered by a subsequent layer* (“moist blanket cure”, i.e. baserock). If treated section is to be exposed for more than 4-days, then a curing seal may be considered. The cure seal shall consist of SS or CSS grade asphaltic emulsion, can be applied as an option to continued water curing after the initial 3-days.

Curing seal shall be applied at a rate of between 0.45- and 0.90-L per square meter of surface. Curing seal shall not be placed when the atmospheric temperature is below 5°C.