

pH Testing Procedure for Lime Stabilization

- Screen soil to be tested through #40 sieve (recommended by Durango engineer, however, our testing to date does not seem to indicate that the screening matters)
- Determine % of lime to be tested (e.g. 5%)
- Multiply % by 25 grams and weigh on scale (e.g. 1.25 g.)
- Weigh 25 g. of soil less test amount of lime on scale (25.00g.-1.25 g.=23.75 g.)
- Fill 120 ml test vial (#1) to the 100 ml mark with distilled or R.O. water
- Place roughly ½ of water from vial #1 in the test vial to be used (#2)
- Place test soil (23.75 g.) and lime (1.25 g.) in vial #2 and secure cap
- Shake vigorously
- Add the other ½ of water from vial #1 to test vial #2
- Shake vigorously
- Allow to settle
- ASTM calls for 30 shakes at 10 minute intervals for 1 hour
- Allow to settle
- Within 15 minutes insert pH tester, stir gently with reading bubble close to soil, and read pH when meter reading is stabilized
- Repeat with all lime %'s to be tested
- Ideal pH for lime stabilization is 12.4
- Some soil/lime combinations will not reach 12.4 and in those cases the best stabilization will occur at the highest level that can be reached with the lowest % lime (i.e., if 6% lime creates a pH of 11.9 and 7% lime also creates a pH of 11.9 you would use 6%)

A technical support person at HACH indicated that if ASTM called for 30 shakes every 10 minutes for an hour that the pH would be transferred to the water and the readings would be accurate. HACH also indicated it would not be prudent to submerge the pH tester into the slurry because particulates would attach to the glass and might affect future readings.

Some feel that partial stabilization occurs once the pH is above 10. If that is true, there may be times when cost is a factor and ideal stabilization is less important. In those cases block manufacturing and soaking will reveal that level at which some satisfactory stabilization is reached. Semi-stabilization is satisfactory for any application if the structure is to be plastered and has a roof. Therefore, a small percentage of lime might be used, i.e. less than ideal to save money on the cost of lime.

pH Pocket Pal Tester (item #44350-01) from HACH:

800-227-4224

970-669-3050

970-669-2932 (fax)

www.hach.com

intl@hach.com (email)

Home Office: P.O. Box 389

Loveland, CO 80539 (distributor in Ames, Iowa also)

To calibrate your pH tester you will need buffer solutions, pH 7 and 10, also from HACH. Singlet Combo (liquid), box of 10 each—pH 7.0 & 10.01 (item #2769820), \$19.00 each plus shipping and tax (CO). Buffer also comes in powdered form, which you must prepare yourself.

HACH also sell gram scales, however, they are more expensive than the RCBS Micro Pro electronic scale (model #98983) from a hunting store in Durango:

Goods for the Woods
307 S. Camino Del Rio
Durango, CO 81303
970-247-5725

It costs about \$190.00 with tax and delivery. You can check local sporting goods stores, particularly those that carry guns and ammo. You need to be able to weigh at least 25 grams.

Test vials are called "Sample Containers" by HACH. 120 ml plastic bottles with a snap-close lid are item #25522-12. However, the smallest quantity they sell is a box of 250.

Sieves ("official" type sifting screens...ASTM approved) can be secured from either Tech Lab in Texas (800-832-6118) or Kuka Industries in Colorado (800-216-7606). They come in 8" or 12" diameters. I got 8" for portability. Lambert Engineering in Durango, Colorado, suggested screening the samples through a #40, which costs about \$35.00. The pan that fits it exactly to catch the screened material costs about \$18. In lieu of that, you can probably just screen your sample through a fine window screen. Lambert suggested screening prior to the test because a little chunk of gravel can weigh a gram so it would be better to remove those prior to mixing the clay and lime.

Advantages of lime stabilization:

1. Costs slightly less than Portland to purchase (varies region to region)
2. Costs less environmentally (slightly less embodied energy than Portland to process, but lime – unlike Portland – absorbs CO₂ when curing)
3. Provides molecular bond for limestone plaster
4. Leaves wall completely breathable
5. No deleterious color change to the clay

Have fun in the chem. lab! Of course, prices are subject to change.

Yours in limey dirt,

Jim Hallock
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