



Lime Putty Guide

Safety

Working with natural lime products requires the use of safety precautions and personal protective gear.

Lime is extremely caustic when it is wet. It has a very high pH (12), which will burn the skin and eyes. It is absolutely required and essential to protect yourself and all of those in the vicinity of any open lime products or the tools used for installation.

Avoid skin contact. Long sleeves, gloves, and long pants should be worn at all times to protect the skin during installation. Those mixing the product by hand or with mechanical mixers should also protect the whole face with a full-face shield. Eye protection should be worn at all times during mixing and installation.

Please consult the Material Safety Data Sheets for more information.

Once carbonated, lime becomes pH neutral.

Ordinary vinegar will neutralize the lime, so keep plenty of it close whenever using the lime products. Always flush eyes with clean water.

Using Lime Putty

Lime putty is the basis for making a number of architectural products common in the 19th century and before. These include lime mortar, lime stucco, lime plaster, and lime wash. Making the first three requires mixing the putty with sand.



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Lime mortar, stucco, and plaster must maintain a consistent proportional mixture of lime and sand. This proportion must be determined for any sand used. All sands are not the same. Sands have different particle shapes and different proportions of large-to-small particle sizes. This means that the void area between the particles varies from sand to sand.

Choose your sand carefully. Sands found at the local masonry supply house are often not suitable for use with natural lime products. They are chosen for use with Portland cement, a very hard and brittle binder that does not depend particularly on the characteristics of sand for its strength.

Sands should have a mix of large pieces, medium particles, and fines. If graphed, the different particle sizes will form a curve line shaped like a bell, with smaller amounts of the large and fine particles on either end, and larger amounts of the middle sizes. This is called the particle size distribution. LLW can provide you with this information for your sand.

The amount of lime that should be used with a given sand is determined by the void space between the particles. The lime should be just enough to coat each particle of sand, but no more. Too much lime, and the finished mortar will not have the necessary strength under pressure. Too much sand, and the finished mortar will tend to fall apart, be unworkable, and won't weather well in the long run.



The Void Space Ratio Test

Determining the void space ratio of a sand is done by means of a simple test. The test requires pure alcohol and very dry sand. Ideally, the alcohol used for this quick on-site test should be 200-proof to eliminate water that can skew readings, but cheap 190-proof grain alcohol [e.g. Everclear] from your local liquor store will do the trick in a pinch (Pennsylvanians will have to travel out of state.) This test requires very dry sand for accuracy. If necessary, the sand can be dried in an oven at 200°F for half an hour or put in a microwave oven until it stops steaming up the interior, then cooled to ambient temperature.

Fill a measured beaker with cleaned and very dry sand to 100mL. Tap the container until the sand is densely packed down, and then slowly add pure alcohol from another measured container until it just wets the top of the sand.

Measure the amount of alcohol added to assess the void space in the aggregate. For example, if for 100ml of sand it took 30ml of alcohol to wet the sand, you would have approximately a 1 lime to 3 sand ratio.

Once the void space ratio is determined, a mix can be made for your application. The fineness of the sand is determined by the application. Base coats of plaster and stucco can utilize coarser sands, while top coats should use finer sands.

Vertical shaft mixers should be used. (Avoid false economy: The cost of a new mixer will be well worth the labor saved and the thoroughness of mixing). Do not use rotating drum or barrel mixers; these do not adequately mix lime mortar. Small batches can be made using a powerful drill and mixing paddle, but this is difficult and not recommended.

Add sand and lime alternately to the mixer while it is running. Unless sand is extremely dry, water is most likely not needed. (Lime gets



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more liquid and workable the longer it is mixed.) If the mixture is crumbly after 15 minutes of mixing, a small amount of water (about 8 fluid ounces at a time for a 15-gallon mixer load) may be added.

Remember excess water leads to shrinkage; the more you add now, the harder you will have to work to compress the mortar later.

Mix for a minimum of 20 minutes. Do not worry about over-mixing the mortar, although motor heat or mixing in direct sunlight may cause mortar to dry during prolonged mixing, so watch the water content. Cover the mixer with a small sheet of rubber membrane or something impermeable and weighty so it won't blow off, in order to maintain water in the mix and limit CO₂ uptake during mixing.

When thoroughly mixed, lime mortar should be fairly dry to the appearance, but spreadable similar to cream cheese. Again “dry” mortar, “wet” substrate is the goal.

Put the mixed mortar into plastic buckets and cover with an inch of water. Place the lids on to keep the mixture clean. The mortar should be aged like this for at least a week, but a month is better. Check the mortar occasionally as sometimes more water is absorbed as it ages.

At any point in this process, please don't hesitate to contact LLW by email or phone. It is important that this process be done correctly for a successful installation, and once understood, it is easily executed. Also, see the **INSTALLATION GUIDE** for more information on using lime putty products from Lancaster Lime Works.