

## Spraying Lime Plaster



(photo courtesy of Harvest Build)

Many people have asked me if spraying lime plaster is a good way to go. There are belief structures on either side of the coin. Some people believe that spraying the plaster will improve the adhesion of the plaster to the bales because the plaster is being forced, via compressed air, into the bales. Others believe that hand application provides the best adhesion because the plaster is pushed and shimmied into the bales with arm power. There are other pieces of the puzzle to consider too. How many people do you have available who know how to plaster? How long do you have to get the plaster applied? What is the weather like? Do you have access to a commercial grade plaster spraying machine? Will a small hopper style sprayer work for you?

Spraying plaster will certainly adhere the material to the bales as well if not better as hand application. The force at which the plaster is applied is enough to inject it into the nooks and crannies of the bales. Furthermore, the sprayed application must then be troweled in by hand anyway, so you get the push of the arm power as well. If you don't hand trowel the sprayed application, you will not get a smooth surface and the adhesion will not be as good. It certainly speeds up the process to spray the plaster on. The initial application is much faster with this method. Be sure not to spray the plaster too thick though. If you spray on the plaster thicker than the approved depth, you risk increasing cracking in the finish coat and those cracks are more likely to telescope all the way through to the bales.



Plastering with a sprayer allows you to minimize the number of people you need on site. Being that the plaster is sprayed on quickly, you can get away with say 4 people to apply the mud. One would be married to the mixer, one would be in charge of spraying and two would be the trowel hands. That is a

good number of folks to work with as hand application can require up to a dozen people on a 2000+ SF house. The speed at which you have to mix and/or spray the plaster will depend on the sprayer. Commercial sprayers have a big hose that pull from a remote location. The amount of mud sprayed is high and the mixer will have to start earlier than the spraying crew to create enough mud to keep up. Smaller units are available like the one above that can speed the process while not speeding things up “too much.” They are also much less expensive to get and can be purchased by the average owner builder. You can purchase one at [www.LimeWorks.us](http://www.LimeWorks.us) for \$250. You will also need a compressor big enough to run the sprayer. (If you decide to buy one, contact me first as I can give you a vendor code for a discount. This is true for your lime as well.)

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## **Slaking and Sand Ratios in Lime Plaster**

I recently received the following questions regarding Natural Hydraulic Lime (NHL) plaster:

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As always, we appreciate your response. We finally ordered the lime, it is arriving this morning. We are scheduled to start tomorrow. Just lining everything up today. Some final technical questions.

In the formula you call for 4 different grains of sand. In my local Home Depot I can only find “play sand” and “Masons Sand. I suppose I’ll have to go to a better source to find the variety of sand. When I do, what is the proportion of different sands that I need? Probably this information is on the DVD, yes?

I have purchased a large mixing tub from a masons supply house thinking this would be ok to slake the lime/sand mixture in. The after thought was that you had suggested creating a troff with 6 mil plastic. The question is, do I have to slake all the lime/sand mixture over night? It would make sense in this case to have the large troff constructed. If on the other had I can mix in batches then I would rather not build the troff and mix in the large tub.

Thanks again,

Harry

Here’s my response:

You do not have to slake the lime at all if you don’t want to. It makes a better plaster if you do, but will be absolutely fine if you do not. Just be sure to mix for a minimum of 20 minutes before you use the material. If you do slake the lime, you will want a fairly big trough to put it in as a single mortar mixer load produces a lot of mud. If you plan to slake all the plaster, then you will need to hold at least four or five mortar mixers full at one time for 24 hour slaking.

The sand itself can be play sand as long as the sand is not washed. The same is true for mason’s sand. The key is that you have at least four different size grains of sand. The scratch and brown should be

fairly coarse sand and the final coat should be fine sands. I think most of the sand at Home Depot will be washed and graded and therefore no good for you. You can call sand supply yards and ask for their play sand and confirm the washing/grading as mentioned above. The mixing ratio of the grains is not that crucial; however, an even mix ratio is great if it can be achieved.

Good luck.

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- > *I would like to make some comments on Derek's statements.*
  - > *Hydraulic lime does not set in a short time. It is a product that*
  - > *can be*
  - > *reworked up to 24 hours.*
  - > *To say that it will harden in the mixer, bucket or trowel is wrong.*
  - > *For exemple, you may mix a batch and use it several hours later.*
  - > *Yes, it*
  - > *will harden, but you mix it again and it comes back "alive". As a*
  - > *matter of*
  - > *facts, it will result in a mortar which is easier to spread. In the*
  - > *old*
  - > *time, they used to mix the mortar in the evening, let it sit covered*
  - > *overnight, and remix it the next morning.*
  - > *As for the inexperienced plasterer, working with Hydrated Lime*
  - > *requires*
  - > *skills and time, and the result is far from being guaranteed. Too many*
  - > *factors like slow curing, thicknesses, ratios, etc. will give huge*
  - > *variations on the performances. I do not know of any reliable*
  - > *technical data*
  - > *for plasters with Hydrated Lime.*
  - > *On the contrary, the use of Hydraulic lime does not require special*
  - > *skills.*
  - > *Any ordinary stucco contractor can use this product by following a*
  - > *few basic*
  - > *guidelines. The performances are known and the technical data is*
  - > *available:*
  - > *you know what you get.*
  - > *One more comment on the Hydrated Lime: by reading Derek's comments,*
  - > *one may*
  - > *believe that you can start plastering a wall and continue months*
  - > *later with*
  - > *the same mix. This is wrong: you would create a cold joint and more*
  - > *cracking. To be able to keep a mix for months in a bucket is*
  - > *irrelevant*
  - > *(except perhaps for interior finishes where you do not need a lot of*
  - > *material) simply because plastering generally requires a lot of*
  - > *material*
  - > *(several cubic yards)*
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*As I write, no one has explained the differences between  
>> hydraulic lime  
>> and hydrated lime. I don't claim to be an authority. One difference  
>> is very significant for the owner-builder. After mixing, hydraulic  
>> limes will set up in a fairly short time, whether you use them or  
>> not.  
>> Unused hydraulic lime will harden in the mixer, in the bucket, on the  
>> trowel, and anywhere else. The reaction can not be stopped. Hydrated  
>> limes can be stored indefinitely (for years) in a sealed  
>> container, or  
>> under a layer of water (preferably both).  
>>  
>> For an inexperienced plasterer like myself, a big plus is that I can  
>> store unused plaster overnight or as needed, and use that plaster  
>> when  
>> I next get time to work. This is not true for hydraulic lime.  
>>  
>> derelict*

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Ferrous Sulfate comes in 50 pound bags (for about \$16 each) and is available from most stores which sell fertilizer -- get the water soluble kind in powdered form. It is the main ingredient in "Ironite" (as ferrous sulfite), used frequently by gardeners to increase the iron levels in their soil, but this comes in a granular form which is not readily soluble in water. On the bag are the words "Caution - stains concrete", and as it turns out it makes a lovely stain for both concrete and lime stucco after it has been applied. But don't panic when it turns DARK GREEN for awhile when it is first brushed on the plaster surface.



Ferrous Sulfate also adds a light tan color to the otherwise white/grey plaster when added directly to the stucco mix. In the picture to the right the left side of the bale has been plastered with Ferrous Sulfate added directly to the stucco mix; the right side has been stained with a Ferrous Sulfate solution after the plaster was applied and had started to cure (but was not completely dry).





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s measuring out some Ferrous Sulfate to add to a sample formula before applying it to a test bale at the left. Keep lots of notes and keep testing till you get what you like...



We have hand applied lime stucco to our interior wall partitions. Ferrous sulfate powder was added to plaster mix itself. Check below to see how this turned out and compare

it to ferrous sulfate liquid staining applied to actual wall



surface as it was curing...

Surrounding the door: lime plastering with ferrous sulfate powder added to the plaster mix itself

Walls inside the room: lime plastering with ferrous sulfate solution brushed on while the plaster is curing

Above the door: small area with straw/clay plaster

Bottle decoration area: motared in with "tufa stone" mix (portland cement, sand, peat moss, and some burnt umber and sienna earthen pigments added)

Wall to the far right of door: the original base coat of lime plaster which was shot on professionally

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## **LIME STUCCO PLASTERING**

### WHY USE LIME STUCCO INSTEAD OF CEMENT STUCCO?

1. Lime sticks extremely well to the surface of the straw bales, and chicken wire is therefore not required as it is when using a cement stucco. Portland cement will not stick well to the bale surface and chicken wire must be used and in fact is required by most building codes. Lime plaster perhaps mixed with adobe plaster is more durable and waterproof than adobe alone. Straw and lime (also straw and adobe) have been used together for centuries -- marriages made in heaven.

Lime retards the growth of mould (a serious problem in straw bale homes if there are any moisture problems). Portland cement will not retard the growth of mould.

Lime is somewhat breathable (letting air and moisture pass through the wall) and will therefore

let moisture escape out of the wall if it gets trapped in the bales. Portland cement is not breathable, thus trapping the moisture which then rots the bales away.

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## SHOOTING G LIME STUCCO

A lime stucco was shot professionally on all interior wall surfaces of our straw bale house... a base coat and a finish coat on two successive days. (The adobe plaster on the external walls which was applied by hand took over a year, and we just didn't have the time or the energy to do it again on the inside.)

NOTE: A small amount of Portland Cement was added to increase drying/curing time. Lime plaster takes a minimum of two to three weeks to cure otherwise. Since we were under time constraints and had to shoot the walls within a two day weekend, adding approximately 20% cement (one to five ratio of cement to lime) produced sufficient drying/curing that the second finish coat could be applied within 24 hours. Only a small amount of cement was added to the final coat. Adding more than 20% cement is not recommended as it significantly decreases the breathability of the stucco which is so crucial for straw bale walls.

White cement was used since coloring added later to the finished walls will take and cover better than over the grey of the more common form of Portland cement.





The surface was lightly trowelled for the right texture using a float sponge. The light tan coloring of the plaster was achieved by adding Ferrous Sulfate powder (a soil additive obtained from fertilizer stores) to the raw plaster mix.



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## THINGS TO LOOK OUT FOR WHEN SHOOTING LIME:

### Clogging

Somewhat more water than is used for traditional cement stucco was needed in order to keep the pumper/mixer



and supply hose from clogging up. Picture below -- grumbling stucco crew getting their pumper unclogged.



### Cracking

We had some cracking as the stucco started to cure. This was easily repaired with a wet float sponge before the plaster was dry. A warm (but not hot) and humid environment is best to allow the stucco to cure slowly and not dry out too quickly.

### General Cautions

Lime is very alkaline and caustic -- producing a terrific case of "dishpan hands" in just a few minutes. Don't breath the dust as you shovel it or get it in your eyes. Wearing gloves, a dust mask, and eye protection is highly recommended. Also the ferrous sulfates not only stains plaster, it stains your hands so wear gloves.

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