

deGruchy's

LIME



WORKSTM.us

Makers of

ecologic[®]

Mortar & Plaster Brand
For Historic Restoration
and Green Building

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Lithomex Stone Repair and Restoration Mortar

Specially formulated repair mortar based on Pure Natural Hydraulic Lime and aggregates for the repair or simulation of masonry, brick or stone. Lithomex is a neutral white or custom colored mortar supplied in 55 lbs. (25kg) bags to which mixing water is added. It is also available in units of 3 lbs or 15 lbs containers for smaller orders.

Mixing and Use:

Lithomex can be mixed manually or mechanically in a typical mortar mixer or with a whisk, adding approximately 1.1 gallons of water per 55 lbs bag of Lithomex used. Mix well for 3 – 5 minutes. Adjust final water content carefully to consistency required.

For small quantities mixed by hand, add only sufficient amount water to make a semi-dry crumbly consistency, beat vigorously for a few minutes, and carefully add a few drops of water at a time until desired consistency is achieved. (8 oz water to 3lbs Lithomex).

The application surface must be clean, free from dust and oils. On porous surfaces, ensure that suction is controlled by pre-wetting and apply Lithomex before it is fully dry. Never apply to surfaces that are over saturated or have standing water.

Lithomex can also be applied on metal lath.

For application on dense impervious materials, please consult us. The minimum thickness is 3/16" (5mm) (can be dressed or cut back to a feather edge when set). For projection / molded work, greater than 4" (100mm) it may be necessary to pin and dowel. Applied in thin layers it can be built out to 4" (100mm) over a working day. Applied in layers of up to 2" (50mm) in one pass.

Lithomex is suitable for all types of casting.

Always dampen application areas. The mortar should be well pressed back in place. If necessary, re-compact by pressing after a couple of hours to suppress any slight shrinkage.

Support where necessary with wires, anchorage, stainless steel fixings or forms, etc.

Simulation of stone / brick features, rough finishes, false joints etc. can be made approximately 5 hours from application (in damp cold weather up to 24 hours).

Shaping and forming of details can be carried out for up to 2 – 3 days after placing by scraping to profile or level with metal tools, such as the edge of a trowel or steel float, however, most shaping and finishing work can be done within 24 hours.

Fine finishes are achieved either by troweling at time of initial setting or by fine sand paper after the material is sufficiently hard (usually 7 days).

Carving, using appropriate tools, requires waiting up to a week or more depending on the weather conditions.

Where ashlar masonry or very finely jointed masonry has had considerable damage to the arises, flush finishing in Lithomex with a false struck joint is the ideal solution.

If building details are damaged and require repair prior to the façade being lime washed or painted, Lithomex will readily accept lime washes and paints.

On plastered areas Lithomex can be used to form decorative stone or brick features such as moldings and cornices.

Lithomex's unique qualities allow it to be tooled, shaped and carved even weeks after the final set has taken place. This affords sufficient time to achieve the very highest standard of work with the best quality reproduction.

Technical Data

Bulk density	lbs./cu ft : 82.5 to 85	(kg/m ³ : 1325 – 1360)
Granulometry	from #23 to #200	(from 0.8 to 008mm)
Consumption	4.7 to 5 lbs. per sq. yd. Per 1/16” of thickness	(1.6 to 1.7kg. per m ² per mm.)

Setting Time (in water with no surcharge): start – 1h30min / end – 2h30min. Tests on paste (water addition 18.7%)

Tests on Hardened Mortar (water addition at 18.7%)

Capillarity	2.06 gr.cm ² . √2 min.	LOW	tested at 28 days
Water permeability	0.25 ml.m.day	LOW	tested at 28 days
Vapor permeability	0.75 gr.m ² .hour.mmHg	VERY HIGH	tested at 28 days

	Tensile Strength	Compressive Strength	Elasticity Moduli	Shrinkage
	Psi	Psi	Mpa	mm.m
7 days	319	900		0.081%
28 days	345	1051	1,115,050	0.085%

	Tensile Strength	Compressive Strength	Elasticity Moduli	Shrinkage
	N/mm ²	N/mm ²	Mpa	mm.m
7 days	2.20	6.20		0.81
28 days	2.38	7.25	7690	0.85

The above details are given for information purposes only. Final dosages and application should be checked with out technicians. The Factory reserves the right to alter specifications.

For surface repairs to be successful the materials employed need to have certain characteristics. They should:

- Have characteristics similar to the host masonry.
- Have adequate bond strength.
- Have a good modulus of elasticity.
- Be vapor permeable.
- Be durable.
- Be capable of being dressed with similar tools to the original masonry.
- Remain workable long enough to allow details to be fashioned.
- Simulate in color and texture.
- Absorb water sufficiently in wetting and drying periods to match adjacent masonry.
- They must always be reversible.

They should never:

- Become significantly stronger than surrounding masonry.
- Have a significantly lower rate of Absorption or Adsorption than surrounding units.
- Create a barrier to Diffusion

MERUC Scale:

For materials to meet these criteria the materials themselves do not require to match every characteristic of the host masonry.

The main visual characteristic of masonry is color. Lithomex can be accurately color simulated with proven light fast pigments.

The finish of a repair material is subject to some degree of licence from the applicator and is not directly attributable to the material, although if the material can be worked correctly with traditional tools after setting it will afford good physical matching.

Lithomex is capable of being dressed with standard mason's tools or at time of placing by skilled operatives.

The physical properties of the masonry can and do vary from one area of the building to the next.

Absorption is a process by which the materials take in a fluid to fill its voids. It can vary depending on a number of factors, not least the surface finishing. The finished repair mortar must have similar characteristics.

Lithomex can be seen by demonstration to absorb water on to its set and hardened surface.

Adsorption is the process in which molecules adhere to the surface of the material, and should be similar in the repair material.

Surface Adsorption is noticeable in Lithomex repairs.

Aging is due to the changing of properties and appearance of materials with time (natural process) and is often a function of the previous two characteristics.

Lithomex does weather as a result of both of the above being sufficiently absorbent to take in pollutants over time, although not unduly.

Breathability – The extent to which a building material is able to allow moisture to move to the surface and evaporate harmlessly should be at least matched or exceeded by the repair material. The greater the degree of breathability of the repair material the faster the release of moisture from the host masonry.

Lithomex has a very high degree of breathability by virtue of its Vapor Permeability.

Capillarity – The ability of a material that is in contact with water, to raise water through capillary canals (capillaries). This is not a desirable quality of any construction or repair material. Capillary pores occur mainly in dense cement materials and hold water, reducing evaporation, many naturally occurring sandstone do have a degree of capillarity, but it is seldom continuous.

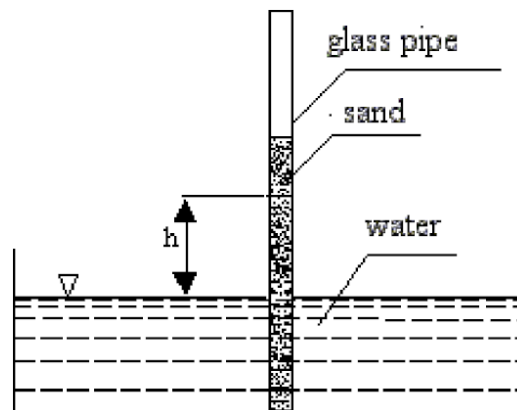


Diagram presenting the capillary rise of water through sand. Lithomex has a very low degree of Capillarity.

Porosity – defines the amount of holes (pores) in the unit of the material volume and can have a bearing on the durability and breathe-ability of the masonry and the repair material. The porosity of the masonry and the repair material is a function of the Pore size.

Pore dimensions cover a very wide range. Pores are classified according to three main groups depending on the access size:

- Micropores: less than 2 microns diameter
- Mesopores: between 2 and 50 microns diameter
- Macropores: larger than 50 microns diameter

Matching the porosity is not therefore essential, what is essential is to maintain good breathability, this is a function of the extent and nature of interlinked pores. There are two main and important typologies of pores: closed and open pores. Closed pores are completely isolated from the external surface, not allowing the access of external fluids in neither liquid nor gaseous phase. Closed pores influence parameters like density, mechanical and thermal properties. Open pores are connected to the external surface and are therefore accessible to fluids, depending on the pore nature/size and the nature of fluid. Open pores can be further divided in dead-end or interconnected pores.

Suitable repair materials should have interconnected pores – micropores structure with tiny microscopic holes or pores approximately 5 microns in diameter interlinking the general pore structure. Water droplets are typically 500 – 5000 microns in diameter; 'drizzle' droplets can be as small as 200 microns in diameter. Attraction between the water molecules forces molecules to group together in a droplet. Water droplets are too large to penetrate the Micropores without substantial pressure.

It is difficult for water droplets to pass through, and therefore the material is reasonably waterproof. Water vapor molecules are much smaller (typically less than 0.0003 microns) and pass easily through the holes, carrying moisture away.

Lithomex does have some Porosity, but this is not linked to Capillarity.

Materials that are suitable for masonry repairs should have a measurable and high vapor permeability range.

As a comparison, the following charts show the vapor permeability range of cement lime sand mixes against different lime mortar mixes.

Portland Cement Mixes.	1:1:6	1:2:9
Permeability (Vapor exch. Gr of air x m2 xhour x mmHg)	0.23	0.25
Lime Mortar Mixes	1:3	2:5
Permeability (Vapor exch. Gr of air x m2 x hour x mmHg)	0.63	0.71
Hydraulic Lime Mortar Mixes (NHL 5 / NHL 2)	1:3	1:3
Permeability (Vapor exch. Gr of air x m2 x hour x mmHg)	0.52	0.71

Lithomex has a vapor permeability figure of 0.75

In addition, the following figures show the mechanical properties of Lithomex.

	Tensile Strength	Tensile Strength	Compressive Strength	Compressive Strength	Elasticity Moduli	Elasticity Moduli
	Psi	N/mm ²	Psi	N/mm ²	Psi (10 ³)	Mpa
7 Days	319	2.20	899	6.20		
28 Days	345	2.38	1051	7.25	1,115	7690

Tests on hardened mortar (water addition at 18.7%)

Capillarity	2.06 gr.cm ² . √2 min.	LOW	tested at 28 days
Water permeability	0.25 ml.m.day	LOW	tested at 28 days
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The Modulus of elasticity is a key component in the ability of the material to flex with the stress imposed during curing and later through thermal, physical movement etc. the lower the number the greater the degree of flexibility. A cement lime sand mix of 1:1:6 ratio has a modulus of elasticity at 28 days of 16200 compared with Lithomex at 7690 and lime putty in a 1:3 ratio with sand of approximately 9000.

The compressive strength of Lithomex 1,051 psi (7.25 N/mm²) sufficiently high enough for the material to be robust enough for general conditions is considerably lower than most masonry units including soft-fired hand made bricks that usually have a compressive strength around 1,150 – 2,000 psi (8-14 N/mm²) sandstone falls in the range 2,900 – 14,500 psi (20-100N/mm²).

LithoStep is recommended for repairing treads. LithoCast is suggested for repairing cast stone that was originally created using Portland Cement and sand. LithoCast is also recommended to recast such units. For step and tread repairs Litholiant is a powder to which aggregates similar to the original stone is added. This will make a material suitably robust for aggressive wear conditions.