

Technical Information Sheet  
Article No. 0543

# Historic Lime Mortar

## Range of use

Remmers Historic Lime Mortar was developed especially for the repair and restoration of historical substrates.

It can be used for:

- pointing
- as a render mortar

Historic Lime Mortar does not have any "restoration render properties" and is therefore only permanently durable on unloaded (moisture, salt) substrates. The sulphate content of the substrate may not exceed a max. of 0.5% by mass.

When used in plinth areas, make sure that Historic Lime Mortar is protected from rising damp and/or heavier splash water loads.

## Property profile

Small lumps of lime are one of the characteristic features of many historical mortars. These are formed when pieces of quick lime are "dry" slaked.

Since these small lumps of lime have been completely slaked, they do not have a "popping effect" but they do have an autogenous healing effect on cracks and lateral detachment because of the dissolving and transport processes that take place. They are not available as a primary binder in the mortar.

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## Characteristic data of the product

The basic mixture of Historic Lime Mortar is packaged in a special container.

### Basic mixture

Colour:	basic colour KSM 001 – beige
Binder-aggregate ratio (BAR) related to Ca(OH) <sub>2</sub> :	approx. 1 : 2
Density:	approx. 1.9 g/cm <sup>3</sup>

The basic mixture does not contain any cement, trass, hydraulic lime or other "non-historical" binders. It is composed of the following:

### Binder:

Pieces of dry slaked quick lime. These lumps of lime which result naturally during the slaking process reduce the mortar's water requirements and increase its autogenous healing properties. Remaining water from the slaking process.

### Aggregates:

Washed natural sand in the medium to fine grain range. Modification or fine adjustment with coarse, local aggregates allows the mixture to be made with less water which reduces shrinkage.

### Less than 10% additives:

Uncontaminated brick dust from slow-baked brick – as found in many historical mortars – produces an additional hydraulic setting reaction which increases the mortar's resistance to weathering influences.

### Matching:

To match the mortar to the specific requirements of the object, sand typical for the location that has been washed several times is added (see below). The largest size of the grain of sand added (e.g. size and form of grain) has a considerable influence on the surface texture of the lime render while the finer grain fractions essentially influence colour.

**Gravel pit or natural sand is never exactly uniform in colour. When gravel pit or natural sand is used, the colour determining ingredients result in a natural range of colours which, on larger surfaces, can lead to a naturally mottled appearance. The mottled colouring does not constitute a defect.**

The ultra-fine constituents of local sand should not be greater than 5% by mass (DIN 18550, part 2 or DIN 4226, part 3).

**Testing the content of ultra-fine constituents:**

Fill a cylindrical bottle two-thirds full with the respective sand and then fill the bottle completely with water. Shake the mixture thoroughly. After a settling time of one hour, shake the mixture again. The fine constituents settle on the top during this process. The ratio between the height of the layer of fine constituents ( $SH_F$ ) and the total height of the sand (sand and fine constituents;  $SH_{S+F}$ ) shows the content of ultra-fine constituents ( $A_{AB}$ )

When producing matched mortars, Historic Lime Mortar and sand should be measured by volume (e.g. with a bucket and not a shovel) and mixed to the proper working consistency (earth moist), adding water if necessary.

$$A_{AB} = \frac{SH_F}{SH_{S+F}}$$

The following binder-aggregate ratios can be achieved by adding sand (assuming:  $\rho$  approx. 1.5 g/cm<sup>3</sup>) to a respective part by volume basic mixture ( $\rho$  approx. 1.9 g/cm<sup>3</sup>):

**Example: Factory-mixed, dry mortar mixed with sand:**

Mixture ratio		Resulting BAR (Ca(OH) <sub>2</sub> )
pbv basic mixture	pbv sand	
1	without	1 : 2.0
11	2	1 : 2.5
17	6	1 : 3.0
2	1	1 : 3.5
3	2	1 : 4.0
7	6	1 : 4.5
1	1	1 : 5.0

**Attention:** The richer the mortar is in binder, the more susceptible it is to cracks.

**Characteristic data in the set state:**

Example for a binder (Ca(OH)<sub>2</sub>-aggregate ratio of 1 : 2.2

- $\beta_D$  (1 year): 5.5 N/mm<sup>2</sup>
- $\beta_D$  (6 years): 8.0 N/mm<sup>2</sup>
- E modulus (1 year): 4.5 kN/mm<sup>2</sup>
- E modulus (6 years): 9.0 kN/mm<sup>2</sup>
- Porosity: 30-35% by volume

**Product**

Historic Lime Mortar is produced in accordance with a historical tradition that has been passed down for "dry slaked" sand-lime

mortar. The mortar does not contain cement. Basic mixtures are used for producing joint and render mortars according to historical models.

By adding local aggregates to the basic mixture, the mortar can be matched to requirements specific to the object.

2-component mortar:

Component A: binder and aggregate

Component B: additives

**General information on working with lime mortars/lime renders**

The application of lime mortars is more complicated than the application of cement based mortars. For this reason, thorough preliminary examination of the following items is a basic prerequisite to minimise the risk of (new) damage:

- Assessment of the object
- Assessment of the state and
- Diagnosis of damage

A concept for the measures covering the respective methods and materials for preserving and restoring the object as well as supporting measures must be prepared based on the results of the assessments stated above.

To safeguard the requirement of due diligence, trial surfaces should be set up for the individual work steps. These trial surfaces should be executed in sufficient time before the measures are executed. When applying lime renders to monuments, it is recommended that a trial surface on the monument be exposed to a weathering phase of at least one winter and better for one year. Before setting up trial surfaces, evaluation criteria should be agreed upon.

One essential requirement when preserving historical monuments concerns thorough documentation according to VDI Guideline 3798 for each measure. Accordingly, the following items are to be included when documenting execution:

- The most important results from the assessment documents
- Condition of the substrate (e.g. drawings, salt and moisture loads)
- Presentation of a restoration concept
- Formulation of the mortar (building site mixture), naming ingredients and/or specification of technical characteristic data
- Thickness and sequence of render layers and subsequent coatings
- Directions for preparing the mixture or directions for factory-mixed, dry mortar
- Working conditions, execution and standing times, weather conditions, follow-up work
- If required: reasons for deviating from the original concept
- Notes on limited options for usage, necessary follow-up work maintenance and care

## Substrates

Before applying the render the suitability of the render base should be examined according to DIN 18350 and DIN 18550 and the render base prepared. It must be load-bearing, clean and free of material that could interfere with adhesion of the render (dust, loose material, organic infestation, etc.).

Non-load-bearing render bases must be supported with suitable lathing (e.g. made by Bekaert).

Dry substrates should be pre-wet approx. 2 hours before the render is applied, highly absorbent substrates may need additional pre-wetting the day before. Avoid over-saturation with water (see below).

## Working

### General notes:

The two components of Historic Lime Mortar are packaged in a special container in the proper mixing ratio. Component B should

be completely added to Component A.

Suitable local sand is added to this mixture. The quantity of sand to be added depends on

- Type and properties of the sand (see above)
- Type and state of the substrate to be treated
- Task at hand

Depending on the task and object specific conditions, a binder-aggregate ratio of 1 : 2.5 to 1 : 5 is normally used.

The mixture should be mixed until homogenous with suitable mixing equipment (e.g. positive mixer). Since the lumps of lime may slowly break down during the mixing process, the intensity and time of mixing influences the size and number of lime lumps which in turn influence the effective binder content and the colour of the mortar: the smaller the size and number of lime lumps, the lighter in colour the finished product. For this reason, check the colour before working and correct if necessary. Colour should be checked in the dry state.

The mortar should be used within 24 hours after mixing. Mortar that has fallen off when worked as well as stiffened mortar should not be returned to the mixture.

Regardless of whether Historic Lime Mortar is used as a joint or render mortar, it must be kept damp after application (preferably by "misting", using a sprayer or airless equipment; never by directly sprayed water). The duration and scope of this measure depends on the respective conditions at the specific object. The mortar should also be protected from direct sunlight and driving rain (e.g. by covering with damp sack cloth or jute sheets) while maintaining sufficient ventilation of the mortar.

In outdoor areas, dehydration may result from e.g. sunlight and/or wind; indoors e.g. from drafts and/or thermal loads.

Surfaces exposed to rain such as towers, but also areas at risk of splash water, may need to be protected from moisture penetration for longer periods of time so that carbonation can progress undisturbed and to make sure that binder is not washed out.

Historic Lime Mortar may only be used on frost-free substrates at temperatures above +5°C. Since lime mortar is very sensitive to frost during the first weeks, application must be carried out and setting concluded in a period without frost. Artificial heating behind curtained scaffolding is not recommended and the addition of "anti-freeze agents" is prohibited.

When working at temperatures above 30°C, there is a very high risk of "burning".

Historic Lime Mortar should be preferably worked by hand. The mortar can be mixed with a barrel mixer with staggered baffles, a positive mixer, a mixing tool or by hand. If the mortar is to be worked by machine, suitability (use and application options in regard to the lime lumps) should be tested in advance.

Strength development of the mortar goes hand in hand with the formation of shrinkage cracks. These cracks, which conically narrow towards the render base, do not constitute a defect. However, before a new layer can be applied, the formation of cracks in the bottom layer(s) of render must have been concluded (see below).

Texturing of the surface of the upper layer (e.g. with felted fabric, wood float, sponge float) is carried out only after setting has commenced.

After the conclusion of setting, open-pored coatings that harden low stress in the Remmers Silicone

Paint System (e.g. Silicone Resin Paint LA, Historic Scumble and Historic Grout Scumble) may be used, if desired. Silicate paints should not be applied because of the resulting surface tension. Horizontal and sloped render surfaces must be suitably protected from rain. Vertical surfaces do not need special protection.

**Regardless of whether the material is used as a joint or render mortar, the physico-mechanical and moisture properties of the mortar used must be carefully coordinated to the existing masonry work. The suitability of the selected mortar mixture should be proved on a sufficiently large and representative trial surface.**

For a lime mortar, Historic Lime Mortar has excellent resistance to weather. Necessary maintenance intervals will depend on the object's specific load situation.

#### **Use as a joint filling mortar**

After the areas to be filled have been scraped out and cleaned, they should be thoroughly pre-wet (see above). Make sure that a film of water does not remain on the substrate.

The mixed Historic Lime Mortar should be applied according to the rules of the trade, frictionally coupled without voids, using suitable tools (lancet, jointing iron, wood spatula, etc.).

In areas with deeper running cracks and missing or broken out areas, it may be necessary to carry out work in several working operations, i.e. in several layers. In this case, each layer of the following layers of mortar should be placed approx. 2 to 4 cm thick. If missing or broken out areas are larger, it may be necessary to form these with suitable, small rough stones.

After the filling has dried the first time, sinter skin should be

removed with suitable tools (coarse brush, wood spatula, jointing iron, etc.).

#### **Use as a pointing mortar**

The areas to be worked should be thoroughly pre-wet (see above). Make sure that a film of water does not remain on the substrate (masonry work and joint filling mortar).

Apply the mixed Historic Lime Mortar according to the rules of the trade, frictionally coupled and without voids, using suitable tools (lancet, jointing iron, wood spatula, etc.).

After the pointing has dried the first time, remove sinter skin with suitable tools (coarse brush, wood spatula, jointing iron, etc.).

#### **Use as a render mortar**

Pre-wet the surfaces to be worked thoroughly (see above). Make sure that a film of water does not remain on the substrate (masonry work and joint filling mortar).

Hollow joints, holes and larger depths should be coarsely closed by throwing on Historic Lime Mortar before the layer of render is applied. Follow-up work is carried out only after sufficient setting time. Sinter skin is removed during initial setting with suitable tools (coarse brush, wood spatula, jointing iron, etc.).

A lime bound rough cast should be applied to

- Highly absorbent substrates
- Larger surfaces with smooth, poorly absorbent stone
- Mixed substrates with highly varying absorption behaviour
- Brick Rabbitz as lathing and/or
- Multiple-layer render

The same lime binder used for the render mortar should be used for the rough cast. If pure, non-hydraulic lime render is used on smooth, poorly absorbent substrates, it may be a good idea to use Remmers Preparatory

Mortar or a lime rough cast with a higher content of hydraulic constituents. The rough cast should have a very coarse grain.

If rules for rendering are followed, the rough cast may not be softer than the layers that follow, so the binder content of the rough cast should be increased. Since a lime based rough cast does not impair the absorbency of the masonry work, the rough cast can be applied either in net form or full covering. The rough cast should be kept damp for 1-2 days (see Working directions – General notes). Standing time until the rough cast is sufficiently load-bearing may take from one to several days.

To improve adhesion on less problematical substrates, a coarse, stiff and rough render is applied and roughly ripped open.

A minimum standing time should be planned, depending on the respective substrate situation or respective rough cast.

The possible thickness of the layers depends on the diameter of the largest grain and, as a rule, should not exceed 4 times the size of the largest grain. However, the maximum layer thickness should not exceed 2 cm.

For multiple layer render (2 layers), application is carried out wet-on-damp as long as the bottom layer is less than 1.5 cm. If the bottom layer is 2 cm thick, waiting time is at least 30 days, depending on site conditions.

During initial setting, the surface is roughened with suitable tools (e.g. render comb, Remmers grated scraper). The second layer is applied in a thinner layer.

Not only the setting behaviour but also adhesion to the substrate is decisively influenced by

- Composition of the mortar
- Thickness of the render and
- Ambient conditions

Initial setting and commencement of adhesion, which are also influenced by the conditions stated above, as the time for applying a subsequent layer of render range between one and several days according to our experience. **The object-specific waiting times before applying a subsequent layer of render should be determined on suitable and sufficiently large trial surfaces.**

#### Tools and cleaning

Mixing tools, positive mixer, smoothing float, levelling rule, toothed float, render comb, broom, nail board, sponge float, trowel, Remmers grated scraper.

Clean tools with water while the material is fresh.

#### Packaging, application rate, shelf-life

**Packaging:**  
35 kg special containers

**Application rate:**  
Depends on the task at hand, the type and quantity of sand added. Determine on a suitable, sufficiently large trial surface.

**Shelf-life:**  
At least 12 months in unopened, original containers, stored frost-free.

#### Safety, ecology, disposal

Further information concerning safety during transport, storage and handling as well as for disposal is found in the latest Safety Data Sheet.

The statements above are compiled from our field of production and according to the latest technological developments and application techniques.

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