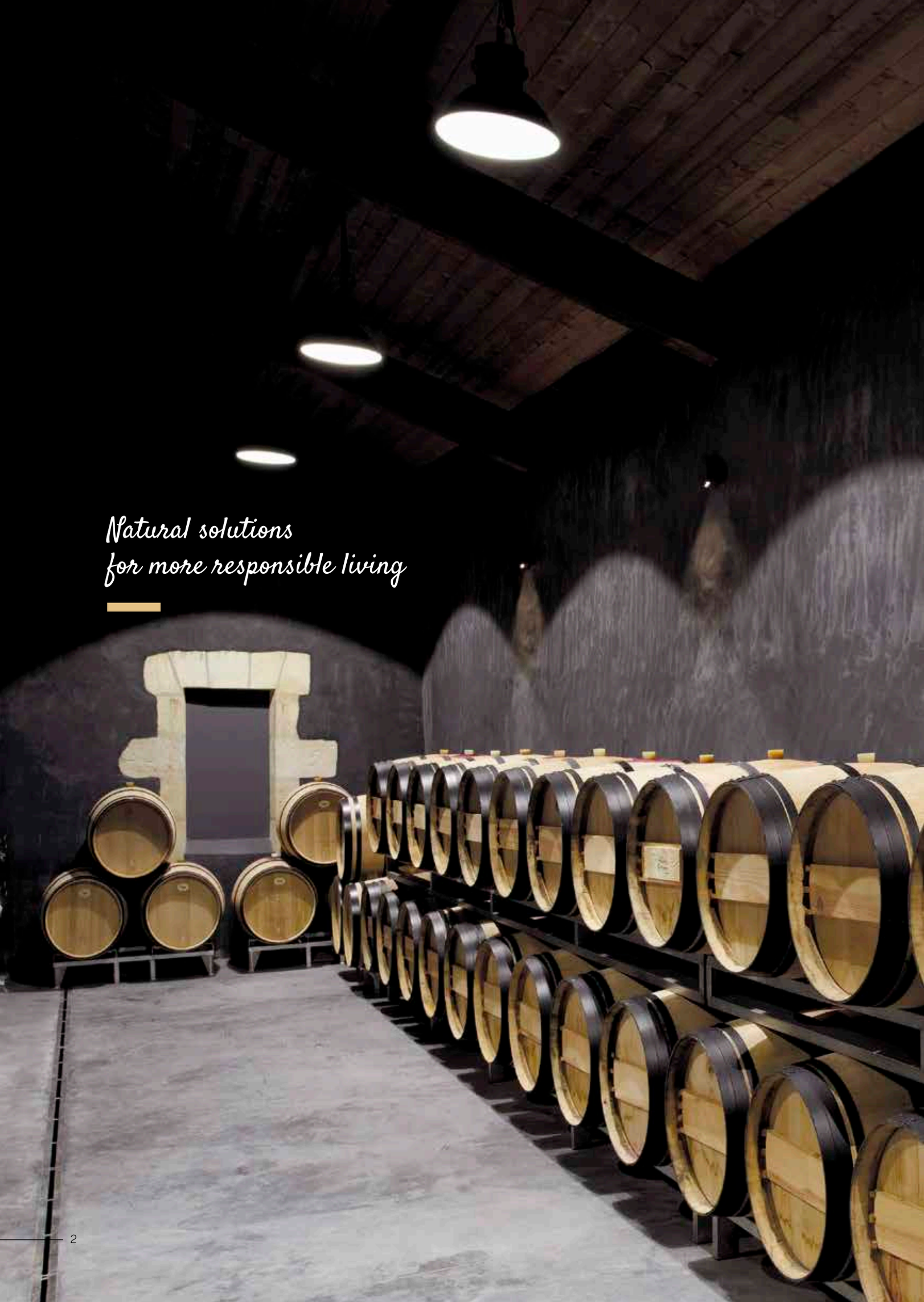
TECHNICAL DOCUMENTATION

SAINT-ASTIER

LIME, LIFELONG EXCELLENCE

Saint-Astier®
limecrete floor and finishing solutions



Natural solutions
for more responsible living

TECHNICAL ADVANTAGES OF NATURAL LIME CONCRETE AND SCREEDS FROM SAINT-ASTIER®

> Natural and healthy

> Excellent hygrothermal regulation

> Easy to install

> Light and insulating (depending on the aggregate)

> Respect for old buildings

> No VOC emissions (Volatile Organic Compounds)

> Chaux de Saint-Astier® have been awarded the EXCELL VERT* label

Label garantissant la bonne qualité de l'air (peu de COV)

NATURAL HYDRAULIC LIME : A BINDER THOUSANDS OF YEARS OLD

Over the centuries, natural hydraulic limes, used as binders to make mortars, have been used in construction in all types of works, including mortars for floors. Saint-Astier® natural hydraulic limes are made from siliceous limestone. Saint-Astier® limes have the property of setting with water as they have an hydraulic part and also gain resistance with air, due to their aerial part.

*A label guaranteeing a superior level of quality, ensuring that emissions of chemical compounds from materials will not cause any deterioration in stored products, or discomfort for occupants, thanks to the absence of specific contaminants.

It is important to follow the application guidelines provided in this document. It may also be necessary for the company to contact their insurer before starting these works.

TAILORED SOLUTIONS
FOR YOUR INDOOR FLOORS

AREAS OF APPLICATION

> Non-load-bearing uncoupled flooring for ground floors of heritage buildings, vernacular buildings, cellar and winery floors*, troglodytic dwellings, restoration of floors in existing buildings, new detached houses, timber-framed houses, etc.

*Caution : a greater thickness may be necessary in the case of barrel cellars.

> Limecrete slabs can only be used inside buildings. On a Saint-Astier® limecrete paving slab, it is possible to make the "partitioned walls" with plaster bricks, plasterboard, Fermacell®, brick tiles or plaster tiles.

THE STRENGTH OF A LIMECRETE SLAB

Made up of aggregates* and Saint-Astier® NHL 5 PURE Lime, the strength of a limecrete slabs is approximately 3 to 4 MPa**, i.e. 30 to 40 kg/cm² at 28 days. In contact with air and moisture, **this strength continues to increase and can double after just 4 months**. These strengths are more than sufficient for their intended use.

* The aggregates that can be used for natural concretes with Saint-Astier® lime are described in the GRANULATES chapter, page 5.
** With the exception of Saint-Astier® limecrete and cork.

Limecrete paving with natural pozzolana aggregates, on tamped hardcore limestone. Private house (France).

THE AGGREGATES USED :

BALLAST (COMMON AGREGATES)

(rounded or crushed 0 / 16 or 0 / 20 mm)

> Economical.
> Very good mechanical compressive strength.

EXPANDED CLAY BALLS

> Lightweight aggregate.
> Expanded clay available in 2-3 mm and 8-3 mm.

EXPANDED SHALE*

> Light aggregate.
> Available in 18 kg ready-to-use bags.

SAINT-ASTIER® NATURAL POZZOLANS*®

(grading 0 / 15 mm)

> Unique in France : no need to add sand.
> Excellent moisture regulation.
> Good bonding of hard limestone thanks to the roughness naturally occurring pozzolana.
> Natural pozzolana reacts with Saint-Astier® lime.
> Lower density than common aggregates.

*Available local shales or pouzzolans can be used, Saint-Astier® cannot be held responsible for the lime concrete made with these shale, if they have not been previously tested and analyzed by Saint-Astier®'s technical department (technical_support@saint-astier.com). The characteristics and indications are the result of intensive work by our technical department, and the application must always respect the local standards of construction. Our recommendations on application and characteristics are intended to assist in the choice of our product but do not constitute any contractual legal relationship. In particular, they do not exonerate the user or the faculty direction from the obligation to check the suitability of the product for its use. The sending or downloading of this guide is sufficient proof in the event of litigation.

SITE **PREPARATION**

GROUND PREPARATION

> Digging the ground :

The purpose of this operation, is to rid the ground of its vegetation, organic matter, waste and rubble, and any cement concrete.

> Under no circumstances must this digging destabilise the existing masonry and it must be deep enough to accommodate the full thickness of the future concrete work ; including the ventilated hardcore layer and the future lime concrete and final floor covering.

> Levelling :

After this digging operation, the surface must be levelled. It may be necessary to compact the existing soil. This will improve its load-bearing capacity.

> Compaction :

The water content of the soil can be reduced by adding Saint-Astier® NHL 5 Lime, which will be mixed with the existing floor using a Rotovator or rototiller. The quantity of lime to be included should be around 8% by weight of thickness per m^2. If the floor has too much clay and/or silt, a granular correction can be made before compaction by adding common aggregates with or without lime treatment. It is necessary to compact the floor in place to improve its load-bearing capacity.

LAYING THE VENTILATED HARDCORE LAYER

> The hardcore layer is made of 20/40 mm or 30/60 mm preferentially angular rock (crushed stone, bricks…). Pebbles can also be use if the hardcore layer remains sufficiently porous. It is installed with a minimum thickness of 20 cm. The purpose of this layer is to create a sanitising air space and to block wicking from the floor through the concrete. This layer can be ventilated, making it an important part of this type of flooring.

> From a thermal point of view, and for the good health of old and new buildings, moisture management of the natural floor or in a cellar, is essential. This traditional technique, with the addition of a drain to ensure permanent extraction of the humidity to the outside, regulates dampness at the base of the masonry. An effective ventilated hardcore layer protects the building and contributes to the overall comfort of the home.

> Place a breathable geotextile on the ventilated hardcore layer before pouring the lime concrete to prevent it from being filled with the concrete and losing its capacity.

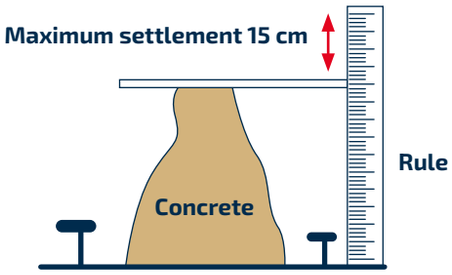
TIPS :

> Thermal insulation : non-compressible insulation boards like Cork… can be laid under the concrete.

> The waste water drains should be buried in trenches under the hardcore and covered with sand for protection.

> The service conduits (electricity, water, cables…) with a diameter greater than 2.5 cm must also be buried under the hardcore layer. Conduits smaller than 2.5 cm in diameter can be placed on the hardcore or on the insulation.

> To ensure good ventilation and/or in the presence of humidity, a ventilation drain (perforated plastic or clay pipe) is recommended. This drain should preferably be laid in an **S**-shape, with the inlets and outlets raised above the finished outside ground level and closed with a protective grid. In particularly damp environments, water should be channeled by gravity flow to the outside via the drain system



ABRAHAMS CONE

MANUFACTURE OF LIMECRETE

PREPARATION SAINT-ASTIER® LIMECRETE

> Saint-Astier® Natural concretes with NHL 5 Lime should be made using a dosage of between 350 and 400 kg of lime per m³ of aggregate.

1 BAG
SAINT-ASTIER®
NHL 5

65 TO 70 LITRES
OF AGGREGATES

> The quantity of water used should make it possible to obtain a concrete with a plasticity consistency, but with better mechanical strength.

> Lime concrete can be mixed using a concrete mixer, a mixer or a mixing bucket on site. Lime concrete can also be manufactured in a concrete mixing plant and delivered in a truck. In all cases, the concrete must have a consistency between S2 and S3 on the SLUMP, i.e. a maximum slump of 15 cm (see diagram). It can also be pumped, in which case it may be necessary to add additives.

Mixing time : 5 minutes minimum, until a homogeneous mixture is obtained.

INSTALLATION OF LIME CONCRETE

LAYOUT OUT THE PAVING

> The paving should be laid with joints whose depth are a third of the thickness of the paving and between 3 and 5 mm wide. It is preferable to obtain square or rectangular shapes with a surface area of no more than 25 m² with a maximal dimensional ratio between length and width of 1.5. The space between joints should be a maximum of 6 m.

SETTING UP

> If a common aggregate is used, the concrete can be placed using a vibrating trowel without compaction.

> In other cases, the concrete shall be placed with a screed and a trowel. The thickness should be a minimum of 15 cm. If the thickness is greater than 25 cm, it should be applied in several layers of 10 to 15 cm with a maximum waiting time of 48 hours between each layer. An uncoupling strip or cork boards can be applied around the perimeter, particularly for renovation work.

CURING THE CONCRETE

> The lime concrete laid, must be kept moist in a closed room and protected from frost. It should be moistened 1 to 2 times per day for 1 week by moderate spraying. If necessary, as pouring progresses, lime concrete can be covered with a waterproof damped hessian or polyane sheet to keep it moist, in order to ensure that it hardens properly. This curing protection should be left on for a week and then removed.

The empty bags of lime used to make the lime concrete can also be used to cure the concrete by moistening them and covering the entire slab.

IMPORTANT : the use of metal reinforcement or welded mesh is prohibited. Lime concrete may be reinforced with polypropylene fibres.

POSSIBLE **FINISHES**

SEALED COATING

After a minimum of 4 weeks drying time, a sealed floor covering can be laid (see the relevant section on "Sealed floor coverings page 10").

FLOORING ON JOISTS

It is applied directly to the lime concrete after a minimum of two months drying time.

COLOUR

Saint-Astier® lime concrete can be coloured* in mass (throughout the thickness of the lime concrete). In this case, it will only be made from standard aggregates and a previous test will have to be made to test the color.
Additional protection may therefore be required (see next paragraph).

*Colors : please consult us.

PROTECTION

If the paving is left unfinished or bare, it needs to be protected to prevent stains and make maintenance easier. To do this, three months after the lime concrete has been laid, you can apply a 38/40 sodium silicate solution or natural solutions such as wax for concrete, or similar.

CONSUMPTION / EFFICIENCY

For 1 m³ of concrete in place you need approximately :

17 BAGS
PURE LIME TRADI 100® NHL 5

✚

1200 LITRES
DEPENDING ON THE AGGREGATE CHOSEN

TECHNICAL DATA

SAINT-ASTIER® LIMECRETE					
	Dosage	**Dry density kg/L**	**Compressive strength to 90 days**	**Hygrometric behaviour**	**R for 15 cm (thermal strength) in $m^2.K.W^{-1}$**
Common aggregates 0/16 mm	1 bag SAINT-ASTIER® NHL 5 + 70 litres of aggregate	1,9 to 2	6,5 MPa	✚✚	0,12
Pozzolana Saint-Astier® 0/15 mm	1 bag SAINT-ASTIER® NHL 5 + 70 litres of aggregate	1,5 to 1,6	4,5 MPa	✚✚✚✚	0,29
Expanded clay	1 bag SAINT-ASTIER® NHL 5 + 70 litres of aggregate	0,9 to 1	2,9 MPa	✚✚✚	0,51
Approved shale	1 bag SAINT-ASTIER® NHL 5 + 70 litres of aggregate	1,2 to 1,4	> 6 MPa	✚	0,35

IMPORTANT : For the use of local aggregates, please contact us.

SOLUTIONS DISTRIBUTED BY SAINT-ASTIER®

for natural limecrete.

SAINT-ASTIER® NHL 5

NHL 5

> 25 kg bag
> Pallet of 1T
(40 bags per pallet)
> Big Bag (consult us)

BIG BAG NATURALLY OCCURRING POZZOLANA

> Big Bag 1m³
(1,2 to 1,3 tonnes approx.)

FLOOR COVERINGS

This chapter refers to "floor coverings" and to experience gained*.

AREAS OF APPLICATION

This work will enable floor coverings to be laid using the Saint-Astier® lime mortar floor covering installation technique. The sealed laying technique can only be used on natural Saint-Astier® lime concrete, and only indoors.
The premises concerned are those for individual use and/or those subject to low levels of stress, and more generally residential premises. The tables below describe the dosages to be taken into account according to the nature of the elements to be sealed.

MATERIALS

Lime : depending on the place and the type of tile.

SAINT-ASTIER® NHL3,5

SAINT-ASTIER® NHL5

HOURDEX® HL5

KHOLAO® COLLE
Tile Adhesive

Sand :

> It must comply with standard XP P 18-545. EN 13139.
> It must be clean and washed.
> The grain size for screed mortar should be 0 / 4 mm.
> Depending on the width of the seals, its grain size should be between 0 / 1 mm and 0 / 4 mm for pointing mortar.

For the dosages given, the buckets of sand are considered to have a volume of 10 litres **(check the volume of your buckets).**

SUBSTRATE : SAINT-ASTIER® LIMECRETE

It must be suitable for receiving the 4 to 6 cm thick Saint-Astier® mortar, be clean and rough, and have a minimum drying time of 4 weeks.

*The characteristics and indications are the result of intensive work by our technical department, and the application must always respect the local standards of construction. Our recommendations on application and characteristics are intended to assist in the choice of our product but do not constitute any contractual legal relationship. In particular, they do not exonerate the user or the faculty direction from the obligation to check the suitability of the product for its use. In the event of mixing the mortar with other products (aggregates, pigments or other elements), other than those described in the sheet, Chaux de Saint-Astier® cannot be held responsible for any possible damage or pathologies that may occur. The sending or downloading of this guide is sufficient proof in the event of litigation.

MORTAR DOSAGE TABLES ACCORDING TO THE TYPE OF TILES TO BE USED

Bedding mortars for **new terracotta tiling (groups AII and AIII)**, cement tiles and natural stone, or for old and/or re-used tiling, may be made from NHL 5, NHL 3.5 or HOURDEX®.

PREMISES FOR INDIVIDUAL USE OR WITH LOW STRESS LEVELS		
Type of hard limestone binders		Dosage
Natural hydraulic lime for thick stones ≥ 2 cm and terracotta tiles	 **SAINT-ASTIER® NHL3,5**  **SAINT-ASTIER® NHL5**	**350 kg/m³ of sand or – 1 bag of 25 kg of lime for 7 buckets of sand (70 litres)**
HL 5 Hydraulic Limes for stone of any thickness or HL 5 for new tiling ceramic type	 **HOURDEX® HL5**	**300 kg/m³ of sand or – 1 bag of HOURDEX® for 8 buckets of sand (80 litres)**

Bedding mortars for **new ceramic tiling (groups AIa, AIb, BIa, BIb)**, except terracotta and natural stone, must be made of HOURDEX®.

PREMISES FOR INDIVIDUAL USE OR WITH LOW STRESS LEVELS		
Type of hard limestone binders		Dosage
HL 5 Hydraulic Limes for stone of any thickness or HL 5 for new tiling ceramic type	 **HOURDEX® HL5**	**300 kg/m³ of sand or – 1 bag of HOURDEX® for 8 buckets of sand (80 litres)**

SCREED THICKNESS

> 5 to 6 cm on a limecrete slab

LAYING THE TILES

> For new tiling (except terracotta and natural stone), it must be laid with HOURDEX® :

- As the work progresses, by sprinkling HOURDEX® screeding mortar onto the fresh screed as it is being laid.
- Or as the work progresses, use fresh barbotine using : **2.5 parts HOURDEX® to 1 part water.**

> For new terracotta, natural stone or reused tiles, the HOURDEX binder used for the slip or sprinkling must be the same as that used for the screed. In all cases, the tiles must be soaked in water for 24 hours before being laid and allowed to "dry out". The tiles must be set with a mallet. The screed must have joints every 25 m² minimum. Where necessary, these should be placed in line with concrete/screed joints. Waiting time before applying the grout : 3 weeks minimum.

The visible surfaces of terracotta tiles and natural stone should be treated before the joints are filled to make them easier to clean.

GROUTING MORTAR FOR TILES

		Thin joints < 2 mm	Reduced Joints of between 2 and 4 mm	Normal joints between 4 and 10 mm	Wide joints > 10 mm
Lime	**NHL 5 or NHL 3,5**	700 to 1000 kg/m³	700 to 1000 kg/m³	500 to 800 kg/m³	400 to 700 kg/m³
Lime	**HOURDEX®**	700 to 1000 kg/m³	700 to 1000 kg/m³	500 to 800 kg/m³	400 to 700 kg/m³
Sand		Sand 0/0,5 mm	Sand 0/1 mm	Sand 0/2 mm	Sand 0/4 mm

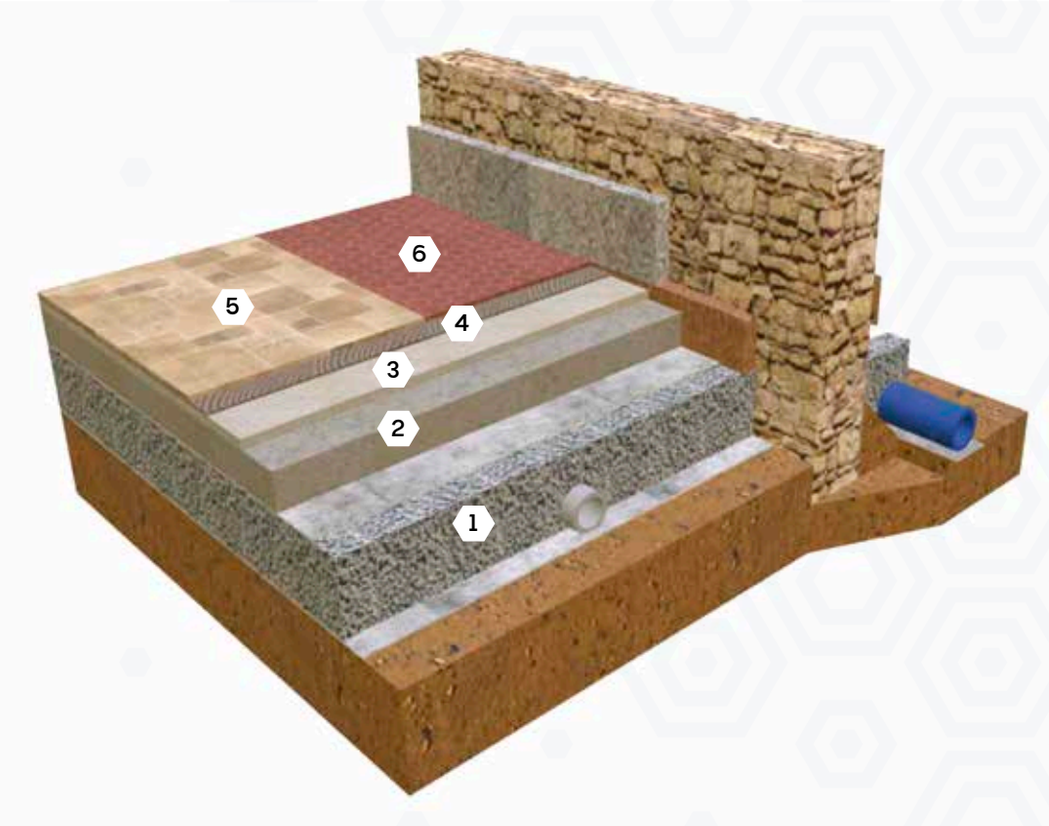
Dosage by volume :

Thin joint : 1 to 1.5 volumes of Saint-Astier® Lime for 1 volume of 0/0.5 mm silica sand or calcium carbonate.
Reduced bonding of masonry : 1 to 1.5 volumes of Saint-Astier® Lime for 1 volume of 0/1 mm silica sand.
Normal joint : 1 volume of Saint-Astier® Lime for 1 volume of 0 / 1 to 0 / 2 mm silica sand.
Wide Joint : 1 part Saint-Astier® Lime to 1 to 1.5 parts 0/4 mm silica sand.

In the case of wide joint (≥ 10 mm), apply a liquid grout of Saint-Astier® lime and sand at a ratio of 1 volume of binder to 1 volume of sand and place it at the bottom of the joint to regulate the absorption of the bedding mortar, then finish the joint without letting the grout dry with a stiffer mortar.

COLOURING OF THE JOINT

> Saint-Astier offer a ready mix solution KHOLAO® JOINT, with a range of colours.



1 Hardcore floor or foamed glass

2 Saint-Astier® Limecrete

3 KHOLAO® Chape Saint-Astier®

4 KHOLAO® Colle Saint-Astier®

5 KHOLAO® Joint Saint-Astier®

6 KHOLAO® Joint Saint-Astier®

CLEANING AND PROTECTION

> The joints should be cleaned after stiffening, preferably with a dry cloth and white sawdust, rubbing along the diagonals of the elements without stripping the seals.
Traffic must be forbidden while the coating is being applied and for at least 7 days thereafter.
The coatings are protected by a layer of white sawdust for as long as necessary.

YOUR PRIVILEGED CONTACT

SAINT-ASTIER
LIME, LIFELONG EXCELLENCE

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