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# TECHNICIAN TRAINING FOR THE CONSERVATION OF MOSAICS

PART 1  
THE CONSERVATION OF IN SITU MOSAICS

## Conservation mortars for in situ mosaics: their components

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# Mortars

A mortar is the combination of a **binder** (lime, etc.), **aggregates** (sand, gravel, etc.) and the appropriate quantity of water.

This mixture is used while still soft and malleable, and fulfills its structural function when it sets and becomes hard.

# Binders

A binder is a material that keeps aggregates together when the mortar is set and has become hard.

Binders can be divided in two categories:

- **NON-HYDRAULIC** binders
- **HYDRAULIC** binders

A non-hydraulic binder needs to be in contact with air to set, whereas a hydraulic binder sets predominantly when in contact with water.

# Binders

## NON-HYDRAULIC

- Lime putty (paste)
- Hydrated lime (powder)

## HYDRAULIC

- Natural hydraulic lime (powder)
- Cements and artificial hydraulic limes (powder)



Thomas Roby 2020 © J. Paul Getty Trust



Livia Alberti 2020 © J. Paul Getty Trust

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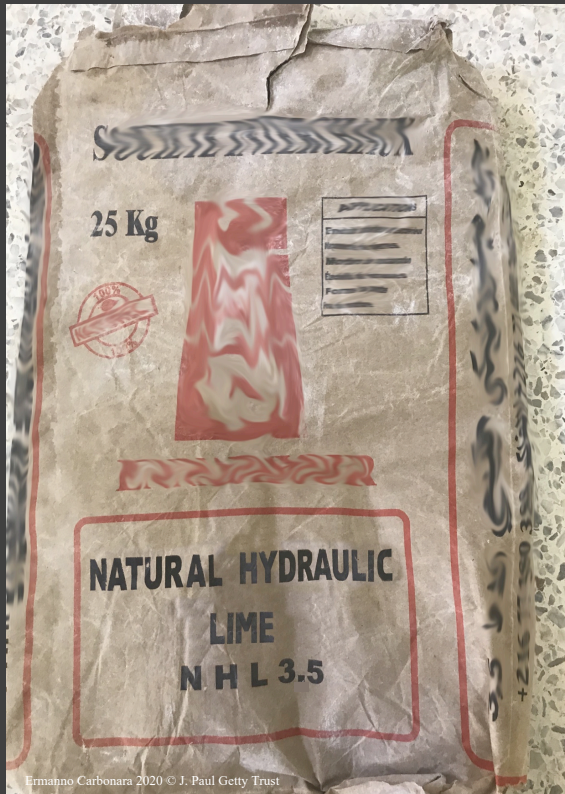
# Binders

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NHL 3.5



NHL 6



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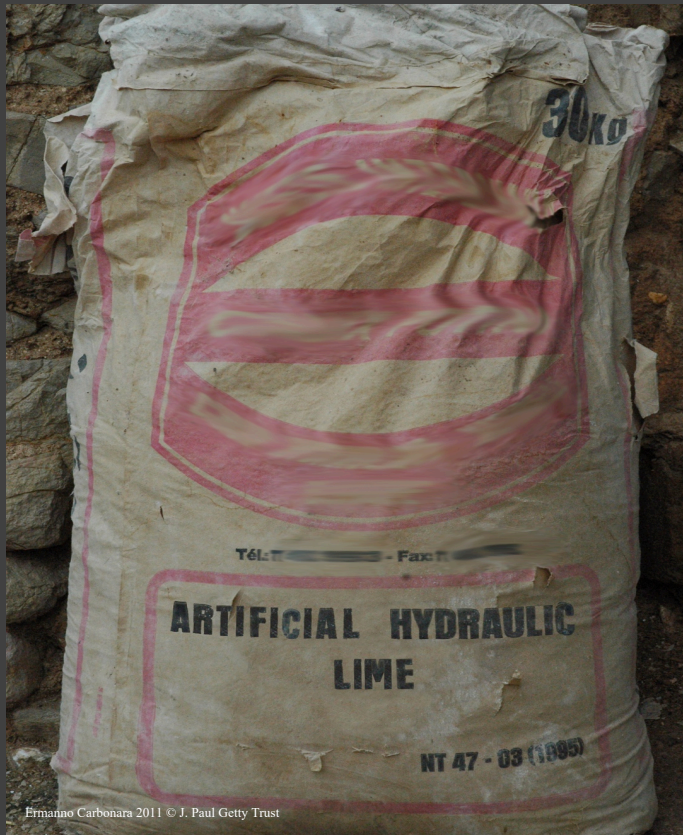
# Binders

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Artificial hydraulic lime

# Binders

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- Hydrated lime (powder)

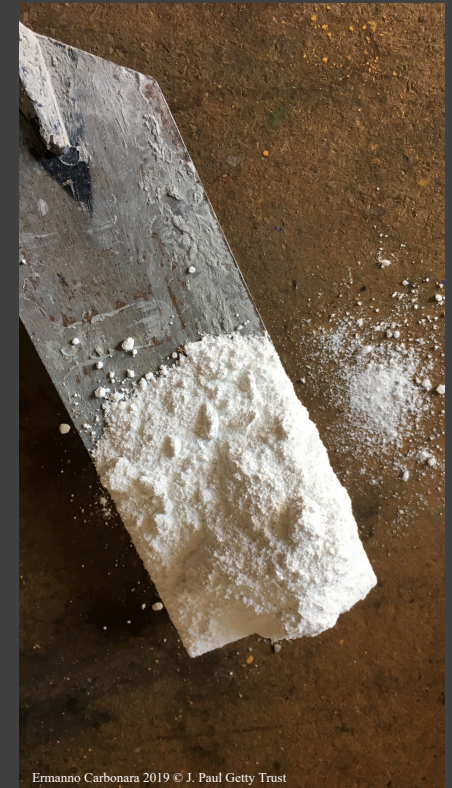
## HYDRAULIC

- Natural hydraulic lime (powder)
- **Cements** and artificial hydraulic limes (powder)



Ermanno Carbonara 2019 © J. Paul Getty Trust

Black cement



Ermanno Carbonara 2019 © J. Paul Getty Trust

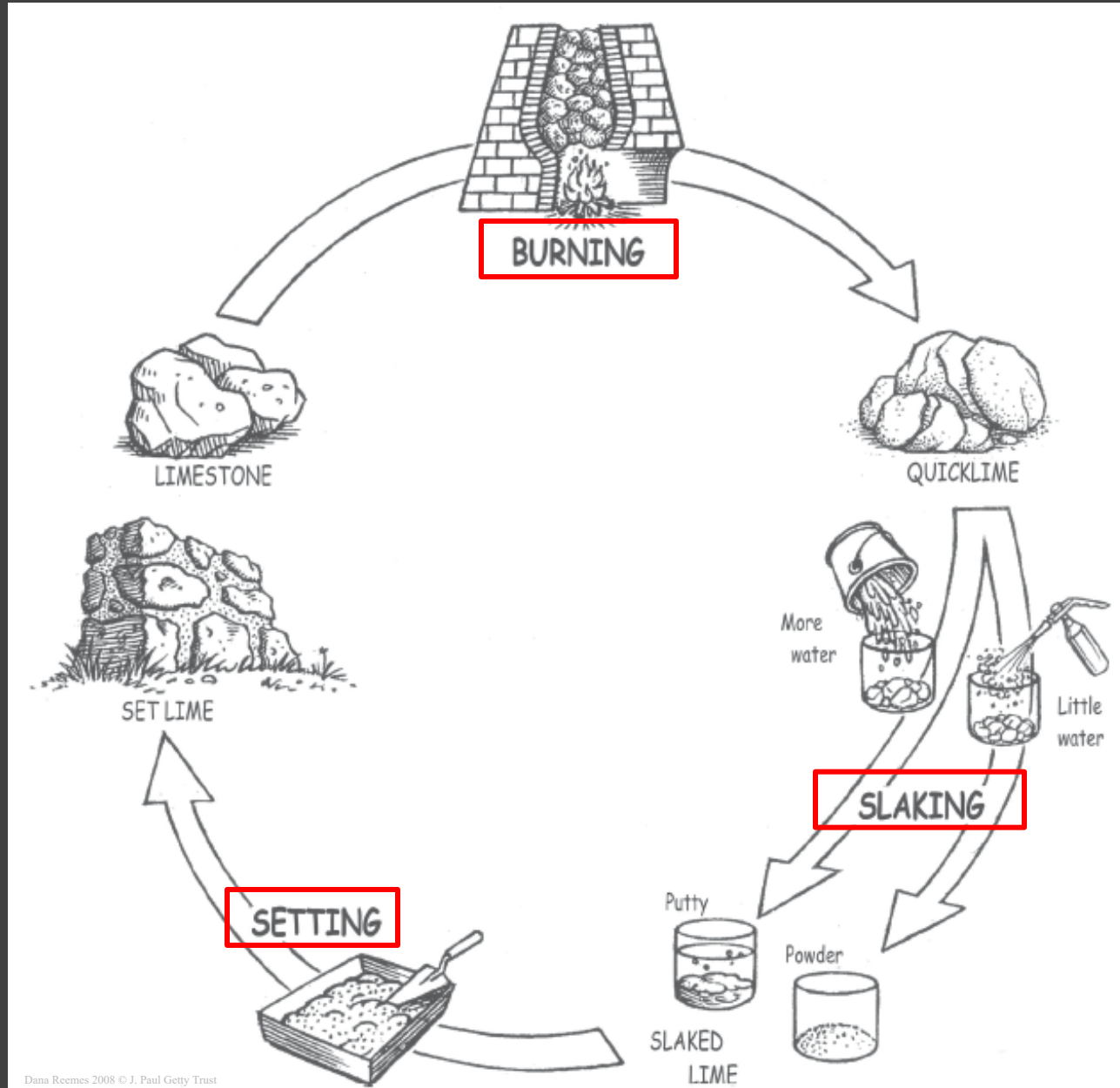
White cement



# NON-HYDRAULIC binders

Lime putty (paste)

# Lime cycle



Dana Reemes 2008 © J. Paul Getty Trust

BURNING



SLAKING



SETTING





Basin for slaking and aging the lime putty

# HYDRAULIC binders

Natural hydraulic lime (NHL) (powder)

STONE



BURNING



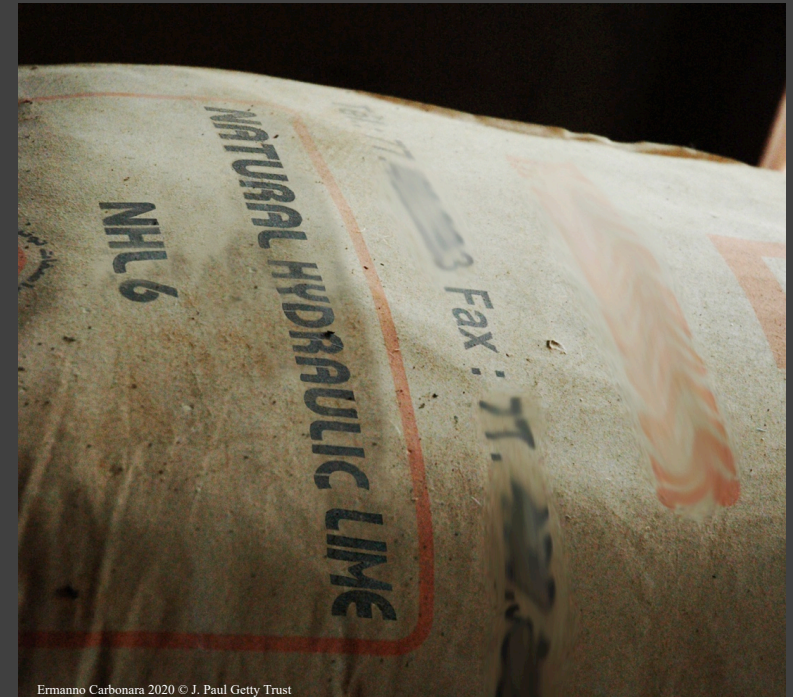
HYDRAULIC BINDER



Limestone containing siliceous components



Burning in industrial kilns



Natural hydraulic lime (NHL)



Livia Alberti 2012 © J. Paul Getty Trust

Storage of natural hydraulic lime



Livia Alberti 2012 © J. Paul Getty Trust

# Aggregates

Aggregates make up the skeleton of the mortar; their hardness contributes to its strength, and they help decrease mortar shrinkage during setting. Aggregates can be divided into two main categories:

- **INERT** aggregates
- aggregates giving **HYDRAULIC** properties to the mortar

Inert aggregates do not react chemically with the binder.

Aggregates giving hydraulic properties to the mortar have the capacity to react chemically with the binder and can significantly improve the hydraulic setting of the mortar.



# Aggregates

## INERT aggregates

- Sand
- Gravel

Aggregates giving **HYDRAULIC** properties to a mortar

- Fired clay
- Volcanic earths and rocks



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Ermano Carbonara 2012 © J. Paul Getty Trust

Preparation and firing of bricks

# Aggregates

## INERT aggregates

- Sand
- Gravel

## Aggregates giving HYDRAULIC properties to a mortar

- Fired clay
- Volcanic earths and rocks



Formation



Quarry



Aggregates

# Preparation and storage of aggregates

# Storage



Livia Alberti 2005 © J. Paul Getty Trust

Aggregate depot



Ermanno Carbonara 2012 © J. Paul Getty Trust

# Crushing



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Mechanical crushing



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# Crushing



Livia Alberti 2008 © J. Paul Getty Trust

Manual crushing



Livia Alberti 2008 © J. Paul Getty Trust



# Sieving



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Mechanical sieving



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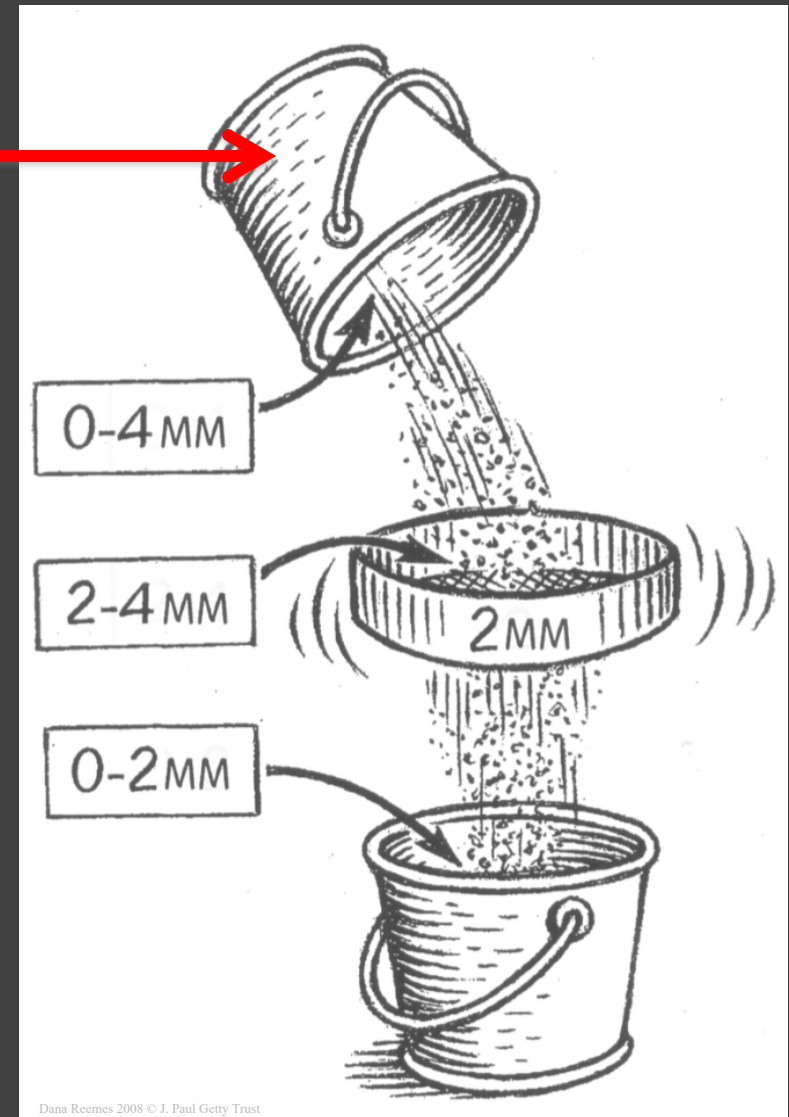
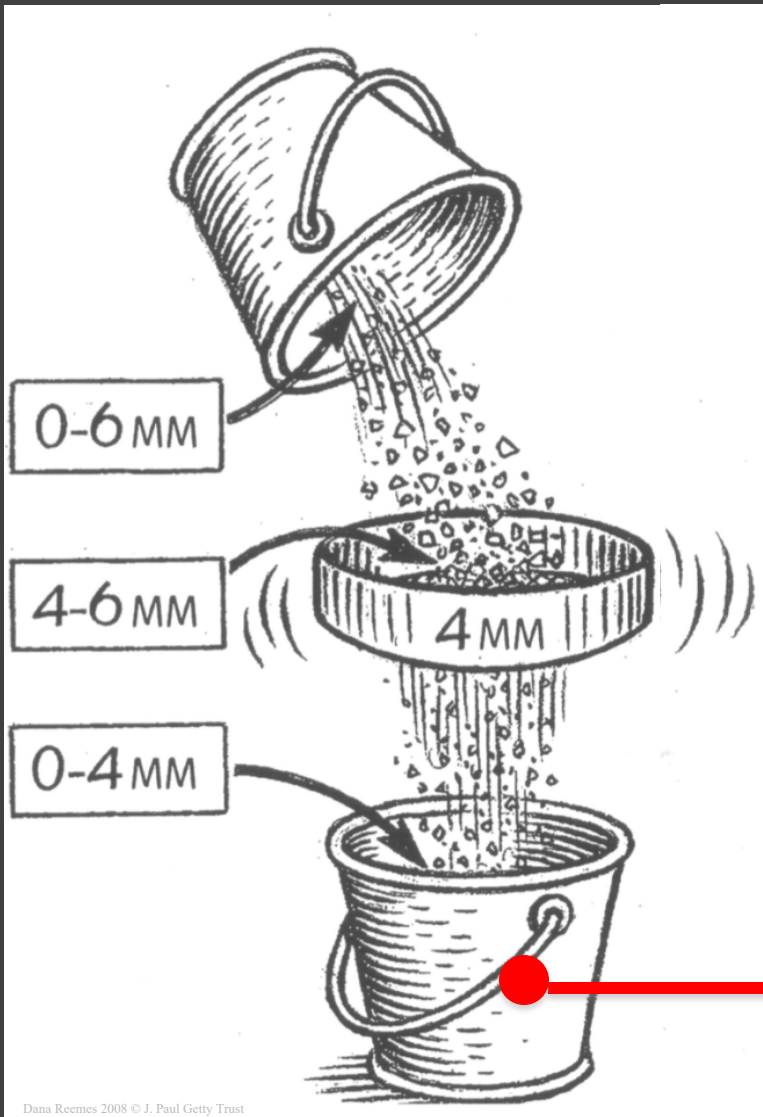
# Sieving



Livia Alberti 2006 © J. Paul Getty Trust

Manual sieving

# Sieving



Sieving of aggregates in several fractions







CERAMIQUE ANCIENNE  
2-5

CERAMIQUE ANCIENNE  
5-10

CERAMIQUE ANCIENNE  
0.5-2

CERAMIQUE ANCIENNE  
0.5-2

# Cleaning



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## Protective gear

- Rubber gloves
- Single-use gloves
- Paper dust masks
- Safety glasses
- Small mats





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MOSAIKON is a partnership of four institutions: the Getty Conservation Institute, the Getty Foundation, ICCROM, and ICCM. The aims of the project are to strengthen the network of professionals concerned with the conservation, restoration, maintenance, and management of mosaic heritage in the southern and eastern Mediterranean region; provide training to a variety of individuals involved in mosaics conservation and, more generally, with the management of archaeological sites and museums with mosaics; work with national and international bodies to provide a more favorable legislative, regulatory, and economic environment for the conservation of mosaics in the Mediterranean; and promote the dissemination and exchange of information.

