



HORCHESTER FARM
HOLYWELL .DORCHESTER
DORSET . DT2 0LL
TEL . 01935 83676
FAX . 01935 83903
MANUFACTURER OF TRADITIONAL
LIMES . MORTARS & PAINTS .
MORTAR ANALYSIS & CONSULTANTS

Mortar Analysis

Test Report No. 5678.

The Orangery Suite, Wimborne, Dorset.

Sample 1. Main Wall. Brickwork Mortar.

Sample as received

One sample of brickwork bedding mortar collected at low level on the main wall thought likely to be original material has been analysed chemically and microscopically.

Sample Assessment, Preliminary Tests and Microscopic Observations

Disrupted pale grey-brown small fragments and powder. Low strength (small fragments could be partially crumbled in fingers with ease). Aggregate principally comprises quartz with occasional particles of other geological types. White particles/nodules of chalk and un-mixed lime noted. Red brick particles noted. Occasional fine charcoal kiln-fuel particles found. Hair or fibre reinforcement not present.

Test results and interpretation

Dry sample. Fully carbonated (phenolphthalein carbonation test).
Apparent water permeability high (water droplet absorption on dried surface).
Vigorous effervescence on addition of dilute (10%) hydrochloric acid.

Chemical Dissolution Analysis (% dry mass) to BS4551:2005+A2:2013 (+ICP-OES).

%	Initial Moisture (oven @ 100 ⁰ C)	2.97
%	Total Calcium as CaO (titrimetric method)	18.9
%	Total Magnesium as MgO (ICP-OES method)	0.37
%	Acid & alkali soluble Silicon as SiO ₂ (gravimetric method)	0.96
%	Total (acid-soluble) sulphate as SO ₃ (gravimetric method)	2.14
%	Soluble Aluminium as Al ₂ O ₃ (ICP-OES method)	0.24
%	Soluble Iron as Fe ₂ O ₃ (ICP-OES method)	0.12
%	Total Acid Insolubles	63.4

BINDER

The binder in this sample is carbonated lime. Although the sample is soft, weak hydraulicity of lime is indicated by the soluble silica test result. The lime source is very likely to be the local chalk. The sulphate is somewhat elevated.

AGGREGATE

Insoluble particle size range: 2.36mm to 45µm (93.2%) : <45µm (6.8%)

The acid-insoluble residue principally comprises:

Yellow-brown quartz
Occasional particles of other mineral and geological types
Yellow-brown fines (principally clay and silt).
Occasional black charcoal kiln-fuel particles.
Occasional red brick particles (sample contamination?)

TEST REPORT 5678

MORTAR BY VOLUME

Acid-soluble calcareous aggregate (chalk) was determined to be present and an allowance has therefore been made. The results adjusted for typical bulk density indicate a calculated volumetric mix of **approximately:**

1 part	Lime (hydrated)
2 to 2.5 parts	Aggregate

Note: If this mortar was produced by using the ‘hot-mix’ method the proportions would have been approximately 1 part hydraulic (chalk) quicklime : 4 parts aggregate.

COMPARATIVE HYDRAULICITY

The hydraulicity determined is approximately equivalent to modern NHL1.

SUGGESTED MATCHING MIX

This is not a specification for a repair mortar, nor must it be treated as one.

If this material is to be matched on a ‘like-for-like’ basis, the following approximate volumetric matching mix recipe might be helpful. This does not necessarily imply that we recommend a ‘like-for-like’ repair mortar mix design in this particular situation, as there are many relevant factors in addition to mortar analysis that must be taken into account.

1 part	Natural Hydraulic Lime (NHL2?) *
2 parts	Yellow-brown quartz sand <2.36mm
0.5 parts	Crushed chalk <3.35mm

***Note:** The grade of Natural Hydraulic Lime to be determined by location, site exposure, structure condition and proposed works. NHL1 grade is not currently available but can be produced (subject to approval by HE/conservation officer) by blending 50/50 NHL2 with non-hydraulic hydrate. Alternatively, matured chalk lime putty augmented by a pozzolan such as trass could be considered.

SOURCES OF MATERIALS

Many limes, sands, stonedusts and aggregates are available from **Rose of Jericho**.

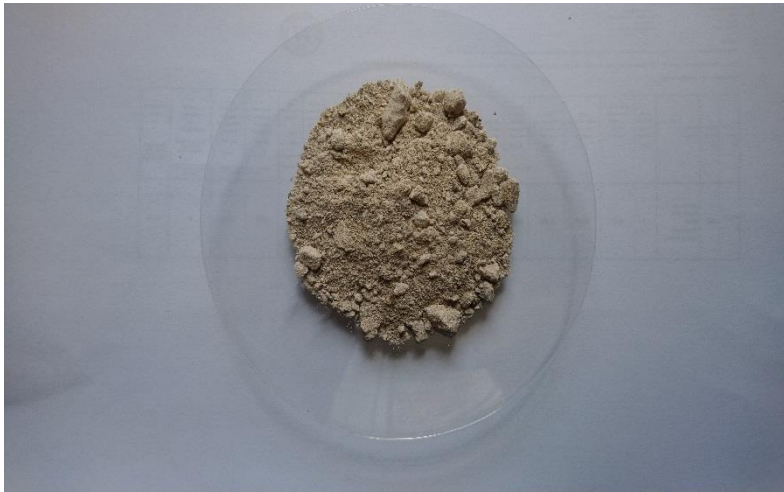
NOTES:

1. Sample mixes must always be prepared to ensure suitability and an accurate colour and texture match.
2. Sands and aggregates conforming to the relevant British/European Standard and with a particle size and grading appropriate for the intended use must be selected.
3. Manufacturers advice should be sought and recommended application mix proportions and ‘Best Practice’ guides must be complied with.
4. It should be remembered that mortars change over time. When analysing an aged material, one is ascertaining what it now is and looking for evidence for what it originally was. Calcium hydroxide carbonates to form calcium carbonate, and calcium silicate hydrate (C-S-H), the principal reaction product in hydraulic limes and pozzolanic limes itself reacts over time with carbonic acid to produce calcium carbonate and hydrous siliceous, aluminate and silico-aluminate gels.

Peter Ellis FSA
31.10.2023

TEST REPORT 5678

PHOTOGRAPHIC ILLUSTRATION OF SAMPLES



5678 sample as tested



5678 insolubles >45µm
Stereomicroscope x10



5678 insolubles <45µm
Stereomicroscope x20