ROSE OF JERICHO
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. 5687.

Lincoln's Inn, New Square, London WC2A.

No 1 New Square (South).

Sample as received.

A core sample (51.6g) of external render collected from c.600mm above ground on the front elevation at basement level has been analysed chemically and microscopically. This is a late 19th or 20th century material and not original late 17th century render.

Sample Assessment and Microscopic Observations.

Multiple paint layers – white (apparently) masonry paint over earlier cream and pale brown probably oil-based paint layers; limewash not determined - removed prior to analysis. Intact brown render c.33mm thick. High strength (sample could not be broken by hand nor crumbled in fingers; crushed using pestle with difficulty). Aggregate is principally yellow-brown quartz. Calcareous aggregate not determined. Kiln-fuel particles not found. Hair or fibre reinforcement not present.

Preliminary Tests.

Dry sample. Generally carbonated (phenolphthalein carbonation test).
Apparent water permeability moderate/low (water droplet absorption on dried surface).
Moderate effervescence on addition of dilute (10%) hydrochloric acid.

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

%	Initial Moisture (oven @ 40^0C)	0.74
%	Total Calcium as CaO (titrimetric method)	13.0
%	Total Magnesium as MgO (ICP-OES method)	0.202
%	Acid & alkali soluble Silicon as SiO_2 (gravimetric method)	3.58
%	Soluble Aluminium as Al_2O_3 (ICP-OES method)	1.71
%	Soluble Iron as Fe_2O_3 (ICP-OES method)	0.79
%	Total (acid-soluble) sulphate as SO_3 (gravimetric method)	0.332
%	Total Acid Insolubles	74.1

BINDER

The binder in this sample is generally carbonated Portland cement as confirmed by the soluble silica and alumina test results and the CaO:SiO_2 ratio.

AGGREGATE

Insoluble particle size range: 3.35mm to 63µm (93.8%) : <63µm (6.2%)

The acid-insoluble material principally comprises:

Yellow-brown quartz
Occasional particles of flint and other geological types.
Pale grey-brown fines – principally clay and silt.

info@roseofjericho.co.uk www.roseofjericho.co.uk
Rose of Jericho Ltd. Reg. No. 3909243 England & Wales. VAT No. 945 7899 49
Registered Office: Armstrong House, Sherborne St. John. Basingstoke RG24 9JZ

TEST REPORT 5687

MORTAR BY VOLUME

Acid-soluble calcareous aggregate particles were not determined to be present and an allowance has therefore not been made. The results, adjusted for typical bulk density, indicate a calculated volumetric mix of **approximately:**

1 part	Portland cement
3 to 4 parts	Aggregate.

COMPARATIVE HYDRAULICITY

The hydraulicity determined is more hydraulic than modern NHL5.

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	Portland cement*
3.5 to 4 parts	Yellow-brown quartz sand <3.35mm

***Note:** This suggested matching-mix would only be appropriate for small patch-repairs. It is widely agreed that Portland cement-based mortars, plasters and renders are not appropriate for repairs to traditional buildings where permeability is important.

SOURCES OF MATERIALS

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

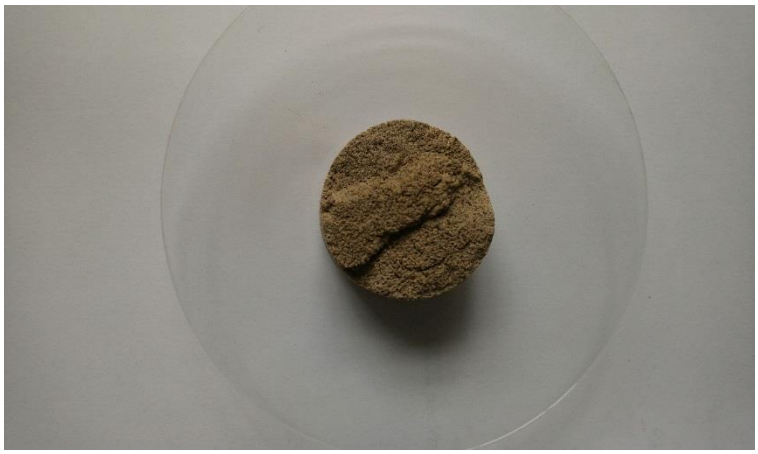
NOTES:

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
29.11.2023

TEST REPORT 5687

PHOTOGRAPHIC IMAGES OF SAMPLE & INSOLUBLE RESIDUES



5687 sample as tested.

5687 Insolubles >63µm
Stereomicroscope x10

5687 Insoluble fines <63µm
Stereomicroscope x20

ROSE OF JERICHO
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. 5688.

Lincoln's Inn, New Square, London WC2A.

No 5 New Square (West).

Sample as received.

A core sample (21.9g) of external render collected from c.1200mm above ground on the front elevation at basement level has been analysed chemically and microscopically. This is likely to be mid/late 19th century material and not original late 17th century render.

Sample Assessment and Microscopic Observations.

Multiple paint layers removed prior to analysis apparently comprising white masonry paint over cream and pale brown possibly oil-based earlier layers. Beneath these is a thin <2mm red calcareous layer that may be neat Roman cement (but it is soft) with traces of off-white limewash visible. Intact grey-brown render c.18mm thick. High strength (sample could not be broken by hand nor crumbled in fingers; crushed using pestle with difficulty). Aggregate is principally yellow-brown quartz and flint. Calcareous aggregate not determined. Kiln-fuel particles not found. Hair or fibre reinforcement not present.

Preliminary Tests.

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

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

%	Initial Moisture (oven @ 40^0C)	1.51
%	Total Calcium as CaO (titrimetric method)	15.1
%	Total Magnesium as MgO (ICP-OES method)	0.427
%	Acid & alkali soluble Silicon as SiO_2 (gravimetric method)	4.04
%	Soluble Aluminium as Al_2O_3 (ICP-OES method)	2.05
%	Soluble Iron as Fe_2O_3 (ICP-OES method)	0.855
%	Total (acid-soluble) sulphate as SO_3 (gravimetric method)	0.271
%	Total Acid Insolubles	75.2

BINDER

The binder in this sample is carbonated Portland cement as confirmed by the soluble silica and alumina test results and the CaO:SiO_2 ratio.

AGGREGATE

Insoluble particle size range: 5mm to 63µm (93.2%) : <63µm (6.8%)

The acid-insoluble material principally comprises:

Yellow-brown quartz
Particles of flint and other geological types.
Pale grey-brown fines – principally clay and silt.

info@roseofjericho.co.uk www.roseofjericho.co.uk
Rose of Jericho Ltd. Reg. No. 3909243 England & Wales. VAT No. 945 7899 49
Registered Office: Armstrong House, Sherborne St. John. Basingstoke RG24 9JZ

TEST REPORT 5688

MORTAR BY VOLUME

Acid-soluble calcareous aggregate particles were not determined to be present and an allowance has therefore not been made. The results, adjusted for typical bulk density, indicate a calculated volumetric mix of **approximately:**

1 part	(Early) Portland cement
3 parts	Aggregate.

COMPARATIVE HYDRAULICITY

The hydraulicity determined is more hydraulic than modern NHL5.

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	Portland cement*
3.5 to 4 parts	Yellow-brown quartz and flint sand <5mm

***Note:** This suggested matching-mix would only be appropriate for small patch-repairs. It is widely agreed that Portland cement-based mortars, plasters and renders are not appropriate for repairs to traditional buildings where permeability is important.

SOURCES OF MATERIALS

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

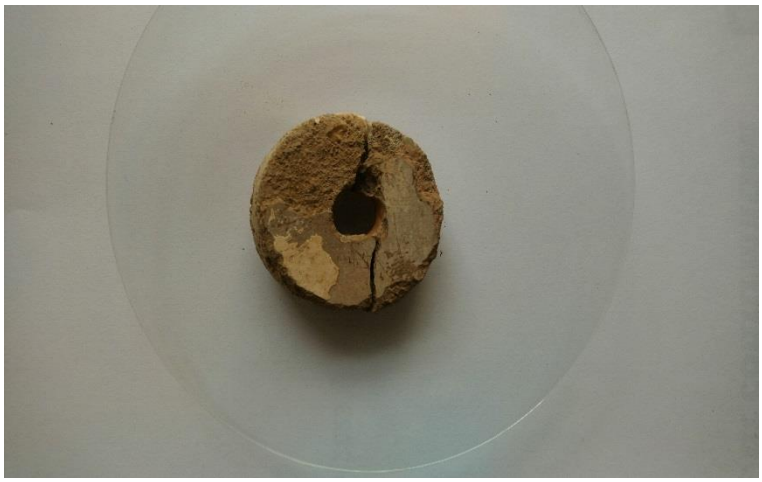
NOTES:

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
29.11.2023

TEST REPORT 5688

PHOTOGRAPHIC IMAGES OF SAMPLE & INSOLUBLE RESIDUES



5688 sample as tested.

5688 Insolubles >63µm
Stereomicroscope x10

5688 Insoluble fines <63µm
Stereomicroscope x20

ROSE OF JERICHO
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. 5689.

Lincoln's Inn, New Square, London WC2A.

No 6 New Square (West).

Sample as received.

A core sample (26.6g) of external render collected from c.1000mm above ground on the front elevation at basement level has been analysed chemically and microscopically. This is a late 19th or early 20th century material and not original late 17th century render.

Sample Assessment and Microscopic Observations.

Multiple paint layers – white (apparently) masonry paints over earlier cream and pale brown possibly oil-based layers; limewash not determined - removed prior to analysis. Intact brown render c.20mm thick. High strength (sample could not be broken by hand nor crumbled in fingers; crushed using pestle with difficulty). Aggregate is principally yellow-brown quartz. Calcareous aggregate not determined. Kiln-fuel particles not found. Hair or fibre reinforcement not present.

Preliminary Tests.

Dry sample. Generally un-carbonated (phenolphthalein carbonation test).
Apparent water permeability low (water droplet absorption on dried surface).
Moderate effervescence on addition of dilute (10%) hydrochloric acid.

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

%	Initial Moisture (oven @ 40^0C)	2.49
%	Total Calcium as CaO (titrimetric method)	14.3
%	Total Magnesium as MgO (ICP-OES method)	0.259
%	Acid & alkali soluble Silicon as SiO_2 (gravimetric method)	3.30
%	Soluble Aluminium as Al_2O_3 (ICP-OES method)	1.11
%	Soluble Iron as Fe_2O_3 (ICP-OES method)	0.417
%	Total (acid-soluble) sulphate as SO_3 (gravimetric method)	0.488
%	Total Acid Insolubles	71.5

BINDER

The binder in this sample is generally un-carbonated Portland cement as confirmed by the soluble silica and alumina test results and the CaO:SiO_2 ratio.

AGGREGATE

Insoluble particle size range: 3.35mm to 63µm (96.7%) : <63µm (3.3%)

The acid-insoluble material principally comprises:

Yellow-brown quartz
Occasional particles of flint and other geological types.
Pale cream-grey fines – principally clay and silt.

info@roseofjericho.co.uk www.roseofjericho.co.uk
Rose of Jericho Ltd. Reg. No. 3909243 England & Wales. VAT No. 945 7899 49
Registered Office: Armstrong House, Sherborne St. John. Basingstoke RG24 9JZ

TEST REPORT 5689

MORTAR BY VOLUME

Acid-soluble calcareous aggregate particles were not determined to be present and an allowance has therefore not been made. The results, adjusted for typical bulk density, indicate a calculated volumetric mix of **approximately:**

1 part	Portland cement
3 to 4 parts	Aggregate.

COMPARATIVE HYDRAULICITY

The hydraulicity determined is more hydraulic than modern NHL5.

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	Portland cement*
3.5 to 4 parts	Yellow-brown quartz sand <3.35mm

***Note:** This suggested matching-mix would only be appropriate for small patch-repairs. It is widely agreed that Portland cement-based mortars, plasters and renders are not appropriate for repairs to traditional buildings where permeability is important.

SOURCES OF MATERIALS

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

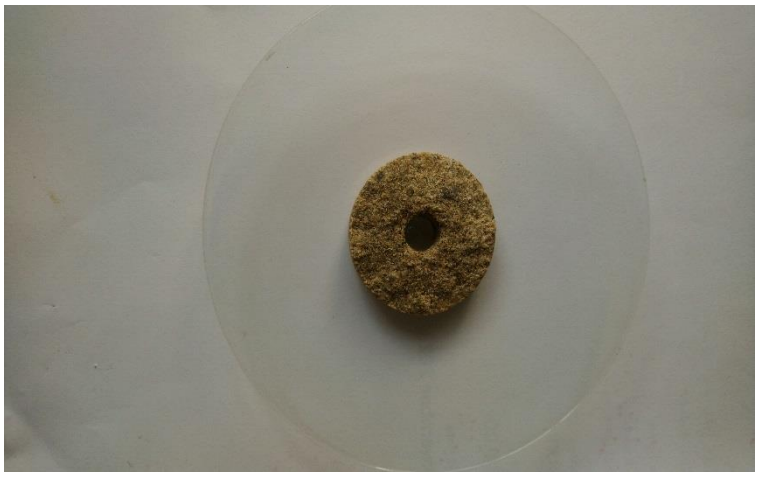
NOTES:

1. This sample is similar to Test Report 5687. 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
29.11.2023

TEST REPORT 5689

PHOTOGRAPHIC IMAGES OF SAMPLE & INSOLUBLE RESIDUES



5689 sample as tested.

5689 Insolubles >63µm
Stereomicroscope x10

5689 Insoluble fines <63µm
Stereomicroscope x20

ROSE OF JERICHO
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. 5690.

Lincoln's Inn, New Square, London WC2A.

No 8 New Square (North).

Sample as received.

A core sample (64.3g) of external render collected from c.600mm above ground on the front elevation at basement level has been analysed chemically and microscopically. This is thought to be mid/late 19th century material and not original late 17th century render.

Sample Assessment and Microscopic Observations.

Multiple paint layers – white (apparently) masonry paint over earlier cream and pale brown possibly oil-based layers; limewash not determined - removed prior to analysis. Intact grey-brown render c.45mm thick. High strength (sample could not be broken by hand nor crumbled in fingers; crushed using pestle with difficulty). Aggregate is principally yellow-brown quartz with much angular flint. Calcareous aggregate not determined. Black coal kiln-fuel particles found. Hair or fibre reinforcement not present.

Preliminary Tests.

Dry sample. Fully carbonated (phenolphthalein carbonation test).
Apparent water permeability low (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 @ 40^0C)	1.58
%	Total Calcium as CaO (titrimetric method)	14.4
%	Total Magnesium as MgO (ICP-OES method)	0.250
%	Acid & alkali soluble Silicon as SiO_2 (gravimetric method)	3.39
%	Soluble Aluminium as Al_2O_3 (ICP-OES method)	2.01
%	Soluble Iron as Fe_2O_3 (ICP-OES method)	0.67
%	Total (acid-soluble) sulphate as SO_3 (gravimetric method)	0.283
%	Total Acid Insolubles	71.7

BINDER

The binder in this sample is fully carbonated Portland cement as confirmed by the soluble silica and alumina test results and the CaO:SiO_2 ratio. Coal particles indicate an early cement produced in a coal-fired kiln.

AGGREGATE

Insoluble particle size range: 6mm to 63µm (91.9%) : <63µm (8.1%)

The acid-insoluble material principally comprises:

Yellow-brown quartz
Angular flint and particles of various other geological types.
Black coal kiln-fuel particles
Yellow-brown fines – principally clay and silt.

info@roseofjericho.co.uk www.roseofjericho.co.uk
Rose of Jericho Ltd. Reg. No. 3909243 England & Wales. VAT No. 945 7899 49
Registered Office: Armstrong House, Sherborne St. John. Basingstoke RG24 9JZ

TEST REPORT 5690

MORTAR BY VOLUME

Acid-soluble calcareous aggregate particles were not determined to be present and an allowance has therefore not been made. The results, adjusted for typical bulk density, indicate a calculated volumetric mix of **approximately:**

1 part	(Early) Portland cement
3 to 4 parts	Aggregate.

COMPARATIVE HYDRAULICITY

The hydraulicity determined is more hydraulic than modern NHL5.

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	Portland cement*
4 to 4.5 parts	Yellow-brown quartz and flint sand <6mm

***Note:** This suggested matching-mix would only be appropriate for small patch-repairs. It is widely agreed that Portland cement-based mortars, plasters and renders are not appropriate for repairs to traditional buildings where permeability is important.

SOURCES OF MATERIALS

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

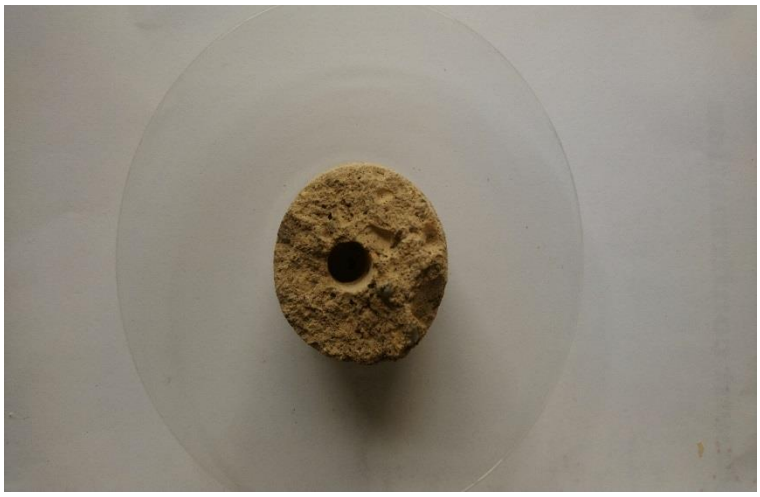
NOTES:

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
29.11.2023

TEST REPORT 5690

PHOTOGRAPHIC IMAGES OF SAMPLE & INSOLUBLE RESIDUES



5690 sample as tested.

5690 Insolubles >63µm
Stereomicroscope x10

5690 Insoluble fines <63µm
Stereomicroscope x20

ROSE OF JERICHO
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. 5691.

Lincoln's Inn, New Square, London WC2A.

No 9 New Square (North).

Sample as received.

A core sample (25.6g) of external render collected from c.750mm above ground on the front elevation at basement level has been analysed chemically and microscopically. This is early render (possibly original late 17th century material if rendered when built).

Sample Assessment and Microscopic Observations.

Multiple paint layers removed prior to analysis – white (apparently) masonry paint over earlier cream and pale green possibly oil-based layers. Beneath this is a thin c.3mm un-haired lime finish coat (possibly later) with possible traces of limewash visible. The 'basecoat' is intact pale off-white render c.50mm thick. Low strength (sample could be broken by hand and partially crumbled in fingers). Aggregate is principally fine yellow-brown quartz. Calcareous aggregate not determined. Kiln-fuel particles not found. Much fine brown animal hair reinforcement present.

Preliminary Tests.

Dry sample. Fully carbonated (phenolphthalein carbonation test).
Apparent water permeability moderate (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 @ 40^0C)	0.96
%	Total Calcium as CaO (titrimetric method)	15.9
%	Total Magnesium as MgO (ICP-OES method)	0.082
%	Acid & alkali soluble Silicon as SiO_2 (gravimetric method)	0.436
%	Soluble Aluminium as Al_2O_3 (ICP-OES method)	0.134
%	Soluble Iron as Fe_2O_3 (ICP-OES method)	0.237
%	Total (acid-soluble) sulphate as SO_3 (gravimetric method)	0.368
%	Total Acid Insolubles	70.6

BINDER

The binder in this sample is carbonated non-hydraulic lime as confirmed by the low soluble silica and alumina test results and the $CaO:SiO_2$ ratio.

AGGREGATE

Insoluble particle size range: 2.36mm to 63µm (98.2%) : <63µm (1.8%)

The acid-insoluble material principally comprises:

Yellow-brown quartz
Cream fines – principally clay and silt.
Fine brown animal hair

info@roseofjericho.co.uk www.roseofjericho.co.uk
Rose of Jericho Ltd. Reg. No. 3909243 England & Wales. VAT No. 945 7899 49
Registered Office: Armstrong House, Sherborne St. John. Basingstoke RG24 9JZ

TEST REPORT 5691

MORTAR BY VOLUME

Acid-soluble calcareous aggregate particles were not determined to be present and an allowance has therefore not been made. The results, adjusted for typical bulk density, indicate a calculated volumetric mix of **approximately:**

1 part	Lime
2 parts	Aggregate.

COMPARATIVE HYDRAULICITY

N/A.

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	Properly 6-month matured Chalk lime putty
2 parts	Yellow-brown quartz sand <2.36mm
+	Animal hair at 6kgs/m3

SOURCES OF MATERIALS

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

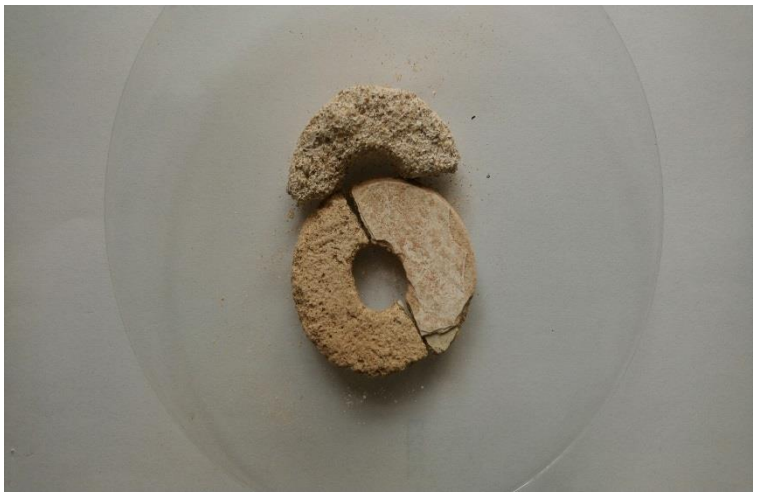
NOTES:

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
29.11.2023

TEST REPORT 5691

PHOTOGRAPHIC IMAGES OF SAMPLE & INSOLUBLE RESIDUES



5691 sample as tested.

5691 Insolubles >63µm
Stereomicroscope x10

5691 Insoluble fines <63µm
& hair.
Stereomicroscope x20