MORTAR ANALYSIS REPORT

JOB REFERENCE	**India House**	SAMPLE	**3**	PAGE **1**

ANALYSIS DATE	**June 2026**
SITE	**India House**
CLIENT	**Recclesia**
DATE/ TAKEN RECEIVED	**June 2026**
CLIENT REQUIREMENTS	**Mortar analysis**
LOCATION/ FUNCTION IN BUILDING	**Infill mortar from turret no. 3**
CONDITION OF SAMPLE RECEIVED/ COLLECTED	**Bound sample**

GENERAL COMMENTS/ SUMMARY

The nature of the binding matrix of the mortar sample and information gained from the analysis suggest that the mortar was probably made by volume from 1 part OPC cement, 3 parts hydrated lime (including a substantial amount of inert lime), and 6 parts waste clinker ash.

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ANALYTICAL PROCEDURES

The selected material sample was dried, weighed, and examined by eye and under a binocular microscope at x 20 and x 35 magnification. The sample was crushed, and the binder was separated from the aggregate by dissolution in dilute hydrochloric acid. The relative proportions of binder (lime, cement, and gypsum) to aggregate were determined. Aggregate (and other acid-insoluble materials) characterisation was undertaken utilising sieve separation and further microscopic examination. The analysis and interpretation provide information on the composition and characteristics of the mortar sample(s) received. Assuming that the sample was generally representative of the mortar, the analysis will give a reasonable indication of the original materials and provide a basis for the specification of repair or replacement mortars.
If more detailed information is required (for example, for historical research purposes), more sophisticated analytical procedures can be undertaken to determine chemistry and mineralogical composition.

MORTAR EXAMINATION AND ANALYSIS

PROCEDURE	**DESCRIPTION / COMMENTS**	
PRELIMINARY EXAMINATION OF SAMPLE BY EYE	A fine-grained, dense, crystalline mid-grey ash mortar with visible lime inclusions.	
EXAMINATION OF PREPARED SAMPLE BY BINOCULAR MICROSCOPE x20 MAG	The fine-grained binder-rich mortar has a semi-closed texture. The rich crystalline binder contains clinker ash and inert lime.	

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ACID DISSOLUTION

PROCEDURE	DESCRIPTION ~ COMMENTS
10% HCL ACID DISSOLUTION	It is difficult to crush. There was a vigorous reaction upon dissolution.
FILTER GRADE (PORE SIZE) & TYPE	Whatman Type 1

AGGREGATE SEPARATION

BS SIEVE Mesh Size	Residue Retained in g's	Undissolved binder %	Aggregate excluding undissolved binder – gs*	Comments	
4.75 mm	0.66	30	0.46	Clinker ash, Iron-stained and clear quartz and a few brick fragments.	
2.36 mm	0.83	30	0.58	Clinker ash, Iron-stained and clear quartz and a few brick fragments.	
1.18 mm	1.21	30	0.85	Clinker ash, Iron-stained and clear quartz and a few brick fragments.	

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0.60 mm (600 µm)	1.00	25	0.75	Clinker ash, Iron-stained and clear quartz and a few brick fragments.	
300 µm	2.16	10	1.97	Clinker ash, Iron-stained and clear quartz and a few brick fragments.	
150 µm	0.12	50	0.06	Clinker ash, Iron-stained and clear quartz and a few brick fragments. Alite and Belite binder residues.	
< 150 µm, including filter residue	0.72	50	0.36	Clinker ash, Iron-stained and clear quartz and a few brick fragments. Alite and Belite binder residues.	

The quartz aggregate is all sub-angular

*The aggregate weight is a proportion of the combined weight of lime and aggregate, the lime being lighter.

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AGGREGATE CHARACTERISTICS

The primary aggregates are clinker ash, quartz sand, and inert lime.
Because sand and gravel aggregates are ultimately derived from the weathering of solid rock, most aggregates contain coarse-grained rock fragments and finer mineral grains. Weathering breaks down the rock fragments within the aggregate into the constituent minerals, resulting in smaller and rounder particles; chemical weathering breaks down unstable minerals, such as feldspars, into clays that may be washed away. Both processes eventually result in quartz-rich sand.

CONSTITUENTS OF ANALYSIS SAMPLE

MATERIAL	***WEIGHT (g)***	**COMMENTS**
A: DRY WEIGHT OF ANALYSIS SAMPLE	11.7	
B: DRY WEIGHT OF ALL INSOLUBLE	6.7	
C: DRY WEIGHT OF INSOLUBLE BINDER	1.67	
D: (B-C) DRY WEIGHT OF AGGREGATE	5.03	
E: (A-B+C)) DRY WEIGHT OF LIME & BINDERS	6.67	
F: DRY WEIGHT OF LIME	5	
OTHER		

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PROPORTIONS OF ANALYSIS SAMPLE

The sample proportions give the aggregate and carbonated or set lime relative volumes, based on the recorded weights for each sieve collection.

CEMENTITIOUS RESIDUES: FREE LIME: AGGREGATE (ASH)

1: 3: 3

PROBABLE ORIGINAL MIX

The nature of the binding matrix of the mortar sample and information gained from the analysis suggest that the mortar was probably made by volume from

1 part OPC cement, 3 parts hydrated lime (including a substantial amount of inert lime), and 6 parts waste clinker ash.

Sample analysis, interpretation and report carried out by: Dr Mark Womersley.
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