

MORTAR ANALYSIS REPORT

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ANALYSIS DATE	July 2018
SITE	Brabins Almshouses
CLIENT	JYM Partnership
DATE/ TAKEN RECEIVED	July 2018
CLIENT REQUIREMENTS	Analyse mortar samples
MORTAR DATING	No
LOCATION/ FUNCTION IN BUILDING	Pointing Mortar
ENCLOSURES	Aggregate Sample
CONDITION OF SAMPLE RECEIVED/ COLLECTED	A Few Solid Pieces

GENERAL COMMENTS/ SUMMARY

A cement/lime binder rich mortar made with washed river sand

SUGGESTED REPLACEMENT MORTAR (Taking account of prevailing site conditions, building materials and condition, location and function of the new mortar, building details, exposure, seasonal working etc.)

A weaker lime based mortar with strength and permeability suitable to its location. We would suggest a mix of 1 part Ionic Old White NHL3.5: 1.5 parts Leighton Buzzard Sand: 1.5 parts Nosterfield Sand

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ANALYTICAL PROCEDURES

The selected sample of material was dried, weighed and examined both by eye and under a binocular microscope at x 20 magnification. The sample was crushed, the binder separated from the aggregate by dissolution in dilute hydrochloric acid and the relative proportions of binder (lime, cement and gypsum) to aggregate determined. Aggregate (and other acid-insoluble materials) characterisation was undertaken by means of sieve separation and further microscopic examination.

The analysis and interpretation provide information on the composition and characteristics of the mortar sample(s) received by us. Assuming that the sample was representative of the mortar generally, then analysis will give a reasonable indication of the original materials and provide a basis for specification of repair or replacement mortars.

If more detailed information is required (for example for purposes of historic research) 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 dirty cream colour, with visible brown and black aggregate
EXAMINATION OF PREPARED SAMPLE BY BINOCULAR MICROSCOPE x20 MAG	A creamy well distributed binder coating rounded small stones and quartz grains

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ACID DISSOLUTION

PROCEDURE	DESCRIPTION ~ COMMENTS
10% HCL ACID DISSOLUTION	Some initial reaction which soon died down
FILTER GRADE (PORE SIZE) & TYPE	Whatman Type 1

AGGREGATE SEPARATION

BS SIEVE Mesh Size	Residue Retained	Undissolved binder %	Aggregate wt excluding undissolved binder	Aggregate weight %	Comments
10.00 mm	0	0	0	0	-
5.00 mm	0	0	0	0	-
2.36 mm	2.1	0	2.1	3	-
1.18 mm	3	0	1.6	5	Small pieces of sedimentary stone
0.60 mm (600µm)	13.3	15	8.7	14	Predominantly quartz sand grains (r) brown, yellow and cream held together by un-dissolved binder
300 µm	31	5	32.3	45	Clear and cream quartz grains (r) with un-dissolved binder clinging to them
150 µm	36.5	35	20.3	33	Un-dissolved binder and clear quartz grains (r)
< 150 µm including filter residue	15	85	2	3	Predominantly un-dissolved binder with some sand grains (r)

a = angular fragments; sa subangular; sr = sub-rounded; r = rounded

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AGGREGATE CHARACTERISTICS

The original sand composed of sedimentary rock fragments and buff, brown and clear quartz.

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 which may be washed away, both processes eventually result in a quartz-rich sand.

CONSTITUENTS OF ANALYSIS SAMPLE

<i>MATERIAL</i>	<i>WEIGHT (g)</i>	<i>COMMENTS</i>
A: DRY WEIGHT OF- ANALYSIS SAMPLE	118	Difficult to crush at first
B: DRY WEIGHT OF ALL INSOLUBLES	97	
C: DRY WEIGHT OF INSOLUBLE BINDER	29	
D: (B-C) DRY WEIGHT OF AGGREGATE	68	
E: (A-(D+C)) DRY WEIGHT OF LIME	21	
OTHER	-	

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PROPORTIONS OF ANALYSIS SAMPLE

The sample proportions gives the relative weights of aggregate and carbonated or set lime.

LIME: CEMENT: AGGREGATE RATIO

2/3 : 1 : 6

PROBABLE ORIGINAL MIX

The probable original mix set out below gives the relative weights of the mortar constituents as mixed on site and before carbonation. From the nature of the binding matrix of the mortar sample and from information gained from the analysis it is probable that the mortar was made up from a combination of 1 part lime: 1 parts cement : 6 parts of a sand, by Volume

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