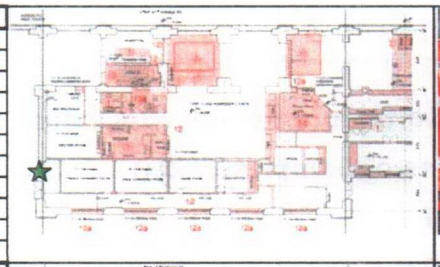
King's Cross Redevlopment Programme Package 6

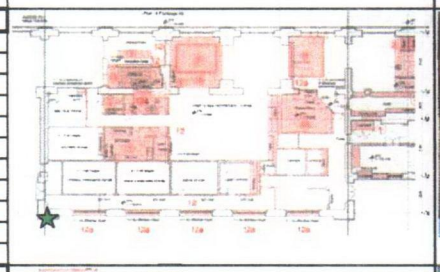
Western Range Building

Brick sizes

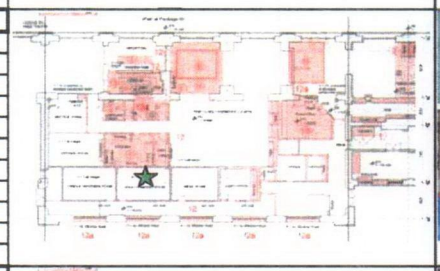
Location 1	W15,WH North facing
13nr courses = 1000mm	
Max mortar bed = 12mm	
Min mortar bed = 8mm	
Brick sizes	Header width
1. 230mm x 70mm	-
2. 234mm x 66mm	-
3. 228mm x 67mm	-
4. 234mm x 67mm	-
Type of bonding	

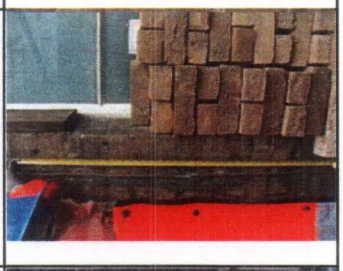


Location 2	W15, WG West facing
13nr courses = 995mm	
Max mortar bed = 9mm	
Min mortar bed = 7mm	
Brick sizes	Header width
5. 232mm x 66mm	110mm
6. 235mm x 67mm	109mm
7. 236mm x 65mm	111mm
8. 234mm x 66mm	110mm
Type of bonding	Flemish bond

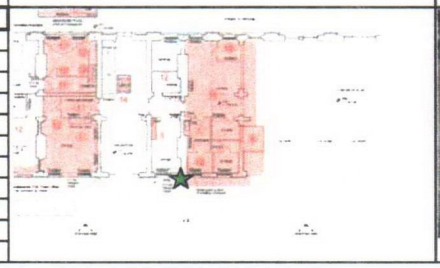


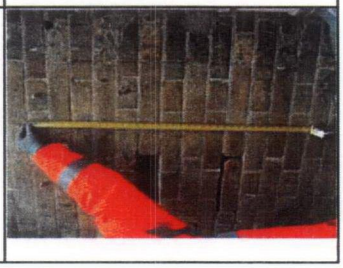
Location 3	W20, WH
13nr courses = 996mm	
Max mortar bed = 9mm	
Min mortar bed = 7mm	
Brick sizes	Header width
13. 235mm x 67mm	110mm
14. 228mm x 68mm	110mm
15. 230mm x 66mm	109mm
16. 225mm x 67mm	109mm
Type of bonding	Flemish bond





Location 4	W19-W20, WH
13nr courses = 1000mm	
Max mortar bed = 9mm	
Min mortar bed = 6mm	
Brick sizes	Header width
17. 228mm x 67mm	110mm
18. 235mm x 66mm	110mm
19. 229mm x 66mm	110mm
20. 233mm x 68mm	107mm
Type of bonding	Flemish bond





Mean length of brick =	232mm
Mean height of brick =	67mm
Mean width of brick (header) =	110mm
Mean mortar bed =	8mm

7.3 Appendix C – Mortar and Render Analysis

7.3.1 Locations of Samples Taken

7.3.2 Report 1

7.3.3 Report 2

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REPORT 40319/C

KINGS CROSS WESTERN RANGE

ANALYSIS OF MORTAR, RENDER, WATER AND PAINT SAMPLES

Reference: Letter from Mr Edward Chruszcz reference EC/LD/56332/01 dated 27 April 2009.

1. INTRODUCTION

Two samples of mortar, a painted stucco render sample and a water sample, taken by yourselves from the above site, were received in our laboratories on 29 April 2009. We were asked to determine mix composition and proportions on the mortar and stucco render. We were asked to determine the nature of the paint sample and we were asked to analyse the water sample for pollutants to ensure safe discharge into the sewer.

2. SAMPLE DETAILS

Sandberg Reference	Your Reference	Details	Weight of sample received, g
C65584	Water ref 56332/3	Water sample.	250mls
C65585	TORC KCWR Mortar ref 56332/1	Several small pieces of light beige mortar, moderately hard, well compacted.	12
C65586	DOFF KCWR	One large piece and several small pieces of light beige mortar, moderately hard, well compacted.	31
C65587	Stucco ref 56332/2	One pieces of 2 layered stucco render, dark grey, hard and well compacted, with a painted outer face: **Inner layer:** up to 15mm thick **Outer layer:** up to 8mm thick	704

3. ANALYSIS METHOD AND RESULTS

3.1 Mortar mix proportions

The samples were prepared and analysed using a combination of hand separation and chemical analysis techniques in accordance with documented in-house methods, Sections 34.1 and 34.8, supported by qualitative chemical techniques where appropriate.

Examination of the analysis data in conjunction with the appearance, tactile properties and available background information for the samples suggested that the mixes consisted of semi-hydraulic lime and sand.

The mix proportions were calculated on these assumptions, following documented in-house methods.

The lime contents were calculated from the acid soluble calcium contents making the assumptions shown in the analysis table. The approximate volume proportions were calculated using typical bulk densities for the constituents as indicated in the analysis table.

Details of the analysis and the calculated findings are given in Table 1 including details of the assumptions made.

3.2 Stucco mix proportions

The stucco sample was separated into layers and each layer was prepared and analysed using documented in-house methods, Section 34.1, based on BS 4551 : 2005.

As examination of the analysis data for the layers indicated that the mixes consisted of Portland cement and sand, the mix proportions were calculated on this assumption, following the directions given Table 3 of BS 4551.

The cement contents were calculated jointly from the acid soluble calcium content and soluble silica content, making the assumptions shown in the analysis tables. Since the results were outside the categories listed in Table 4, the approximate volume proportions were calculated assuming the average bulk densities of the constituents which are given in BS4551.

The values assumed by us in the calculations are those that appear to be the most likely after full consideration of the chemical composition and other properties of the sample examined. If further information about any of the constituents of the sample becomes available, calculations of mix proportions could be repeated to take this into consideration. An example is masonry cement which cannot be chemically distinguished from Portland cement in hardened mortar.

Details of the analyses are given in Table 1 of this report, including details of the assumptions made in the calculations.

The mix proportions of both the mortar and stucco samples are summarized below:

Sandberg Reference	Client Reference		Mix Constituents	Ratio binder : sand by volume
C65585	TORC KCWR Mortar ref 56332/1		Semi-hydraulic lime : sand	1 : 1.3
C65586	DOFF KCWR		Semi-hydraulic lime : sand	1 : 1.4
C65587a	Stucco ref 56332/2	inner layer	Portland cement : sand	1 : 2.2
C65587b		outer layer	Portland cement : sand	1 : 1.8

3.3 Infrared analysis of the sample

The top two coats of the paint sample were examined directly by Fourier transform infrared spectrometry using attenuated total reflectance through a germanium crystal.

The spectra produced were then compared with reference library data.

The outer layer of the sample gave a closest library matches with a polyurethane resin

The second layer of the sample examined gave a closest library matches with an alkyd resin.

The spectra are reproduced as Appendix A.

3.4 Lead content

The paint sample, incorporating all paint layers, was analysed for total lead content by atomic absorption spectrophotometry after ashing and extraction with nitric acid.

The results are given in Table 2 of this report, expressed as per cent by weight total lead (Pb).

3.5 Analysis of the water sample

The water sample was analysed for pollutants using documented in-house methods, Section 51.1. The results are given in Table 3.

4. REMARKS

It is not always possible by chemical analysis alone to distinguish with certainty between Portland cement and lime binders or between hydraulic and non-hydraulic limes.

Microscopical examination can usually ascertain the presence or otherwise of Portland cement in the mortar and of calcareous material in the aggregate. In the absence of such confirmatory work, interpretation of the analytical results is made on the basis of consideration of the analysis in conjunction with the appearance and any available background information for the mortar.

Mix proportions are traditionally expressed on the basis of volume ratios and, in the absence of information about the particular binder or aggregate, assumed bulk density values are used to calculate such proportions. Volume proportions can as a result be somewhat inaccurate and it may be desirable to use weight proportions if an attempt is made to match the mortar for renovation work.

The mortar samples were found to comprise semi-hydraulic lime and sand mixes.

Both of the layers in the stucco render sample were found to comprise very rich Portland cement and sand mixes.

There is no specific limit for lead in paint but, for guidance, the HSE Control of Lead at Work Regulations, 2002, Section 65, classes lead contents of less than 1% Pb as being in a category where work with lead is not liable to result in significant exposure.

For lead levels exceeding this value, an appropriate risk assessment, as detailed in Section 54 of the above publication, should be carried out.

The paint sample examined had a lead level well above 1% Pb.

The paint layers were identified as follows:

Sandberg reference	Sample reference	Top coat	Build coat
C65587	Stucco ref 56332/2	Polyurethane resin	Alkyd resin

The water sample was not found to contain significant levels of pollutants.

The mortar sample sizes were considerably smaller than the minimum sample size recommended in BS 4551 : 2005.

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for Sandberg LLP

G S Mayers

For the attention of Mr Edward Chruszcz

G S Mayers
Department Manager
7 April 2009

GSM/Chemcur/gsm

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QUALITY MANAGEMENT

REPORT 40319/C

KINGS CROSS WESTERN RANGE

ANALYSIS OF MORTAR, RENDER, WATER AND PAINT SAMPLES

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For the attention of Mr Edward Chruszcz

This report comprises
4 pages of text
Table 1 of 2 sheets
Table 2 of 1 sheet
Table 3 of 1 sheet
Appendix A of 1 sheet

7 April 2009

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Table/Sheet 1/1

Date of Test 1-7/05/09

MORTAR - CHEMICAL ANALYSIS
DETERMINATION OF MIX PROPORTIONS

Documented In-house Methods Based in BS 4551:2005

Sandberg Reference	C65585	C65586		
Client Reference	TORC KCWR	DOFF KCWR		
Details	Mortar 56332/1	Mortar		
CHEMICAL ANALYSIS				
Insoluble Residue	71.54	72.37		
Soluble Silica, SiO_2	1.28	1.28		
Acid soluble Alumina, Al_2O_3	0.50	0.44		
Acid soluble Iron, Fe_2O_3	0.22	0.20		
Acid soluble Calcium, CaO	13.77	13.58		
Acid soluble Magnesium, MgO	0.28	0.30		
Acid soluble Sulphate, SO_3	0.16	0.21		
Loss on Ignition	11.86	11.16		
Total	99.61	99.54		

Calculated Mix Proportions				
Composition to nearest 0.5%	% by mass of dry mass			
Semi-hydraulic lime : sand				
Lime	23.5	23.0		
Sand	76.5	77.0		
Calculated volume proportions	1 : 1.3	1 : 1.4		
Remarks	-	-		

Assumptions used in calculations	SiO_2 %	CaO %	bulk density kg/m³	material type
Sand	-	0.0	1400	siliceous
Semi-hydraulic lime	-	62.0	575	semi hydraulic

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Table/Sheet 1/2
Date of Test 1-7/05/09

MORTAR - CHEMICAL ANALYSIS
DETERMINATION OF MIX PROPORTIONS

Documented In-house Methods Based on BS 4551:2005

Sandberg Reference	C65587a	C65587b		
Client Reference	Stucco 56332/2	Stucco 56332/2		
Details	inner layer	outer layer		
CHEMICAL ANALYSIS				
Insoluble Residue	62.35	57.97		
Soluble Silica, SiO_2	5.12	5.93		
Acid soluble Alumina, Al_2O_3	1.73	2.17		
Acid soluble Iron, Fe_2O_3	0.90	1.11		
Acid soluble Calcium, CaO	15.66	18.42		
Acid soluble Magnesium, MgO	0.66	1.20		
Acid soluble Sulphate, SO_3	0.61	0.76		
Loss on Ignition	12.56	12.31		
Total	99.59	99.87		

Calculated Mix Proportions				
Composition to nearest 0.5%	% by mass of dry mass			
Portland cement : sand				
Portland cement	28.0	32.5		
Sand	72.0	67.5		
Calculated volume	1 : 2.2	1 : 1.8		
Mortar Designation From Table 4, BS4551 : 2005	-	-		
Sulphate % by mass of	2.5	2.6		

Assumptions used in calculations	SiO_2 %	CaO %	bulk density kg/m³	material type
Sand	0.2	0.0	1675	siliceous
Portland cement	20.2	64.5	1450	OPC

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Table
2

Date of Test
1-7/05/09

LEAD CONTENT OF PAINT
In-house Method, Section 40.3

Sandberg Reference	Client Reference	Mass of sample received g	Lead content, total % by mass
C65587	Stucco 56332/2	-	33.5

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Table 3

Date of Test 1-7/05/09

WATER - CHEMICAL ANALYSIS
Documented In-house Methods

Sandberg Reference	C65884			Typical trade effluent levels
Client Reference	Water ref 56332/3			
Volume of Sample Received	250mls			
pH	7			6-11

ANALYSIS		mg/litre			
Settled and Suspended Solids, dried at 110°		1465*			1000
Cadmium	Cd	<0.001			0.02
Copper	Cu	<0.001			3
Zinc	Zn	0.5			3
Lead	Pb	0.1			-
Sulphate	SO_4^{--}	372			1800
Chloride	Cl^-	50			50
Free and Saline Ammonia	N	<1			35
Oxygen Absorption from N/80 Permanganate (4 hours at 27°C)		0.9			500 (as COD)

Notes: < = less than

* We understand that the solids are to be filtered out using sand bags prior to discharge.