B.H. MAULE & PARTNERS
Chartered Engineers and Surveyors.

Our ref: 16/20064653
LV ref: 45495204005

6 November 2007

Mr D M Egan
81 Fordwych Road
London
NW2 3TL

ENGINEERING REPORT ON

FINDINGS OF SITE INVESTIGATION

AT

81 FORDWYCH ROAD

LONDON

NW2 3TL

Albion Chambers, Matthew Street, Dunstable, Bedfordshire, LU6 1SD.
Telephone: (01582) 602260 Fax: (01582) 608901
www.maule.co.uk.

Introduction

This report relates to structural movement at 81 Fordwych Road, London NW2 3TL.

The property is the right hand one of a pair of substantial Victorian semi detached houses. No. 81 is the right hand one of the pair. Structural movement occurred generally throughout the house but much of the movement is historic.

The house has ground, first and second floors with attic rooms at third floor level. At the rear there is a single storey flat roofed addition which appears to be either part of the original construction or certainly constructed soon after the original.

Across the centre of the house from left to right is a cellar area which has limited head room.

Our investigations comprised a visual inspection, a measured survey, level monitoring from March 2007 until October 2007. A verticality survey, a level distortion survey, three trial hole investigations to examine the foundation and four window sampler boreholes taken to a depth of 3.0 metres.

Visual Inspection

The visual inspection shows Category 4 (BRE Digest 251) damage with cracking throughout the height of the party wall at the position of the central staircase, and numerous cracks and distortions generally throughout the property.

The nature and direction of the fresh cracking is indicative of differential settlement of the rear of the property relative to the front, but more particularly on the line of the party with No. 83.

Generally the house is in poor decorative order with much of the decoration being in excess of 20 years old.

Photographs are appended to this report.

Level and Distortion Surveys

The level distortion survey indicates the front of the house to have settled relative to the rear by an average of 150mm.

We included in the distortion survey the adjoining property No. 83 and the front left corner of that house is some 300mm lower than its rear left corner. No. 140mm

Taking the pair of houses as a whole, the front left corner is 90mm lower than the front right and generally the front of the house has settled relative to the rear. The level distortion survey also shows the rear part of the party wall has settled relative to each of the rear corners, this differential settlement being a maximum of some 60mm.

The verticality survey shows the rear wall to be leaning outwards and the right flank wall to be leaning in. This is all consistent with the general pattern of cracking and the level distortion surveys.

Level Monitoring

Level monitoring was started in March 2007 and continued until October 2007.

Level monitoring pins were established on both No. 81 and No. 83, with pins 14, 15, 16 and 17, being on the adjacent house No. 83.

Over the period of monitoring positions 1, 17, 16, 15 demonstrated continued settlement whereas with the exception of points 9 and 10, which are on the rear wc extension, the remainder of the level monitoring points showed reasonable stability.

Trial Holes and Boreholes

The trial hole taken against the rear elevation showed a 80mm thick concrete foundation founded 600mm below ground level. The subsoil was found to be a firm dark brown mottled grey clay with roots evident to a depth of 1.0 metres. The shear vane tests gave gradually increasing results with depth.

Trial hole 2 was taken against the rear right corner which is the small wc extension. This showed a 150 concrete foundation founded only 250mm below ground level. The subsoil at that position is a firm dark brown mottled grey clay. With tree roots being evident to a depth of 1.50 metres.

Trial hole 3 was taken against the front right corner of the house, it showed the front of the house to have been underpinned with concrete and the concrete was proved to a depth of over 1.5 metres. Probing indicates the underpinning depth is likely to be of the order of 2.0 metres. The concrete foundation extends 700mm from the face of the brickwork above. The window sampler borehole shows stiff dark brown mottled grey clay with shear vane tests being high in excess of 130.

Borehole 4 was taken in the front garden some 3 metres from the front of the house. It showed firm to stiff dark brown mottled grey clay with roots evident to 1.30 metres below ground level. The shear vane tests gave gradually increasing results from 85 at 0.50 metres to 130 at 2.0 metres depth.

The laboratory tests of the subsoil samples show the clay to have a plasticity index in the range 41.2% to 53.5%. This indicates the clay has a high shrinkage potential. The plastic limit for the clay was found to be in the range 26.9% to 33.4%.

The moisture content profiles indicate some deficit to a depth of 1.0 – 1.25 metres in boreholes 1, 2 and 4 whereas borehole 3 (front right corner) shows a deficit to a depth of 1.50 metres. This corresponds to the depth to which tree roots were identified, and although there is a deficit, the results do not show desiccation as defined by 0.4xLL.

The Site

The site slopes down from the left to the right and from the rear to the front. In the public highway footpath some 12 metres from the front of the house is a mature tree, however the front garden of No. 81 has a number of large shrubs and bushes.

At the rear there are a number of large bushes and shrubs and several smaller trees including a Silver Birch with a small Willow being some 20 metres away. At the rear some trees have been removed more recently in an endeavour to minimise subsoil moisture extraction by the roots below foundation level.

Works to No. 83 Fordwych Road

Over the period August to October 2007, No. 83 has been fully underpinned using a traditional mass concrete technique. The maximum depth of the underpinning was some 3 metres below foundation level.

The level monitoring shows some settlement over this period and no doubt this is due to the actual underpinning being undertaken.

Conclusions

It is clear there has been much historic settlement and movement of No. 81 with the main settlement being towards the front of the house as a result of the sloping site and the proximity of the mature trees in the public highway/footpath. However the front

has been underpinned to a depth in excess of 1.50 metres and most probably to a 2 metre depth.

The recent damage is to the party wall and the rear of the house. Unusually the single storey rear addition has not broken away from the main part of the house and the hinge point of the movement is further towards the centre of the house on the line of the central cellar which is across the centre of the house from left to right. At this position the internal walls, the party wall and the flank wall of the house all have much deeper foundations than in the walls to the rear of the cellar.

Evidence of tree roots just below foundation level indicates the problem to be one of drying shrinkage of the clay subsoil due to moisture extraction by the roots from trees and vegetation during the drier summer months.

The damage to the adjoining property, No. 83 was significantly greater and in an endeavour to remedy this significant vegetation reduction was undertaken.

The damage over the last few years appears to be confined to the rear of the property and is fully consistent with differential movement between the more shallow founded rear part of the house relative to the deep and stable foundations of the cellar walls. These will have a foundation depth of the order of 2.0 metres below ground level and the site investigation undertaken by Geoinvestigate Ltd indicate that below 2 metres there is generally little or no moisture deficit in the clay subsoil.

The level monitoring shows settlement of the front part of the party wall over the later summer months of 2007 however it also shows settlement of the front left corner and rear left corner of the adjoining property. Over this period that property was underpinned and it is quite probable that the settlement being recorded by the level monitoring is simply the small settlements which are likely to occur during the process of underpinning.

The only other points where some settlement has occurred to No. 81 is to the small single storey wc extension at the rear which has an extremely shallow foundation. Nevertheless the summer differential settlement of this portion is less than 6mm.

The main recent damage to the house is to the party wall and this has now been underpinned.

The front of the house has previously been underpinned and with the exception of pin number 1 on the party wall position, no significant differential movements have been recorded by the level monitoring. Indeed over the summer months the level monitoring points around No. 81 show reasonable stability.

In view of this stability and the fact that the party wall has been fully underpinned, there does not appear to be an immediate requirement to undertake foundation underpinning to No. 81.

The level distortion survey indicates No. 83 has settled relative to No. 81 and over the years this has resulted in the front left corner being nearly 300mm lower than the rear left corner. It should be noted that where there are different depths of foundation in a building, some differential foundation movement is possible. In this case No. 83 now has foundation of the order of 2.5 - 3.0 metres deep. Whereas No. 81 has its rear wall and flank wall on much shallower foundations of the order of 0.6 metres deep.

In order avoid future problems, there are two options. The first is to remove as much vegetation as possible from the front and rear garden of No. 81 and the second is to underpin the external wall to provide a consistency of foundation with that of No. 83.

Recommendations

We recommend the superstructure cracks be repaired using masonry reinforcement techniques and in this respect it is important that the party wall cracking be repaired at the same time as the repairs are undertaken to No. 83.

Masonry reinforcement crack repairs are also required to the flank wall No. 81 and it would be appropriate to introduce continuous lines of reinforcement (helibeams) and to connect these to the internal cross walls. All crack repairs should follow normal good practice employing resin injection, plaster reinforced with expanded metal lath and masonry reinforcement repairs on all significant cracks.

Consideration should be given to providing a better foundation to the small single storey wc and extension, or in the alternative it may be more appropriate to remove this extension.

We also recommend extensive removal of vegetation both in the front and rear gardens of No. 81 in order to reduce the moisture demand on the shrinkable clay subsoil.

In the event that No. 81 exhibits further damage, then underpinning will need to be considered. It should be noted that parts of the house have quite shallow foundations (0.60m) compared to other parts (2.0m) and the adjoining house No. 83 (3.0m). The more shallow foundations are likely to be susceptible to differential movement.

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B H MAULE & PARTNERS

Report prepared and checked by : Douglas Pirie BSc(Hons) CEng MICE
16/jlw

APPENDIX A

Our Ref: 20064653 **Your Ref: 45495204005**

81 Fordwych Road, London NW2 3TL

PHOTOGRAPHIC INDEX

1. Front.
2. Rear.
3. Front bay.
4. Front bay.
5. Rear part of party wall.
6. As above.

7 – 14. Internal damage

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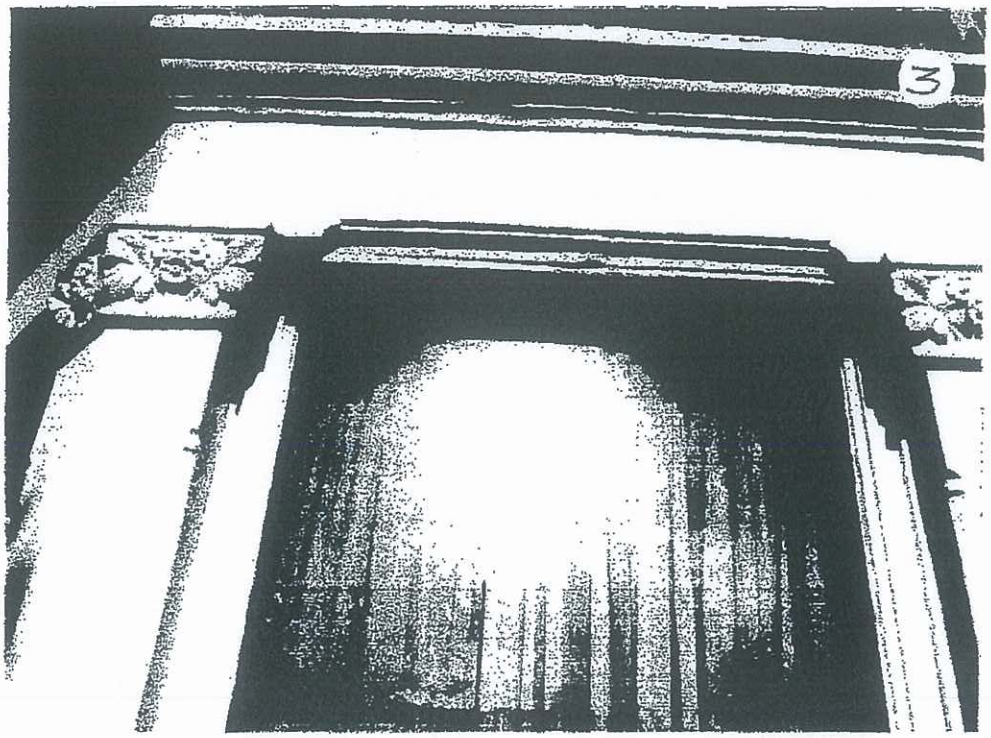

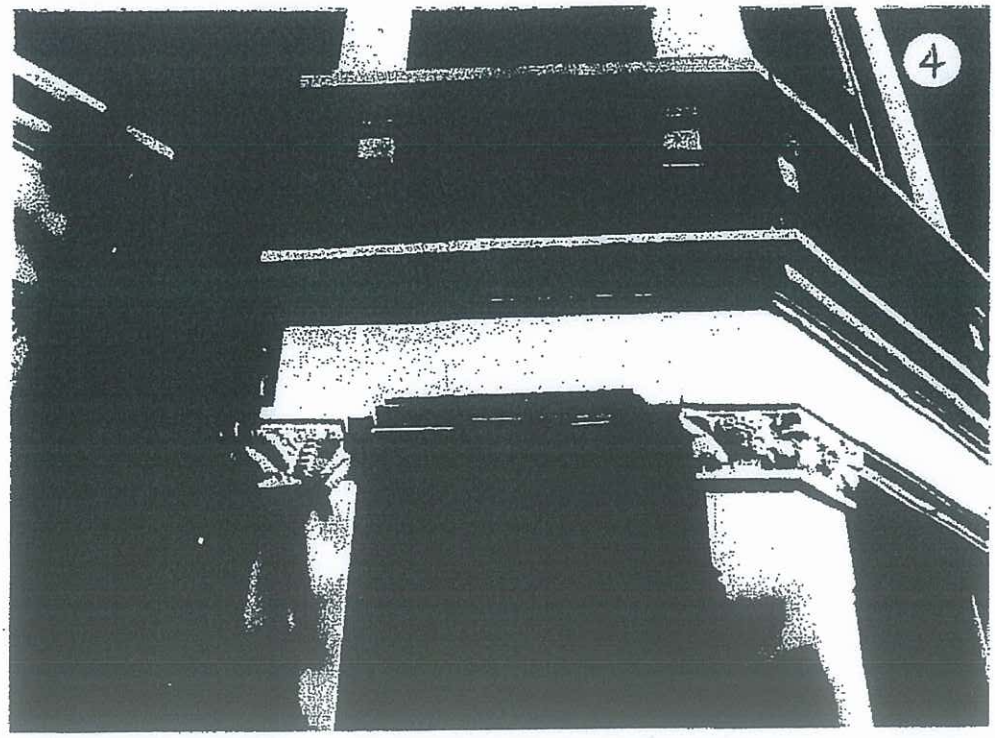

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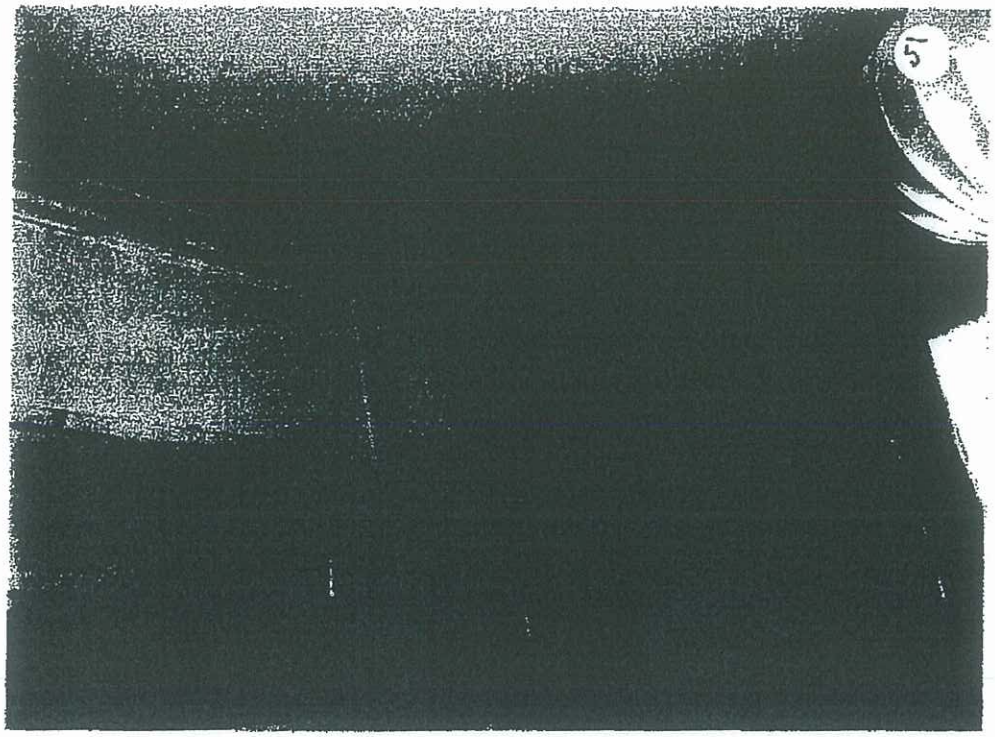

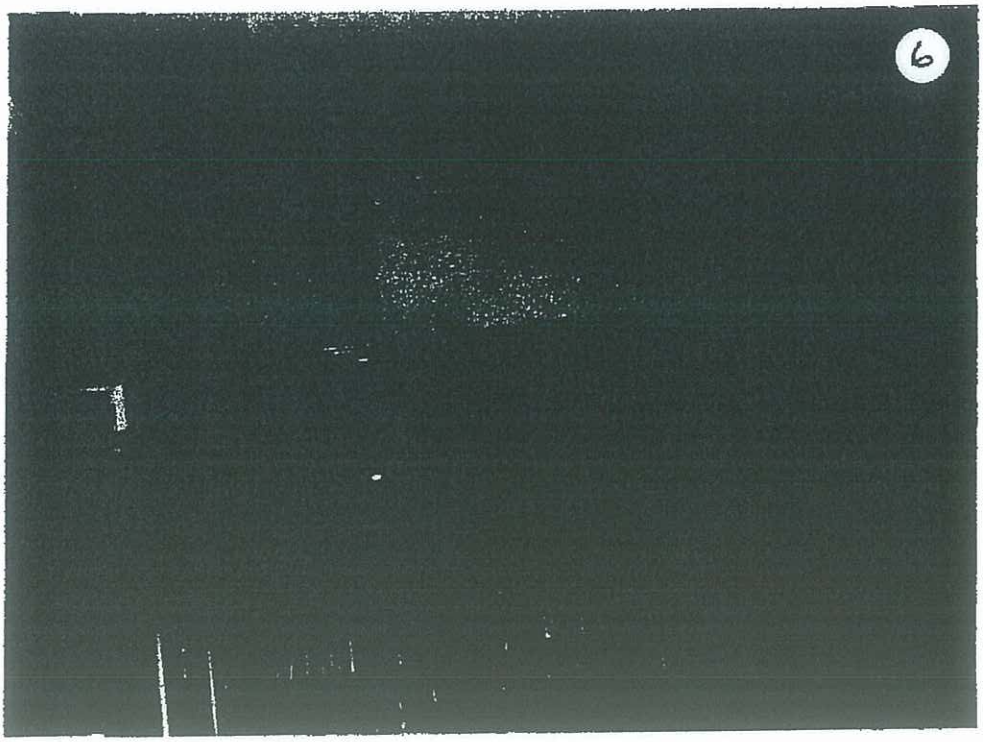

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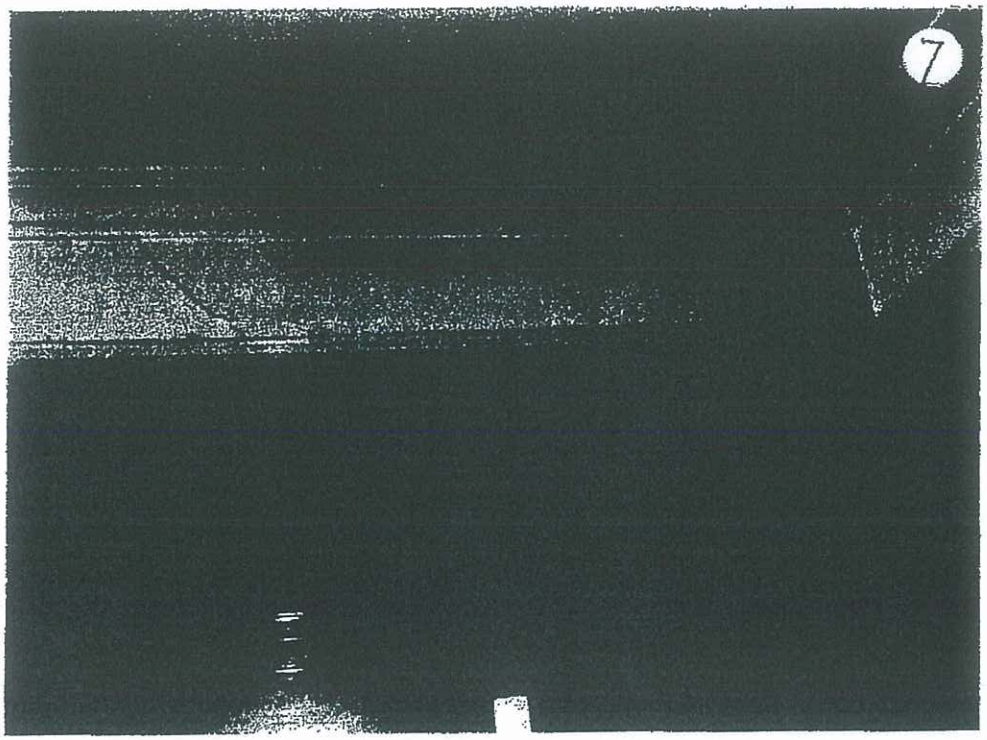

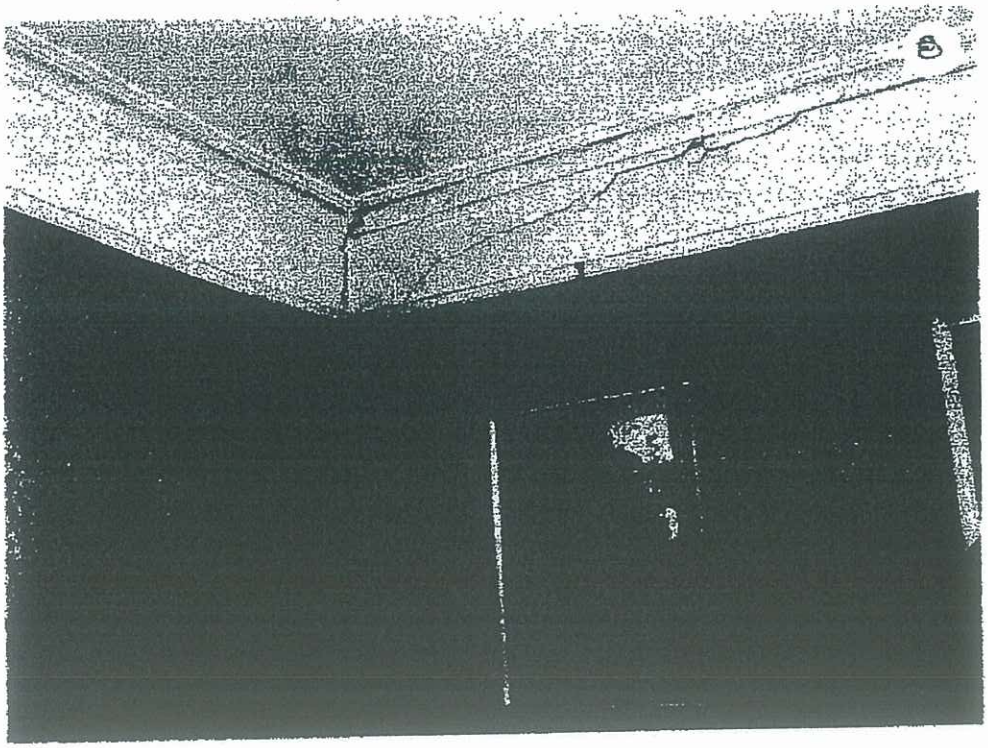

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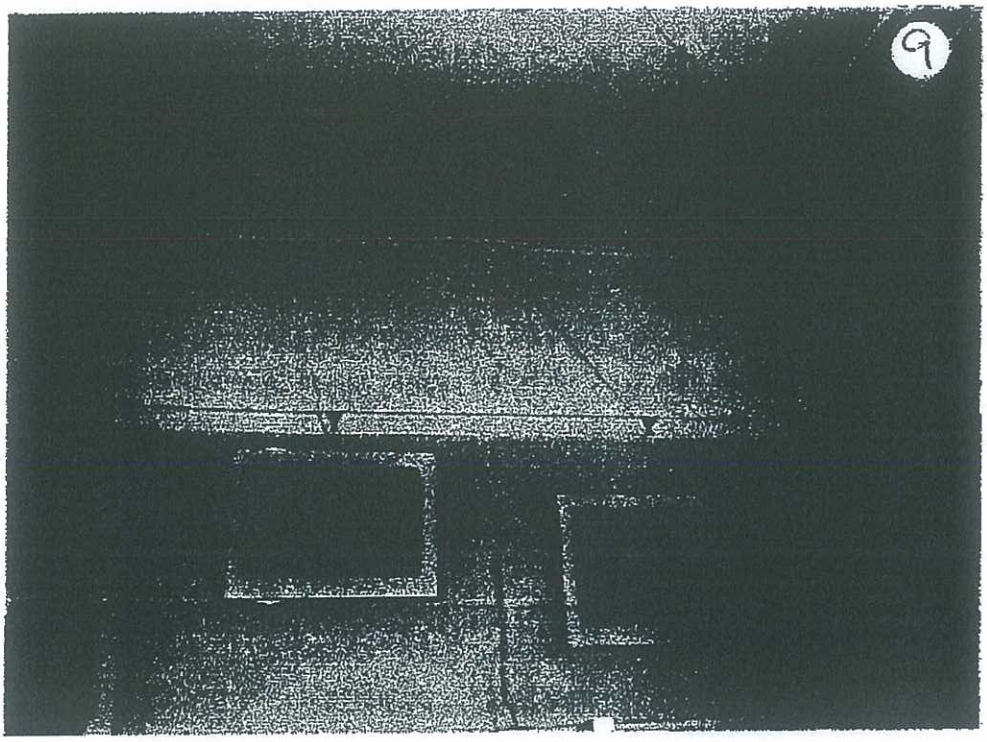

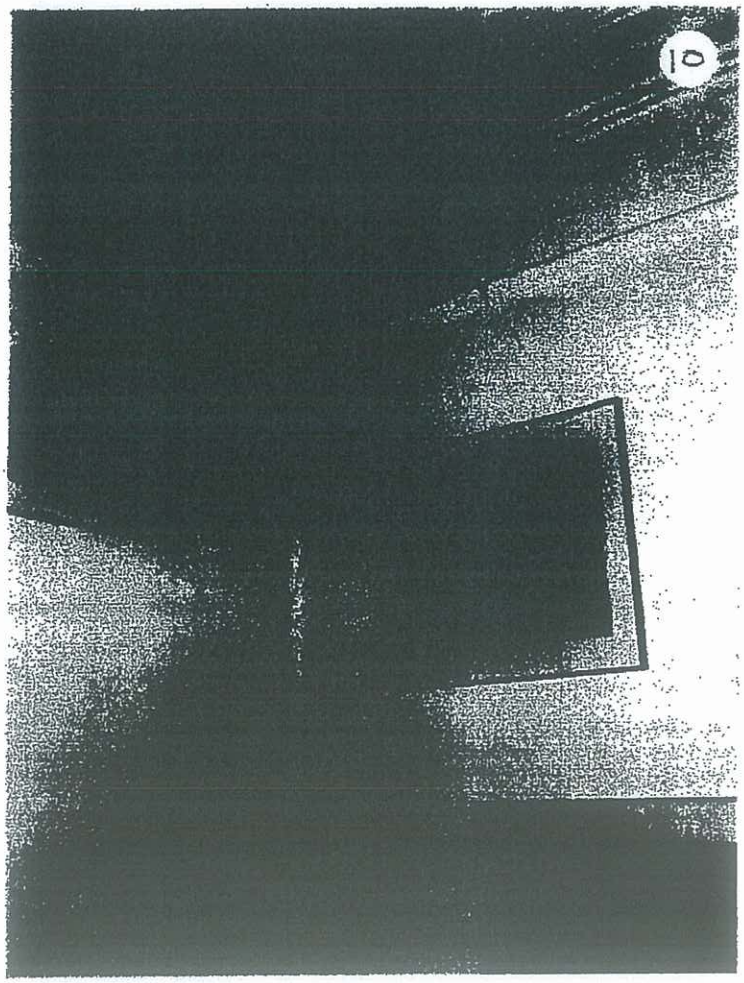

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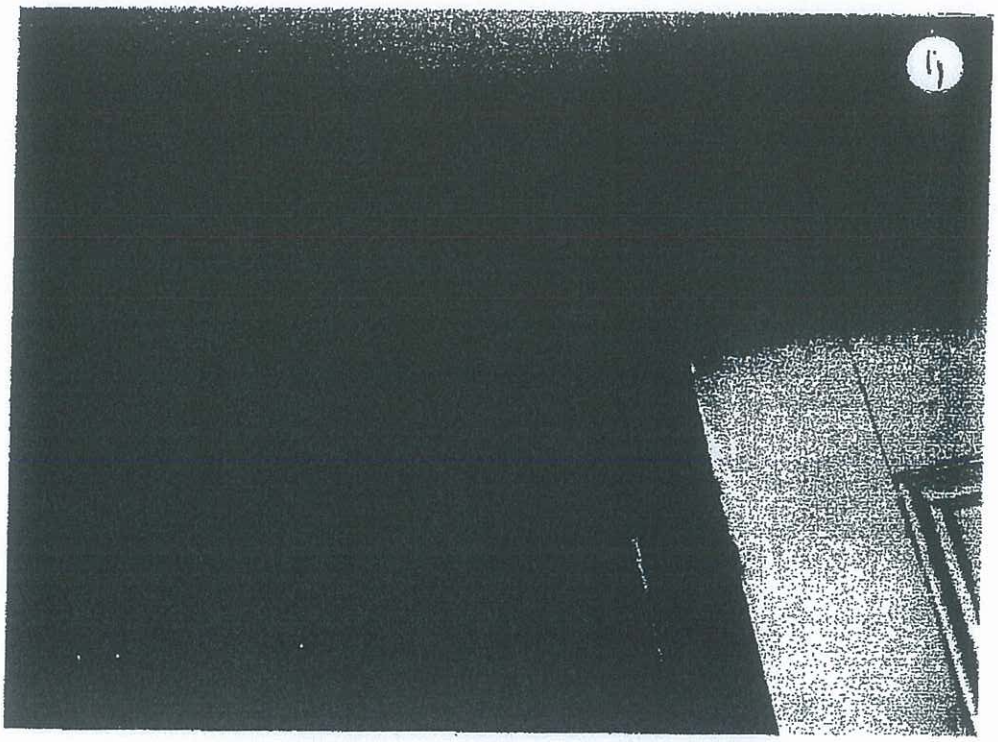

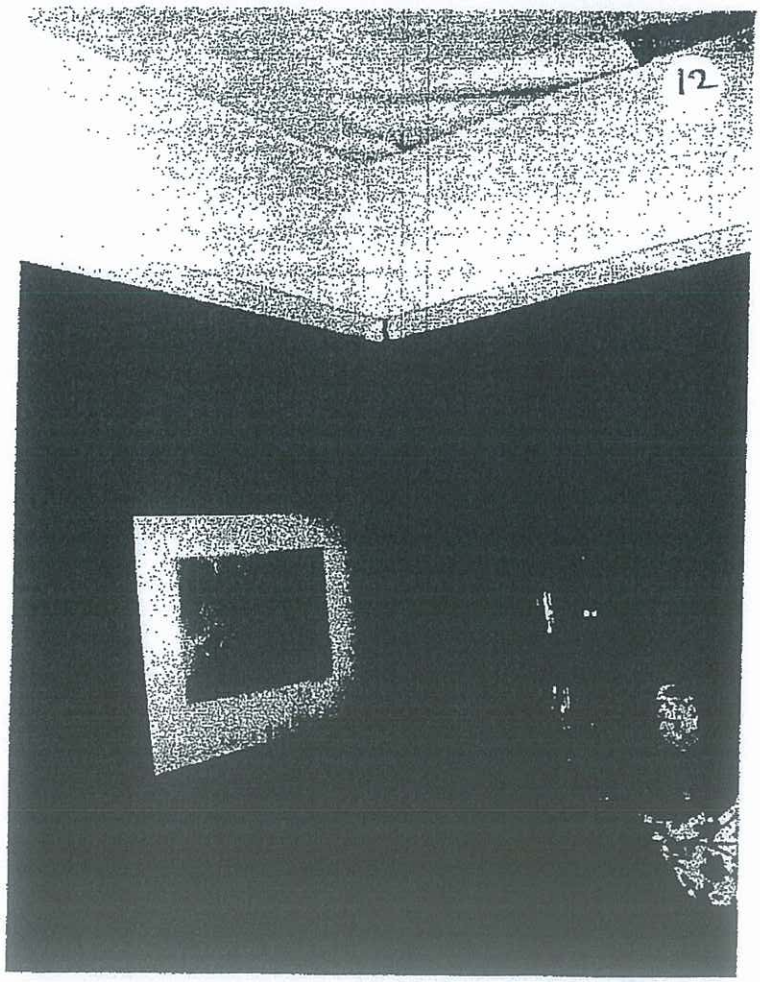

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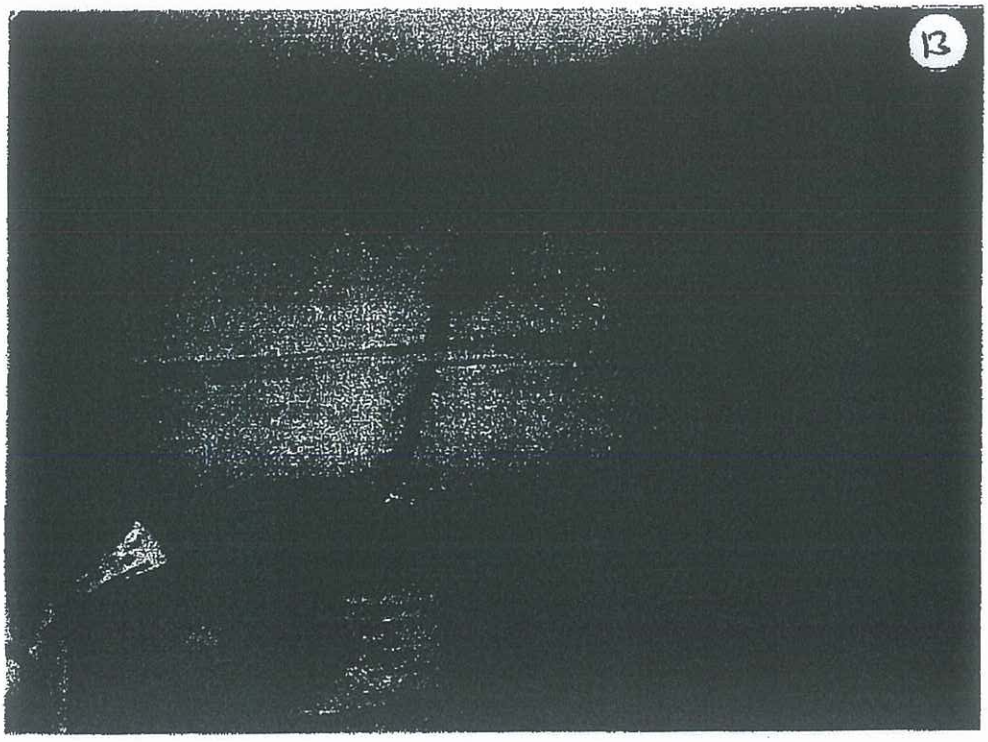
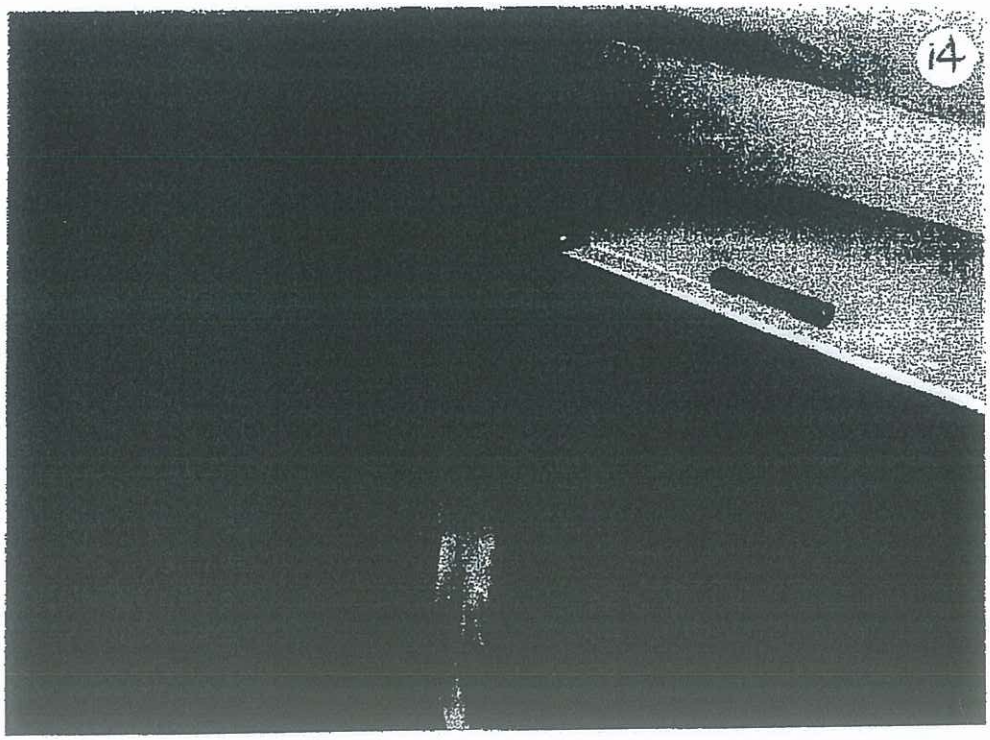
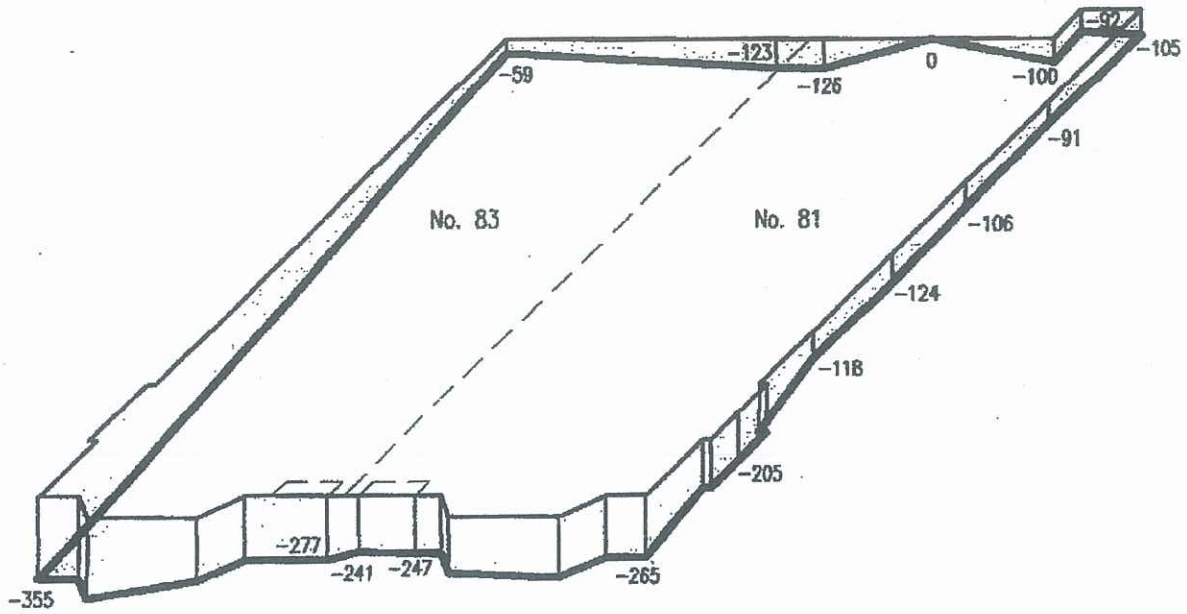




APPENDIX B

NOTE: All measurements are in millimetres and are relative to the highest recorded point.



FRONT

LEVEL DISTORTION SURVEY

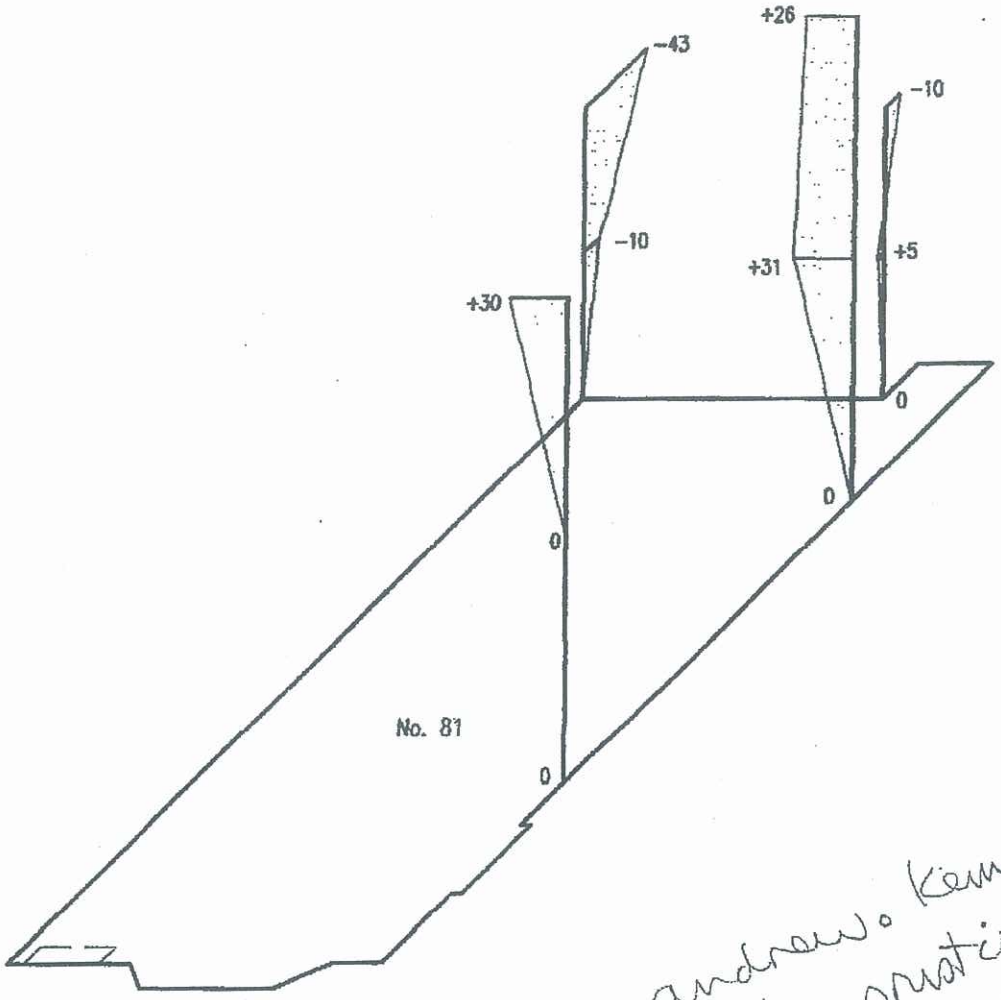
7 Wherry Lane
Ipswich
Suffolk
IP4 1LG

Kemp Rust Consulting Ltd

TEL. 01473 254141
FAX. 01473 254020

Project	Date	Drg No.	Rev.
81 Fordwych Road Cricklewood London NW2 3TL	March 2007	SK 02	
	Drawn By: KH	Scale: NTS.	Ref.: 07/3642

NOTE: All measurements are in millimetres and are relative to the bottom chord.



andrew.kemp@kemprustconsulting.co.uk.

FRONT

VERTICALLITY SURVEY

7 Wherry Lane
Ipswich
Suffolk
IP4 1LG

Kemp Rust Consulting Ltd

TEL. 01473 254141
FAX. 01473 254020

Project	Date	Drg No.	Rev.
81 Fordwych Road Cricklewood London NW2 3TL	March 2007	SK 03	
	Drawn By: KH	Scale: NTS.	Ref.: 07/3642

APPENDIX C