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24-HOUR NOISE LEVEL SURVEY CARRIED OUT
ON THE ROOF TERRACE AT THE FRONT OF
PENDRELL HOUSE, NEW COMPTON STREET, LONDON WC2
AND A REPORT ON THE NOISE CONTROL MEASURES
REQUIRED TO MINIMISE THE NOISE IMPACT
OF THE PROPOSED NEW EXTERNAL PLANT

Test Engineer : J R Tait

Report Author :

J R Tait

Authorised for
Release by :

I J Marchant

Client : Pure / Fruitful Design Company
Project : 151, Shaftesbury Avenue, London WC2
Emtec Ref. : QF7144/PF4623/RP1
Issue Date : 12th June 2012



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24-HOUR NOISE LEVEL SURVEY CARRIED OUT
ON THE 5TH FLOOR BALCONY AT THE FRONT OF
PENDRELL HOUSE, NEW COMPTON STREET, LONDON WC2
AND A REPORT ON THE NOISE CONTROL MEASURES
REQUIRED TO MINIMISE THE NOISE IMPACT
OF THE PROPOSED NEW EXTERNAL PLANT

1.0. INTRODUCTION

This report details the results of a 24-hour noise survey carried out on the 5th floor balcony at the front of Pendrell House, New Compton Street, London WC2.

The objectives of this survey were as follows:

- To establish the existing background noise level at the front of Pendrell House and neighbouring residential properties.
- To assess the proposal to that is to install new external air conditioning plant on the building opposite Pendrell House, which is 151 Shaftesbury Avenue, and to recommend noise limits and any necessary measures to ensure that the operation of the new plant does not disturb the occupants of Pendrell House or any neighbouring residential properties.

This report has been divided into the following sections for ease of analysis:

- 1.0. INTRODUCTION
- 2.0. SITE DESCRIPTION
- 3.0. TEST INSTRUMENTATION
- 4.0. TEST PROCEDURE
- 5.0. RESULTS AND EVALUATION OF NOISE CRITERIA

2.0. SITE DESCRIPTION

Pendrell House is a five storey block of twenty-five flats with a central front door on New Compton Street, London WC2.

Pendrell House faces the rear façade of the commercial offices of 151 Shaftesbury Avenue.

3.0. TEST INSTRUMENTATION

All measurement equipment used during the survey complied with the requirements of BS4142:1997 "Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas". Details of the equipment are as follows:

Integrating Sound Level Meters : Bruel & Kjaer type 2231 fitted with a Bruel & Kjaer type 4155 ½ inch condenser microphone.

Statistical Analysis Modules : Bruel & Kjaer type BZ 7115 capable of computing the percentile levels L1, L10, L50, L90 and L99 and also the Leq level.

Acoustic Calibrator : Bruel & Kjaer type 4231 electronic calibrator.

Calibration was performed before and after the surveys and found to be, in all cases, +/- 0.1 dB from the reference source.

3.1. Existing Noise Climate

New Compton Street is a minor through road in central London and road traffic noise was observed throughout the manned period at the start and end of the survey.

There being no above ground railway nearby, rail noise was not observed during the manned periods at the start and end of the survey.

Commercial jet aircraft were observed at relatively low altitude during the survey. The noise levels measured will include contributions from low to medium altitude jet aircraft.

Numerous mechanical plant items were observed to be operating on the roof 151 Shaftesbury Avenue. The noise contribution of this existing mechanical plant to the overall noise climate will have been included within the readings measured. It is taken that all mechanical plant at the rear of the site is operating within legal noise limits and has planning permission.

We judged that noise emanating from vehicular road traffic and the existing mechanical plant on the roof 151 Shaftesbury Avenue to provide the primary contribution to the noise levels recorded during the survey.

4.0. TEST PROCEDURE

The survey was conducted during a continuous 24-hour period from 09.46am on Tuesday the 22nd May 2012 to 09.06 on Wednesday the 23rd of May 2012.

Data was continuously acquired throughout the measurement period with the individual averaging time for statistical noise data set to 20 minutes. The following 'A' weighted statistical measurements were recorded concurrently:

- LA1 - The Sound Pressure Level exceeded for 1% of the measurement period.
- LA10 - The Sound Pressure Level exceeded for 10% of the measurement period.
- LA50 - The Sound Pressure Level exceeded for 50% of the measurement period.
- LA90 - The Sound Pressure Level exceeded for 90% of the measurement period.
LA90 is considered to represent the "background noise level" during the measurement period and is used for the assessment of noise to determine the likelihood of complaints (See BS 4142).
- LA99 - The Sound Pressure Level exceeded for 99% of the measurement period.
- LAeq - The continuous steady state Sound Pressure Level that has the same acoustic energy as the real fluctuating level.

4.1. Measurement Positions

Noise levels were measured on the 5th floor balcony at the front of Pendrell House, New Compton Street, a position considered equivalent to the closest receptor properties in order to enable noise predictions from the proposed condensers to be compared and assessed against. The photograph in Appendix 'B' of this report shows the location of the microphone.

The microphone was pointing due east and was approximately 1.2 metres above roof level. The rest of the measurement equipment was located in a weatherproof enclosure with a low impedance cable running from the microphone to the instrumentation.

4.2. Weather Conditions

The weather conditions prevailing during the measurement period were in line with those recommended in BS 4142:1997. The weather was clear throughout the daytime and night time periods. Wind was calm during the daytime and during the night time periods, and the microphone was protected throughout the tests by an acoustically transparent wind balloon.

5.0. RESULTS AND EVALUATION OF NOISE CRITERIA

The raw data, gathered during the noise survey, is given in Appendix 'A' of this report.

The 'A' Weighted Leq levels measured over each 20 minute interval throughout the 24-hour periods (denoted by LAeq, (20 mins) are displayed as a bar graph on the attached Sketch No QF/7144/T1 at the back of this report.

The 'A' Weighted percentile levels measured over each 20 minute interval denoted by LA10 (20 mins), LA50 (20 mins) and LA90 (20 mins) are displayed as a line graph on the attached Sketch No QF/7144/T2 at the back of this report.

5.1. Summary of Results

The table QF/7144/D1 below summarises the noise levels taken over the 24-hour period in terms of the maximum and minimum Sound Pressure Levels recorded.

Table QF/7144/D1 – Summary of Maximum and Minimum Noise Levels

	LA1	LA10	LA50	LA90	LA99	LAeq
Min.	59.8dBA	56.3dBA	52.8dBA	51.3dBA	50.3dBA	54.1dBA
Max.	75.8dBA	65.3dBA	61.8dBA	56.8dBA	55.8dBA	63.7dBA

5.2. Noise sensitive property design criteria

Westminster City Council current Core Strategy retains the previous ENV policy 7 of the Unitary Development Plan (UDP) and this requires that where existing external noise levels exceed WHO guideline external noise levels, new mechanical services plant should be designed to a noise level which is 10dBA below the minimum existing LA₉₀ background noise level during the relevant operational period. The WHO guideline external noise levels are as follows:-

- LAeq 12 hours 55dB daytime (0700-1900)
- LAeq 4 hours 50dB evening (1900-2300)
- LAeq 8 hours 45dB night-time (2300-0700)

The policy applies to noise sensitive properties as follows:-

All residential properties, Educational establishments, Hospitals, Hotels, Hostels, Concert Halls, Theatres, Broadcast and Recording Studios.

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Where noise emitted from the proposed development will contain tones, or will be intermittent, then the maximum emission level should not exceed 15dB below the minimum external background noise level.

The new plant will be inverter controlled and will not be intermittent or contain tones. It should therefore be designed to be 10 dBA below the minimum existing LA_{90} background noise level during the relevant operational period.

5.3. Summary of external noise criteria

Based upon the results of the survey and the local authority's design criteria we summarise the actual design rating levels to be adopted for this project in table QF/7144/D2 below: -

Table QF/7144/D2 – recommended design rating levels $L_{Ar,T}$

Type of premises	$L_{Ar,T}$ (daytime 07.00 to 23.00)	$L_{Ar,T}$ (24-hour)
Noise sensitive	N/A	41.3 dBA

6.0. DISCUSSION OF RESULTS

The surrounding buildings to the proposed location of the plant were inspected and the nearest was identified as Pendrell House, a block of residential flats to the rear of 151 Shaftesbury Avenue.

Pendrell House House has windows approximately 20 metres away in line of sight of the proposed location of the new plant.

6.1 Description of Equipment and Predicted Noise Levels

The proposal is to install three Mitsubishi air conditioning condensers on the roof comprising: -

- 1 No. Mitsubishi PUHZP250 YHA3 – SPL 56dBA at 1 metre in free field conditions
- 1 No. Mitsubishi PUHZP125 VHA3 – SPL 48dBA at 1 metre in free field conditions
- 1 No. Mitsubishi PUHZP250 YHA3 – SPL 56dBA at 1 metre in free field conditions

Their combined sound pressure level will therefore be 59dBA at 1 metre in free field conditions.

Assuming a -25dB reduction in noise due to a 20 metre distance to the nearest affected window ($20 \log r$, where r = distance) and a +6dB increase in noise due to directivity, we predict that condensers' noise levels at 1 metre external to the nearest affected residential window will be in the order of 40dBA.

It is also proposed to install a new air handling within the building with ventilation louvres set into the building envelope at ground floor level facing Pendrell House. The air handling plant comprises: -

1 No. Mitsubishi LGH 200 RX5E – SPL 62dBA at 1 metre in free field conditions

Ducts shall connect the unit's fresh air intake and exhaust outlet to the louvres mounted in the façade of the building, so we will take the external noise level of this unit to be 62dBA at 1.5 metres from the face of the louvres.

Assuming a -22dB reduction in noise due to a 20 metre distance to the nearest affected window ($20 \log r_2/r_1$ where r_2 = distance and $r_1=1.5\text{m}$) and a +6dB increase in noise due to directivity, we predict that air handling unit noise levels at 1 metre external to the nearest affected residential window will be in the order of 45dBA.

(N.B. – Noise data supplied by The Fruitful Design Company in their drawing number P.0412.14 and Mitsubishi's published data.)

6.2 Measures to mitigate noise

We understand the plant may operate on a 24-hour basis.

The recommended design rating level for 24-hour operation is 41.3dBA.

The predicted noise level, due to the roof mounted condensers, at 1 metre outside the nearest affected noise sensitive window is 40dBA.

The predicted noise level at 1 metre outside the nearest affected noise sensitive window due to the condensers is 1.3dB below the recommended design rating level.

It will therefore be unnecessary to apply acoustic treatment to the condensers in order to meet the recommended design noise limits for noise sensitive properties.

The predicted noise level, due to the air handling unit, at 1 metre outside the nearest affected noise sensitive window is 45dBA.

The predicted noise level at 1 metre outside the nearest affected noise sensitive window due to the air handling unit is 3.7dB above the recommended design rating level.

It will therefore be necessary to apply acoustic treatment to the air handling unit in order to meet the recommended design noise limits for noise sensitive properties.

This shall be achieved by installing in line duct mounted silencers between the atmospheric connections of the air handling unit and the louvres set within the building envelope.

Fresh air and exhaust air shall enter and leave the air handling unit via silencers, such as Emtec type RAAC/38/600S silencers, having the following minimum dynamic insertion loss:

	Dynamic Insertion Loss (dB) at Octave Band centre Frequencies (Hz)							
	63	125	250	500	1k	2k	4k	8k
Silencers	3	6	13	21	28	29	25	15

The silencers shall be designed to ensure efficient operation of the proposed air handling unit when operating at maximum capacity.

All the proposed plant, air handling unit and condensers, shall be effectively isolated from the structure using double deflection neoprene-in-shear anti-vibration mounts and flexible ducts to prevent the transmission of structure borne noise.

The drawings, P.0412.14 and P.0412.15, in Appendix 'C' of this report show the general layout of the air conditioning equipment and the approximate location of the condensers on the roof the property.

6.3 Summary

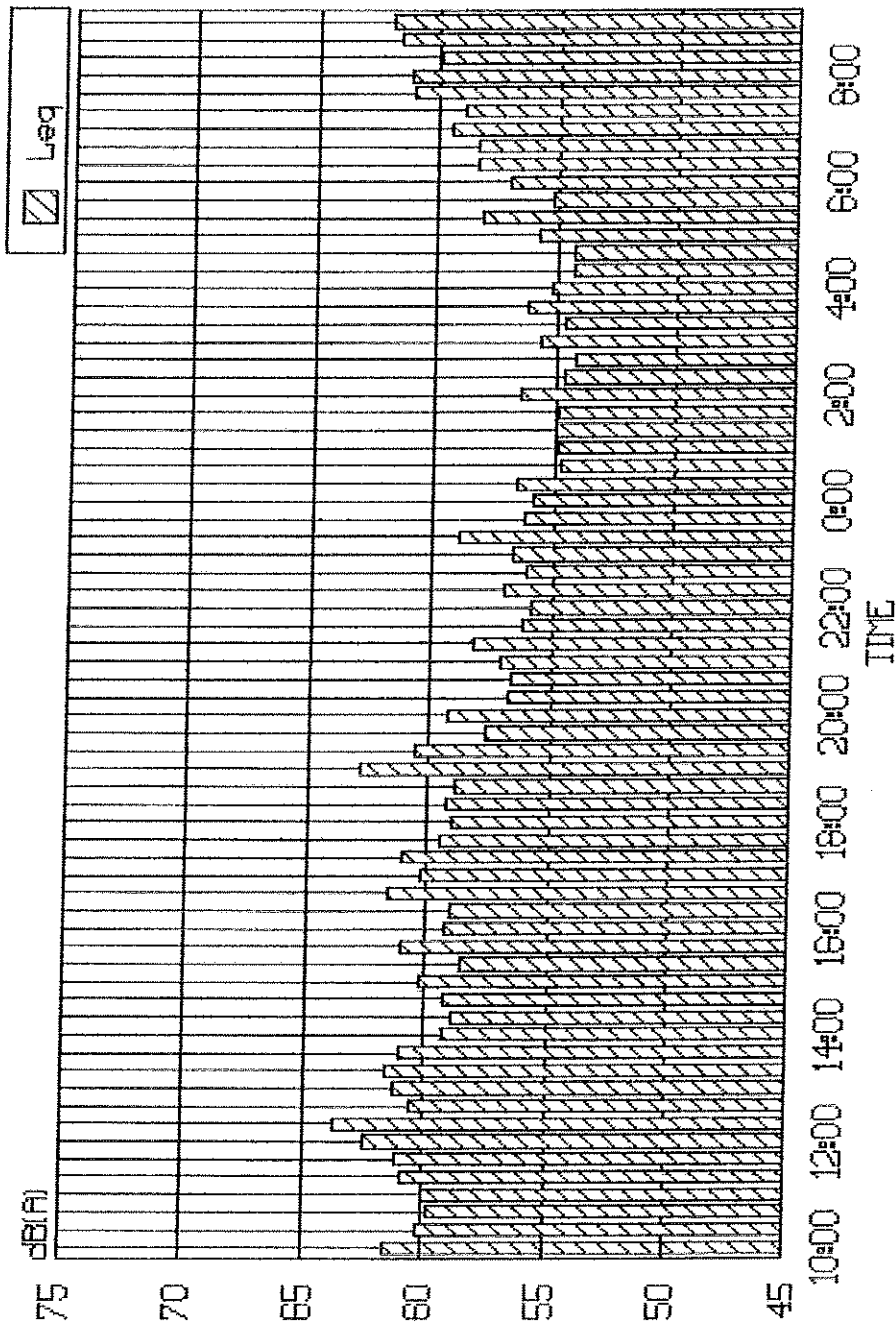
A 24-hour noise survey has been undertaken out on the 5th floor balcony at the front of Pendrell House, New Compton Street, London WC2.

Design noise limits have been recommended, based on the results of the survey and Westminster City Council's planning guidelines.


Noise control measures have been advised for the proposed new external air conditioning condensers and air handling unit.

If the recommended noise control measures are implemented and the design rating levels are achieved, it is predicted that operation of the new plant should attract no justifiable complaints under the guidelines set out in Westminster's planning guidelines and as such reservations are not expected from the planning authority on the grounds of noise.

Pendrell House, New Compton Street, WC2 22nd May to 23rd May 2012



TITLE: LAeq Levels recorded at Pendrell House, New Compton Street, WC2	ISSUE DATE: 23/5/2012		DRAWN BY: JRT		A	B	C	D	E	F	G	H
	PF No: 4623		APPROVED BY: MGR		REVISION							
CLIENT: Pure/Fruitful Design Company	Q	A	M	I	DESIGN AUTH: JRT							
PROJECT: 151 Shaftsbury Avenue	SKETCH No. QF/7144/T1											

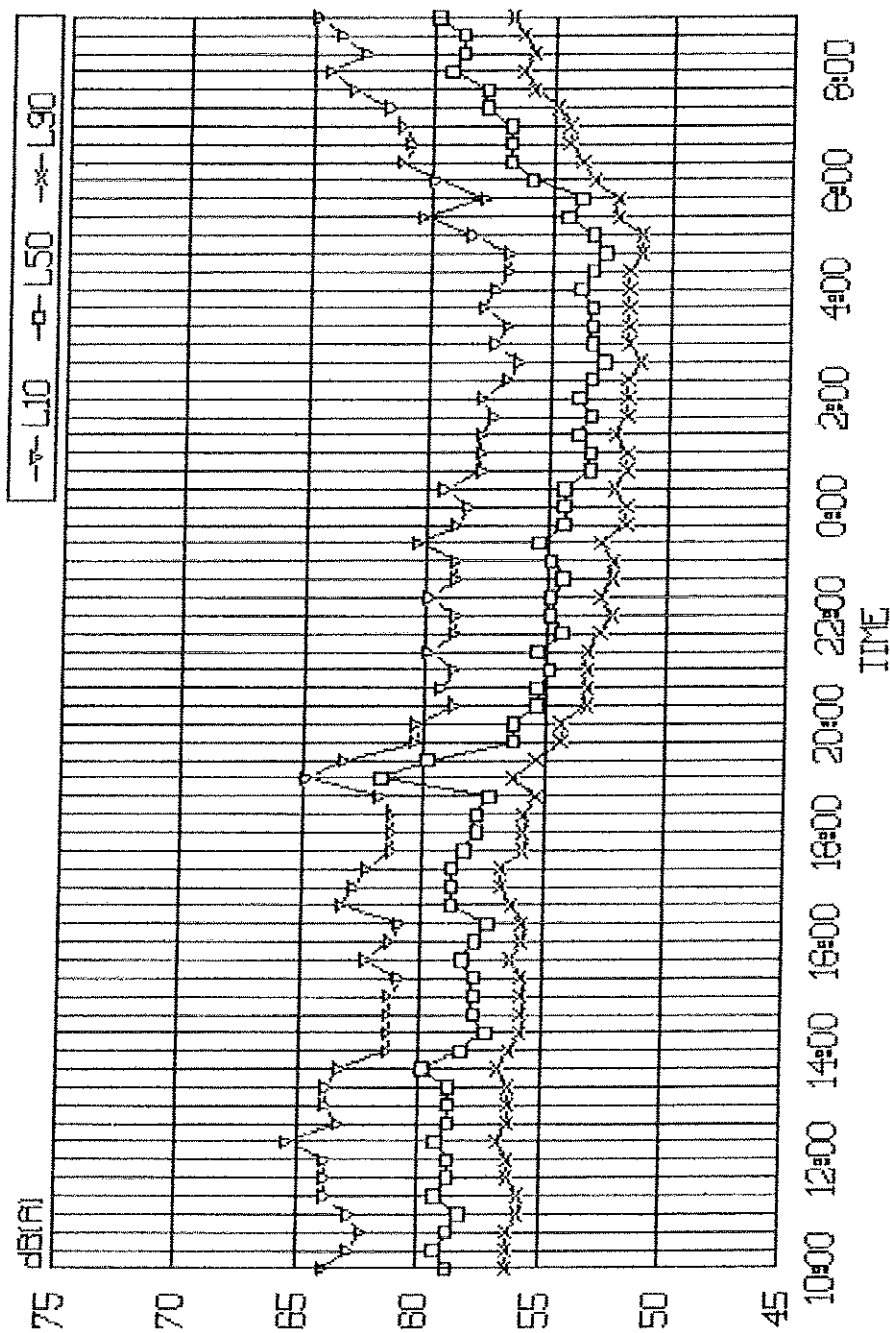


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Pendrell House, New Compton Street, WC2
22nd May to 23rd May 2012



TITLE: LA10; LA50 & LA90 Levels recorded at Pendrell House, New Compton Street, WC2		ISSUE DATE: 23/5/2012		DRAWN BY: JRT		A		B		C		D		E		F		G		H	
CLIENT: Pure/Fruitful Design Company		PF No: 4623		APPROVED BY: MGR		REVISION															
PROJECT: 151 Shaftsbury Avenue		Q	A	M	I	DESIGN AUTH: JRT															
						SKETCH No. QF/7144/T2															

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APPENDIX A

Raw Data – Noise Survey

22nd of May to the 23rd of May 2012

NOISE SURVEY DATA FROM BACKGROUND NOISE LEVEL SURVEY CARRIED OUT
ON THE BALCONY AT THE FRONT OF PENDRELL HOUSE, NEW COMPTON STREET, LONDON W

Project : No.151 Shaftesbury Avenue, London WC2
Client : Fruitful Design Company Ltd. / Pure
Ref : QF7144
Report Date : 28rd May 2012

Measure No.	Finish Time	MaxP (dBA)	L1 (dBA)	L10 (dBA)	L50 (dBA)	L90 (dBA)	L99 (dBA)	Leq (dBA)
1	10:06	97.5	70.8	63.8	58.8	56.3	55.3	61.5
2	10:26	97.6	66.8	62.8	59.3	56.3	54.8	60.3
3	10:46	87.1	66.3	62.3	58.8	56.3	54.8	59.8
4	11:06	89.4	67.3	62.8	58.3	55.8	54.8	60
5	11:26	90.3	68.3	63.8	59.3	55.8	54.8	60.9
6	11:46	90.3	69.8	63.8	58.8	56.3	55.3	61.2
7	12:06	92.8	74.3	63.8	58.8	56.3	55.3	62.4
8	12:26	92.8	75.8	65.3	59.3	56.8	55.8	63.7
9	12:46	87.1	67.3	63.3	58.8	56.3	55.3	60.5
10	13:06	89.5	70.8	63.8	58.8	56.3	55.3	61.3
11	13:26	89.1	70.8	63.8	58.8	56.3	55.8	61.5
12	13:46	88.1	69.3	63.3	59.8	56.8	55.8	61
13	14:06	85.9	64.8	61.3	58.3	56.3	55.8	59.2
14	14:26	89.2	65.8	61.3	57.3	55.8	54.8	58.9
15	14:46	83.4	67.3	61.3	57.8	55.8	54.8	59.2
16	15:06	97.8	64.8	61.3	57.8	55.8	55.3	60.3
17	15:26	83.4	64.8	60.8	57.8	55.8	54.8	58.6
18	15:46	92.3	71.8	62.3	58.3	56.3	55.3	61
19	16:06	89.6	67.8	61.3	57.8	55.8	54.8	59.3
20	16:26	88.3	67.3	60.8	57.3	55.8	54.8	59
21	16:46	90.7	71.3	63.3	58.8	56.3	55.3	61.5
22	17:06	88.2	66.3	62.8	58.8	56.8	55.8	60.3
23	17:26	97.8	68.3	62.3	58.8	56.8	55.8	61.1
24	17:46	85.9	67.8	61.3	58.3	55.8	54.8	59.5
25	18:06	85	65.8	61.3	57.8	55.8	54.8	59
26	18:26	91.9	65.8	61.3	57.8	55.8	54.8	59.2
27	18:46	84.4	64.3	61.8	57.3	55.3	54.3	58.9
28	19:06	89.2	71.3	64.8	61.8	56.3	54.3	62.8
29	19:26	82.3	65.3	63.3	59.8	55.3	54.3	60.5
30	19:46	82.1	62.8	60.3	56.3	54.3	53.3	57.7
31	20:06	89.6	70.3	60.3	56.3	54.3	53.3	59.2
32	20:26	82.4	63.8	58.8	55.3	53.3	52.8	56.8
33	20:46	82.5	63.3	59.3	55.3	53.3	52.8	56.7
34	21:06	82.7	67.9	58.8	54.8	53.3	52.3	57.1
35	21:26	88.8	67.8	59.8	55.3	53.3	52.3	58.2
36	21:46	82.1	64.3	58.8	54.3	52.8	52.3	56.2
37	22:06	78.3	61.8	58.8	54.8	52.3	51.3	55.9
38	22:26	82.9	64.8	59.8	54.8	52.8	51.8	57
39	22:46	82.3	64.3	58.8	54.3	52.3	51.3	56.1
40	23:06	83.5	65.8	58.8	54.8	52.3	51.3	56.7
41	23:26	92.5	69.8	60.3	55.3	52.8	51.8	58.9
42	23:46	83.2	65.3	58.8	54.3	51.8	51.3	56.2
43	00:06	79.6	62.8	58.3	54.3	51.8	50.8	55.9
44	00:26	82.1	66.8	59.3	54.3	52.3	51.3	56.6
45	00:46	77.3	61.3	57.8	53.3	51.8	50.8	54.8
46	01:06	83.5	61.3	57.8	53.3	51.8	50.8	54.9
47	01:26	80.4	61.8	57.8	53.8	52.3	51.3	55
48	01:46	77.7	62.8	57.3	53.3	51.8	50.8	54.9
49	02:06	88.5	67.3	57.8	53.8	51.8	50.8	56.4
50	02:26	82.8	61.3	56.8	53.3	51.8	50.8	54.6
51	02:46	81.6	61.3	56.3	52.8	51.3	50.3	54.1
52	03:06	83.6	65.8	57.3	53.3	51.8	51.3	55.6
53	03:26	80.7	61.8	56.8	53.3	51.8	50.8	54.7
54	03:46	85.4	65.8	57.8	53.3	51.8	50.8	56.2
55	04:06	81.9	61.8	57.3	53.8	51.8	51.3	55.2
56	04:26	75.8	59.8	56.8	53.3	51.8	50.8	54.3
57	04:46	85.9	61.3	56.8	52.8	51.3	50.8	54.3
58	05:06	85.2	64.3	58.3	53.3	51.3	50.8	55.8
59	05:26	86.9	68.8	60.3	54.3	52.3	50.8	58.1
60	05:46	77.7	61.8	57.8	53.8	52.3	51.3	55.2
61	06:06	82.8	64.8	59.8	55.8	53.3	51.8	57
62	06:26	82.8	65.3	61.3	56.8	53.8	52.3	58.3
63	06:46	85.4	65.3	60.8	56.8	54.3	53.3	58.3
64	07:06	90.3	68.3	61.3	56.8	54.3	53.3	59.5
65	07:26	94.2	65.3	61.8	57.8	54.8	53.8	58.9
66	07:46	92.2	69.3	63.3	57.8	55.8	54.3	61.1
67	08:06	89.5	68.8	64.3	59.3	56.3	54.8	61.2
68	08:26	84.8	66.8	62.8	58.8	55.8	54.8	59.9
69	08:46	96.7	67.8	63.8	58.8	56.3	55.3	61.6
70	09:06	97.7	70.3	64.8	59.8	56.8	55.3	61.9

APPENDIX 'B'

- Photo showing location of the microphone and nearest noise sensitive properties

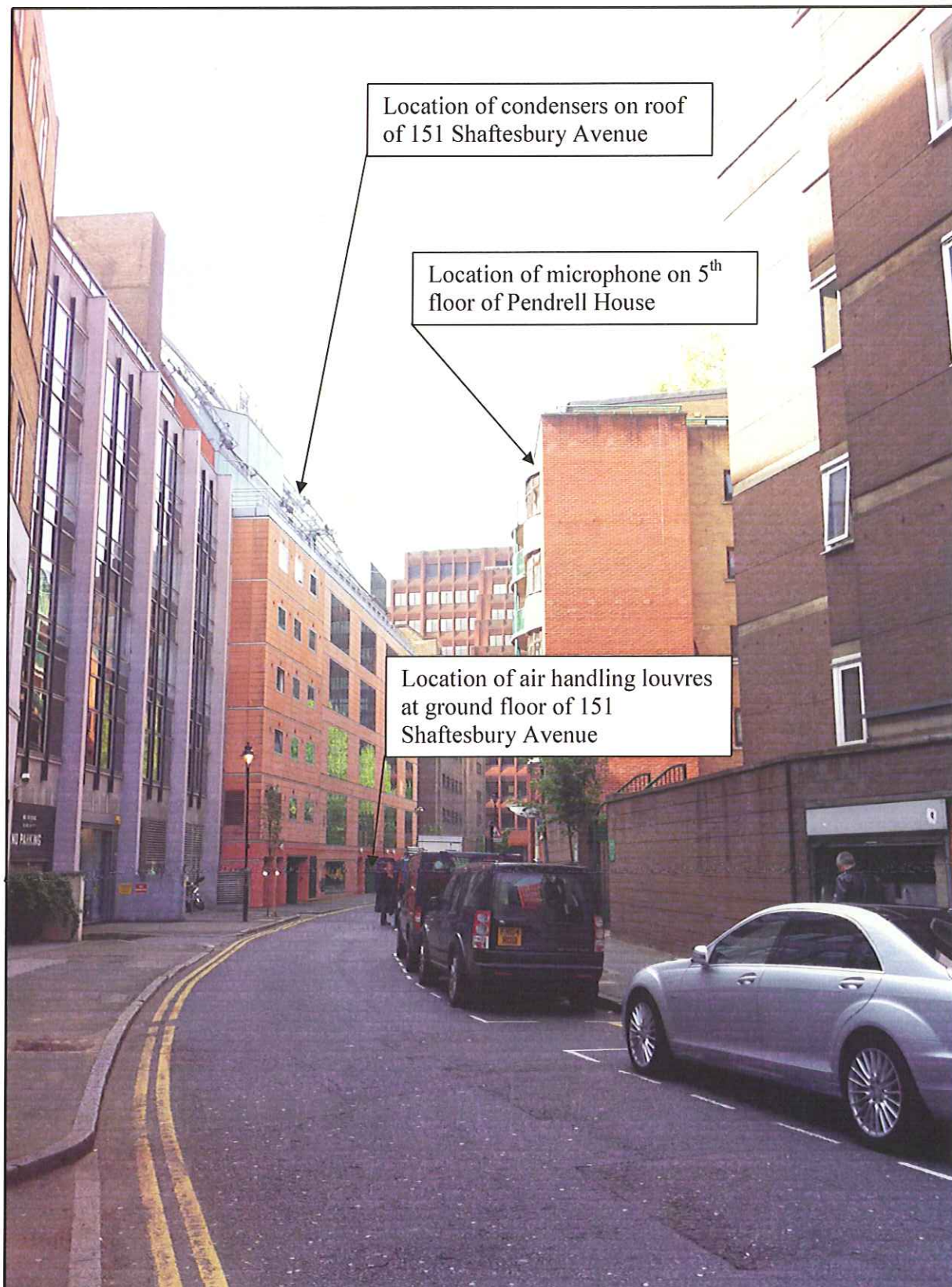
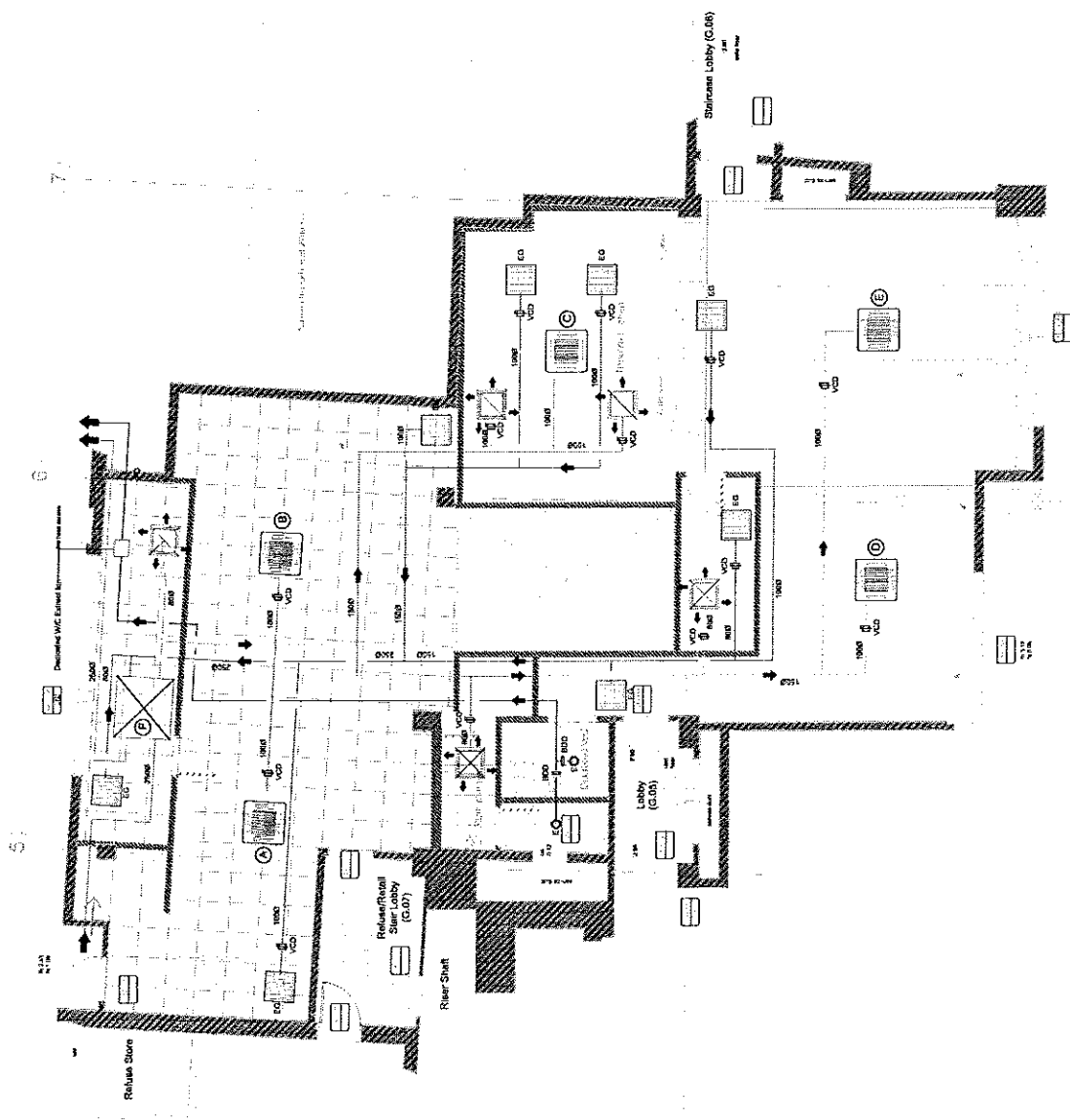


PHOTO B: Image showing location of plant and nearest affected noise sensitive properties

APPENDIX 'C'

- Drawing numbers P.0412.14 and P.0412.15


$$P(\mathbf{A}, \mathbf{B}, \mathbf{C}) = \frac{1}{2} \left(\frac{1}{2} \frac{1}{2} \frac{1}{2} \right) = \frac{1}{8}$$
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Pre-Contract Drawing Issues

[illegible]

The Fruitful Design Consultancy Ltd
Joceli B, Chiltern House, Waterside, Chesham, Bucks, HP8 1PS
T 01494 771517 E jmc@fruitful.co.uk

State Agency _____
 Date _____

175

151 Shaftosbury Avenue

Math Practice 4

Air conditioning & ventilation

Order no.	Product	Scale (g)
0044044		0.00

1:50	12.14
------	-------

29/05/12	DATE	29/05/12	DATE
JAO	INITIALS	JAO	INITIALS
BHRM	SIGNATURE	BHRM	SIGNATURE

Q. What did he tell you about the telephone call?

[illegible]

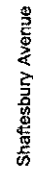
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(continued from page 10)

THE RESULTS: "We are seeing a significant increase in the number of people who are taking control of their own health," says Dr. Smith. "This is a positive trend that we hope will continue to grow."

[illegible]

P.0412.15

[illegible]