RESULTS OF A 24-HOUR NOISE LEVEL SURVEY CARRIED OUT AT THE REAR OF THE COMMERCIAL PREMISES LOCATED AT 107 GRAYS INN ROAD, LONDON WC1 AND A REPORT ON THE NOISE IMPACT OF THE PROPOSED NEW EXTERNAL PLANT

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Report Author : M G Roberts

Authorised for Release by : I J Marchant

Client	:	Conditioned Environment Mechanical Services Ltd
Project	:	107 Grays Inn Road, London WC1
Emtec Ref.	:	QF10072/PF6702/RP1
Issue Date	:	28th February 2020

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1.0. INTRODUCTION

This report details the results of a 24-hour noise survey carried out at the rear of the office building located at 107 Grays Inn Road, London WC1.

The objectives of the survey were as follows:

- To assess the proposal to install a new heat recovery unit within the building, at ground floor level, which will have fresh air and exhaust air connections to external louvres on the rear face of the building.

- To identify the nearest residential properties that might be affected by noise from the new plant.

- To establish the existing background noise level outside the nearest affected properties.

- To recommend noise limits and any necessary mitigating measures to ensure that the operation of the new plant does not disturb the occupants of the nearest affected properties and meets the planning directives of the local authority with regard to noise.

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

2.0. SITE DESCRIPTION

The building located at 107 Grays Inn Road is a five storey office building. The front façade of the building can be seen on the attached Photo A.

To the rear of the building there is residential development with windows and balconies looking directly onto the rear face of the office building at 107 Grays Inn Road. There are existing air cooled condensers, in acoustic enclosures, located at ground floor level of 107 and there are further air cooled condensers, with no acoustic treatment, located behind the adjacent building at 99 Grays Inn Road (Fanz House). The rear of the property, the adjacent residential properties and the air cooled condensers can be seen in the attached Photos B, C, D and E

An aerial overview of the site can be seen in the attached Photo F.

3.0. TEST INSTRUMENTATION

All measurement equipment used during the survey complied with the requirements of BS4142:2014 "Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas". Details of the equipment are as follows:

Integrating Sound Level Meter:	Rion type NL-52 class 1 Sound Level Meter fitted with a Rion type UC-59 ½ inch condenser microphone. Serial No.: 01232569
Statistical Analysis Modules:	Built in module capable of computing the percentile levels LA_1, LA_{10}, LA_{50}, LA_{90} and LA_{99} and also the LA_{eq} level.
Acoustic Calibrator:	Bruel & Kjaer type 4231 electronic calibrator. Serial No.: 1934160

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

3.1. Existing Noise Climate

Road traffic travelling on Grays Inn Road could be heard at the start and end of the survey, so the noise levels measured will include contributions from road vehicles.

Commercial jet aircraft were observed at medium and high altitude during the manned periods at the start and the end of the survey, so it is possible that the noise levels measured could include contributions from medium altitude jet aircraft.

There are no overland railways nearby, so the noise levels measured will not include contributions from rail noise.

Construction works were not observed being carried out in the vicinity during the manned periods at the start and end of the survey so the sound levels recorded should be typical of normal daytime background noise levels.

4.0. TEST PROCEDURE

The survey was conducted during a continuous 24-hour period from 8:02 am on Tuesday the 25th of February 2020 to 8:02 am on Wednesday the 26th of February 2020.

Data was continuously acquired throughout the measurement period with the individual averaging time for statistical noise data set to 15 minutes. The following 'A' weighted statistical measurements were recorded concurrently: -

LA_1 - The Sound Pressure Level exceeded for 1% of the measurement period.

LA_{10} - The Sound Pressure Level exceeded for 10% of the measurement period.

LA_{50} - The Sound Pressure Level exceeded for 50% of the measurement period.

LA_{90} - The Sound Pressure Level exceeded for 90% of the measurement period. LA_{90} 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 4142:2014).

LA_{99} - The Sound Pressure Level exceeded for 99% of the measurement period.

LA_{eq} - The continuous steady state Sound Pressure Level that has the same acoustic energy as the real fluctuating level.

4.1. Measurement Positions

The microphone was mounted onto a tripod boom and projected out of a first floor window at the rear of the building. The microphone was oriented vertically and was approximately 1.5 metres from the rear face of the building and approximately 5 metres above the ground floor terrace at the rear of the building. The location of the microphone can be seen on the attached Photos B, C, D and F.

The microphone was connected by a low impedance cable to the associated instrumentation which was contained within a weatherproof housing.

4.2 Weather Conditions

The weather conditions prevailing during the measurement period were in line with those recommended in BS 4142:2014: -

Weather daytime: -	Overcast	Weather night time: -	Overcast
Wind daytime: -	Calm	Wind night time: -	Light

The microphone was protected throughout the survey by an acoustically transparent wind balloon.

5.0. RESULTS AND EVALUATION OF NOISE CRITERIA

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

The 'A' Weighted L_{eq} levels measured over each 15 minute interval throughout the 24-hour period, denoted by LA_{eq}, (15 mins), are displayed as a bar graph on the attached Sketch No QF/10072/T1 at the back of this report.

The 'A' Weighted percentile levels measured over each 15 minute interval throughout the 24-hour period, denoted by LA_{10} (15 mins), LA_{50} (15 mins) and LA_{90} (15 mins) are displayed as line graphs on the attached Sketch No QF/10072/T2 at the back of this report.

5.1. Summary of Results

The table QF/10072/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/10072/D1 – Summary of Maximum and Minimum Noise Levels

	LA_{eq}	**LA_{1}**	**LA_{10}**	**LA_{50}**	**LA_{90}**	**LA_{99}**
Minimum	42dBA	45dBA	43dBA	41dBA	40dBA	40dBA
Maximum	67dBA	81dBA	63dBA	55dBA	54dBA	54dBA

The table QF/10072/D2 below states the minimum LA_{90} noise levels recorded during the time periods of 7.00am to 23.00pm (Daytime / Evening) and between 23.00pm and 7.00am (Night time)

Table QF/10072/D2 – Minimum LA_{90} Noise Levels – Daytime/Evening and Night time

	Minimum LA_{90}
Daytime/Evening (7am to 11pm)	43dBA
Night Time (11pm to 7am)	40dBA

5.2. Summary of the Local Authority's planning requirements regarding noise for noise sensitive properties

The local planning authority is the London Borough of Camden.

The Camden Local Plan sets out the Council's planning policies and replaces the Core Strategy and Development Policy planning documents (adopted in 2010). It ensures that Camden continues to have robust, effective and up-to-date planning policies that respond to changing circumstances and the borough's unique characteristics and contribute to delivering the Camden Plan and other local priorities.

The Local Plan will cover the period from 2016-2031. Policy A4 of The Local Plan is entitled Noise and Vibration and states:

The Council will seek to ensure that noise and vibration is controlled and managed. Development should have regard to Camden's Noise and Vibration thresholds (Appendix 3). We will not grant planning permission for a) a development likely to generate unacceptable noise and vibration impacts or b) a development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses. We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development.

The parts of Appendix 3 that we have identified as relevant to this application are as follows:

Appendix 3: Noise thresholds

The significance of noise impact varies dependent on the different noise sources, receptors and times of operation presented for consideration within a planning application. Therefore, Camden's thresholds for noise and vibration evaluate noise impact in terms of various 'effect levels' described in the National Planning Policy Framework and Planning Practice Guidance:

- *NOEL – No Observed Effect Level*
- *LOAEL – Lowest Observed Adverse Effect Level*
- *SOAEL – Significant Observed Adverse Effect Level*

Three basic design criteria have been set for proposed developments, these being aimed at guiding applicants as to the degree of detailed consideration needed to be given to noise in any planning application. The design criteria outlined below are defined in the corresponding noise tables. The values will vary depending on the context, type of noise and sensitivity of the receptor:

- *Green – where noise is considered to be at an acceptable level.*
- *Amber – where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development.*
- *Red – where noise is observed to have a significant adverse effect.*

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	*Assessment Location*	*Design Period*	*LOAEL (Green)*	*LOAEL to SOAEL (Amber)*	*SOAL (Red)*
*Dwellings***	*Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)*	*Day*	*'Rating level' 10dB* below background*	*'Rating level' between 9dB below and 5dB above background*	*'Rating level' greater than 5dB above background*
*Dwellings***	*Outside bedroom window (façade)*	*Night*	*'Rating level' 10dB* below background and no events exceeding 57dB L_{Amax}*	*'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}*	*'Rating level' greater than 5dB above background and/or events exceeding 88dB L_{Amax}*

**10dB should be increased to 15dB if the noise contains audible tonal elements (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.*

***levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require an NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted L_{eq} (5mins) noise levels in octave bands, 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area.

5.3. Determination of noise sensitive property design criteria

We believe that the sound produced by the new plant will not be intermittent or contain tones. To comply with a green rating from the table above the new plant should therefore have a Sound Pressure Level 10dB below the lowest LA_{90} background noise level at 1 metre from the nearest noise sensitive window.

The lowest recorded LA_{90} background noise levels measured during the 24 hour survey period are given in Table QF/10072/D2 above.

Applying the above criteria gives limiting rating levels as listed in table QF/10072/D3 below:

Table QF/10072/D3 – Proposed Design Rating Levels (LA_{eq})

Existing Noise sensitive receptor	*Design Period*	*Lowest measured background level*	***Proposed rating level***	*Proposed Local Authority criteria*
Dwellings	*Day*	*43dBA*	***33dBA***	*Green*
	Night	*40dBA*	***30dBA***	*Green*

5.4. Determination of commercial design criteria

The use of the building next door at b99 Grays Inn Road, Fanz House, consists of offices. It is therefore proposed that the recommendations given in BS8233:2014 should be followed and that Table 2 of that standard be considered.

	Good	Reasonable
Open Plan offices: $LA_{eq,T}$	45dBA	50dBA

We propose that the lower of these rating levels is adopted, i.e. 45dBA.

Assuming a 10dB noise reduction due to a partially open window the rating level at 1 metre external to the nearest affected office windows should be 45dBA + 10dB = 55dBA.

5.5. Summary of external noise criteria

Based upon the lowest measured LA_{90} background noise levels during the survey and the Council's requirements outlined above we summarise the design rating levels to be adopted for this project in table QF/10072/D4: -

Table QF/10072/D4 – recommended design rating levels $L_{Ar,T}$

Type of premises	**$L_{Ar,T}$ (7am - 11pm)**	**$L_{Ar,T}$ (11pm - 7am)**
Noise sensitive	33dBA	30dBA
Commercial	-	55dBA

6.0. DISCUSSION OF RESULTS

The new heat recovery unit within the ground floor offices is a Daikin VAM650J model and the table QF/10072/D5 below itemises the noise level of the unit and the natural attenuation to a position 1 metre from the adjacent residential windows.

Table QF/10072/D5 – Operation of Heat Recovery Unit and Natural and Required Attenuation to meet limiting LAeq level for daytime/evening use of the plant at the rear of the building (7am to 11pm)

Unit/Attenuation	Sound Pressure Level (dB ref 2 x 10^{-5} N/m^2) 63	125	250	500	1k	2k	4k	8k	dBA
Fresh Air Inlet Sound Power Level	64	60	54	50	47	43	36	29	
In duct correction	+10	+10	+10	+10	+10	+10	+10	+10	
Ducting (3m)	-2	-2	-1	-1	-1	-1	-1	-1	
End Reflection (600 mm louvre)	-8	-4	-2	0	0	0	0	0	
SWL to SPL at inlet	-8	-8	-8	-8	-8	-8	-8	-8	
Distance loss – 6 metres (20log 5)	-14	-14	-14	-14	-14	-14	-14	-14	
Reverberation	+3	+3	+3	+3	+3	+3	+3	+3	
Emtec RAAC/43/600 silencer	-3	-5	-11	-19	-23	-22	-17	-9	
SPL at 1m from window	42	40	31	21	14	11	9	10	28
Exhaust Sound Power Level	64	60	54	50	47	43	36	29	
In duct correction	+10	+10	+10	+10	+10	+10	+10	+10	
Ducting (8m)	-5	-5	-3	-3	-3	-3	-3	-3	
End Reflection (600 mm louvre)	-8	-4	-2	0	0	0	0	0	
2 Bends	0	0	0	0	-2	-4	-6	-6	
SWL to SPL at outlet	-8	-8	-8	-8	-8	-8	-8	-8	
Distance loss – 6 metres (20log 5)	-14	-14	-14	-14	-14	-14	-14	-14	
Reverberation	+3	+3	+3	+3	+3	+3	+3	+3	
Emtec RAAC/43/600 silencer	-3	-5	-11	-19	-23	-22	-17	-9	
SPL at 1m from window	39	37	29	19	10	5	1	2	25
Overall SPL at 1m from window due to operation of HRU	44	42	33	23	15	12	10	11	30

Based upon the above calculations the noise level at 1 metre from the nearest neighbouring residential window will be 30dBA due to the operation of the new Heat Recovery Unit and this is 3dB below the limiting LAeq noise level that would allow operation of the unit from 7am to 11pm.

If the fresh air and exhaust air ducts are fitted with the Emtec RAAC/43/600 silencers listed in the above calculations the operation of the new Heat Recovery Unit will create a noise level that is below the limiting LAeq noise level listed in table QF/10072/D4 for daytime/evening operation of the plant and will meet the planning requirements of the local council.

Emtec Products Ltd
28th February 2020

APPENDIX 'A'

Raw Data – Noise Survey

25th of February 2020 to 26th of February 2020

EMTEC PRODUCTS LTD.

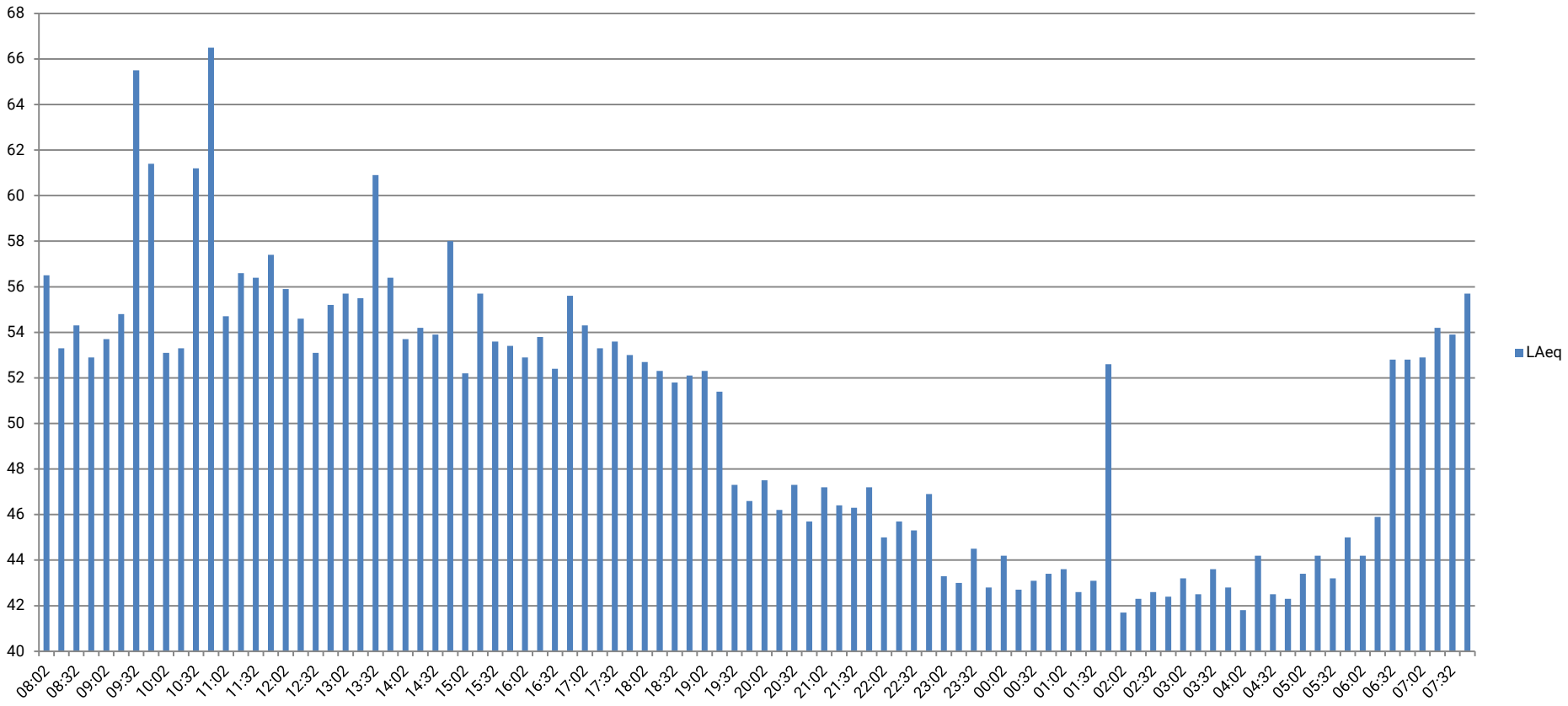
Project: 107 Grays Inn Road, London WC1
Client: Conditioned Environment Mechanical Services Ltd
Date: 25th to 26th February 2020
Serial No: 01232569

Address	Start Time	LA_{eq}	LE	Lmax	Lmin	LA_{1}	LA_{10}	LA_{50}	LA_{90}	LA_{99}
1	08:02	57	86	78	52	66	57	55	54	53
2	08:17	53	83	63	46	58	55	53	48	48
3	08:32	54	84	65	48	61	56	53	52	51
4	08:47	53	83	61	48	57	55	53	52	49
5	09:02	54	83	74	50	58	55	53	52	52
6	09:17	55	84	86	50	56	55	53	52	51
7	09:32	66	95	91	50	79	59	55	53	52
8	09:47	61	91	90	47	68	56	53	50	49
9	10:02	53	83	72	47	58	54	53	50	49
10	10:17	53	83	74	45	60	54	53	48	47
11	10:32	61	91	82	46	75	60	53	52	50
12	10:47	67	96	88	51	81	63	55	53	52
13	11:02	55	84	75	47	62	56	54	50	49
14	11:17	57	86	81	45	65	56	54	51	49
15	11:32	56	86	83	45	67	58	53	48	47
16	11:47	57	87	82	49	67	57	54	52	51
17	12:02	56	86	78	47	67	56	53	49	48
18	12:17	55	84	73	46	59	56	54	49	48
19	12:32	53	83	73	45	61	55	53	47	47
20	12:47	55	85	76	47	62	57	54	52	52
21	13:02	56	85	74	46	67	56	53	49	48
22	13:17	56	85	74	48	66	56	53	50	50
23	13:32	61	91	83	47	74	58	53	50	49
24	13:47	56	86	81	47	66	57	53	50	49
25	14:02	54	83	73	47	60	56	53	49	49
26	14:17	54	84	73	47	66	55	52	49	48
27	14:32	54	84	75	46	62	56	52	48	48
28	14:47	58	88	79	46	71	58	53	49	48
29	15:02	52	82	74	45	59	54	52	47	47
30	15:17	56	85	78	46	65	55	53	50	49
31	15:32	54	83	80	44	57	55	53	48	46
32	15:47	53	83	60	48	56	55	53	51	51
33	16:02	53	83	67	46	58	55	53	49	48
34	16:17	54	83	73	45	64	54	52	47	46
35	16:32	52	82	62	45	58	54	52	48	47
36	16:47	56	85	65	52	60	57	55	54	54
37	17:02	54	84	64	51	57	56	54	52	52
38	17:17	53	83	62	49	56	55	53	52	51
39	17:32	54	83	64	51	59	55	53	52	51
40	17:47	53	83	59	49	55	55	53	51	51
41	18:02	53	82	65	47	56	54	53	49	48
42	18:17	52	82	60	47	54	53	53	51	50
43	18:32	52	81	64	46	57	53	52	48	47
44	18:47	52	82	64	44	60	54	52	45	45
45	19:02	52	82	65	44	55	55	52	46	45
46	19:17	51	81	70	44	56	53	52	46	46
47	19:32	47	77	57	43	54	49	46	45	45
48	19:47	47	76	61	44	52	48	46	45	45
49	20:02	48	77	61	43	53	50	47	45	45

50	20:17	46	76	62	43	52	48	46	45	44
51	20:32	47	77	59	43	55	49	46	45	44
52	20:47	46	75	55	43	49	47	45	44	44
53	21:02	47	77	61	43	58	48	45	44	44
54	21:17	46	76	60	43	53	48	46	44	44
55	21:32	46	76	63	42	54	48	45	44	43
56	21:47	47	77	66	43	58	48	45	44	44
57	22:02	45	75	58	42	49	46	45	43	43
58	22:17	46	75	70	43	51	47	45	44	44
59	22:32	45	75	59	42	51	47	45	44	43
60	22:47	47	77	64	42	57	49	44	43	43
61	23:02	43	73	53	41	46	44	43	42	42
62	23:17	43	73	53	41	47	44	43	42	42
63	23:32	45	74	53	41	48	46	44	43	43
64	23:47	43	72	59	41	46	44	43	42	42
65	00:02	44	74	58	41	51	46	43	42	42
66	00:17	43	72	54	40	46	44	42	41	41
67	00:32	43	73	53	40	47	45	43	42	41
68	00:47	43	73	63	40	51	44	42	41	41
69	01:02	44	73	56	40	51	45	43	42	41
70	01:17	43	72	55	40	47	44	42	41	41
71	01:32	43	73	56	40	46	45	43	41	41
72	01:47	53	82	77	39	67	45	41	40	40
73	02:02	42	71	54	39	45	43	41	40	40
74	02:17	42	72	59	39	48	44	41	40	40
75	02:32	43	72	55	39	46	44	42	41	41
76	02:47	42	72	58	39	50	44	41	41	40
77	03:02	43	73	57	40	51	45	42	41	41
78	03:17	43	72	52	39	46	44	42	41	41
79	03:32	44	73	57	39	51	46	43	41	41
80	03:47	43	72	61	39	51	44	41	40	40
81	04:02	42	71	53	40	46	43	41	41	40
82	04:17	44	74	56	40	49	46	44	42	42
83	04:32	43	72	55	40	49	44	42	41	41
84	04:47	42	72	52	40	47	44	42	41	41
85	05:02	43	73	58	40	50	45	42	42	41
86	05:17	44	74	52	40	48	46	44	42	41
87	05:32	43	73	54	40	48	45	43	42	41
88	05:47	45	75	58	41	52	47	44	42	42
89	06:02	44	74	58	42	48	45	44	43	43
90	06:17	46	76	64	43	51	47	45	44	43
91	06:32	53	82	61	45	56	55	53	47	46
92	06:47	53	82	71	44	56	55	52	52	47
93	07:02	53	83	67	43	56	55	54	44	44
94	07:17	54	84	63	52	57	55	55	52	52
95	07:32	54	84	74	46	58	55	53	52	51
96	07:47	56	85	70	51	64	57	55	53	53

APPENDIX ‘B’

Photos and Drawing



TITLE: *LAeq Levels*	*ISSUE DATE:* *26th February 2020*				*DRAWN BY:* *MGR*	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*
CLIENT: Conditioned Environment Mechanical Services Ltd	*PF No: 6702*				*APPROVED BY:* *MGR*	*REVISION*							
PROJECT: 107 Grays Inn Road, London WC1	*Q*	*A*	*M*	*I*	*DESIGN AUTH:* *MGR*	*SKETCH No. QF/10072/T1*							

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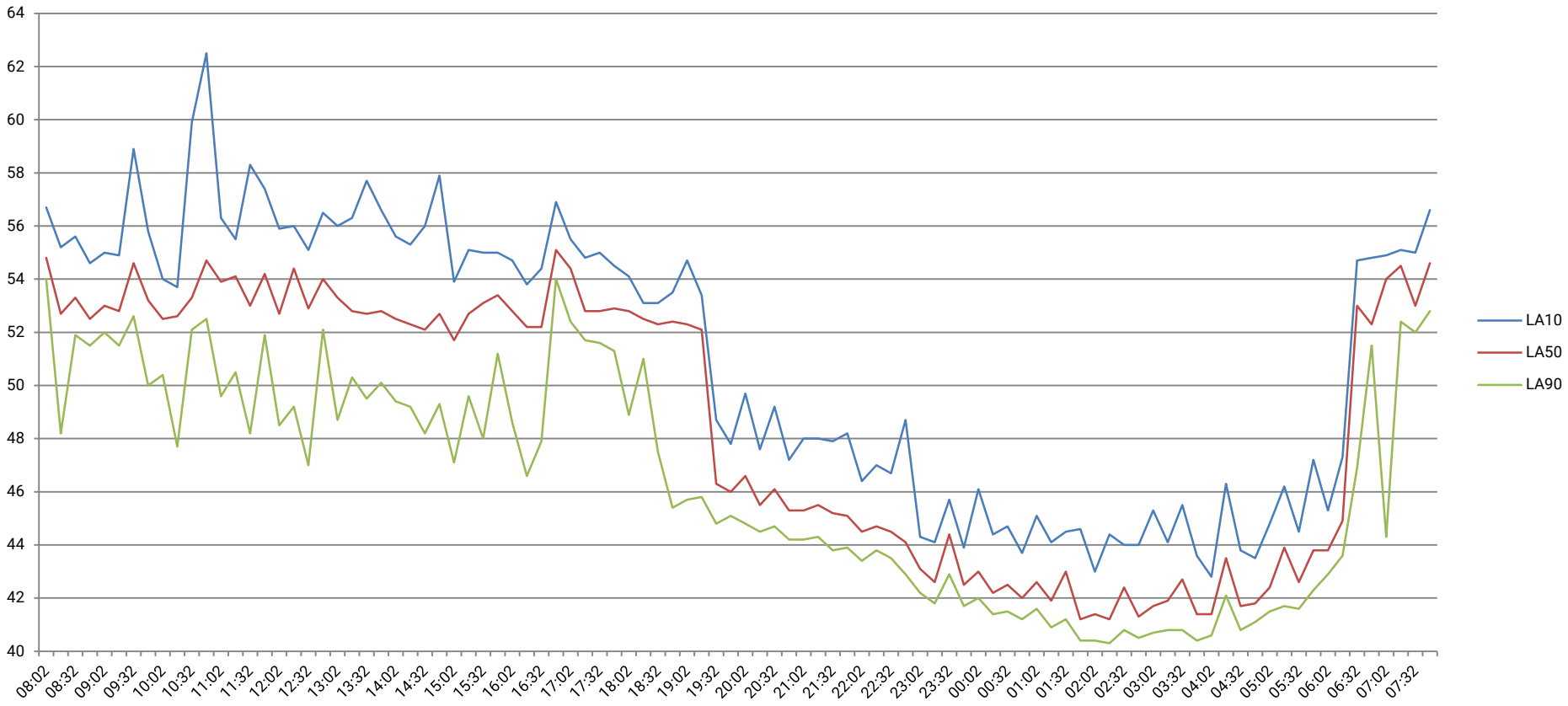

TITLE: *LA10; LA50 & LA90 Levels*	*ISSUE DATE:* *26th February 2020*				*DRAWN BY:* *MGR*	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*
CLIENT: Conditioned Environment Mechanical Services Ltd	*PF No: 6702*				*APPROVED BY:* *MGR*	*REVISION*							
PROJECT: 107 Grays Inn Road, London WC1	*Q*	*A*	*M*	*I*	*DESIGN AUTH:* *MGR*	*SKETCH No. QF/10072/T2*							

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Photo A – Front Façade of the Office Building at 107 Grays Inn Road

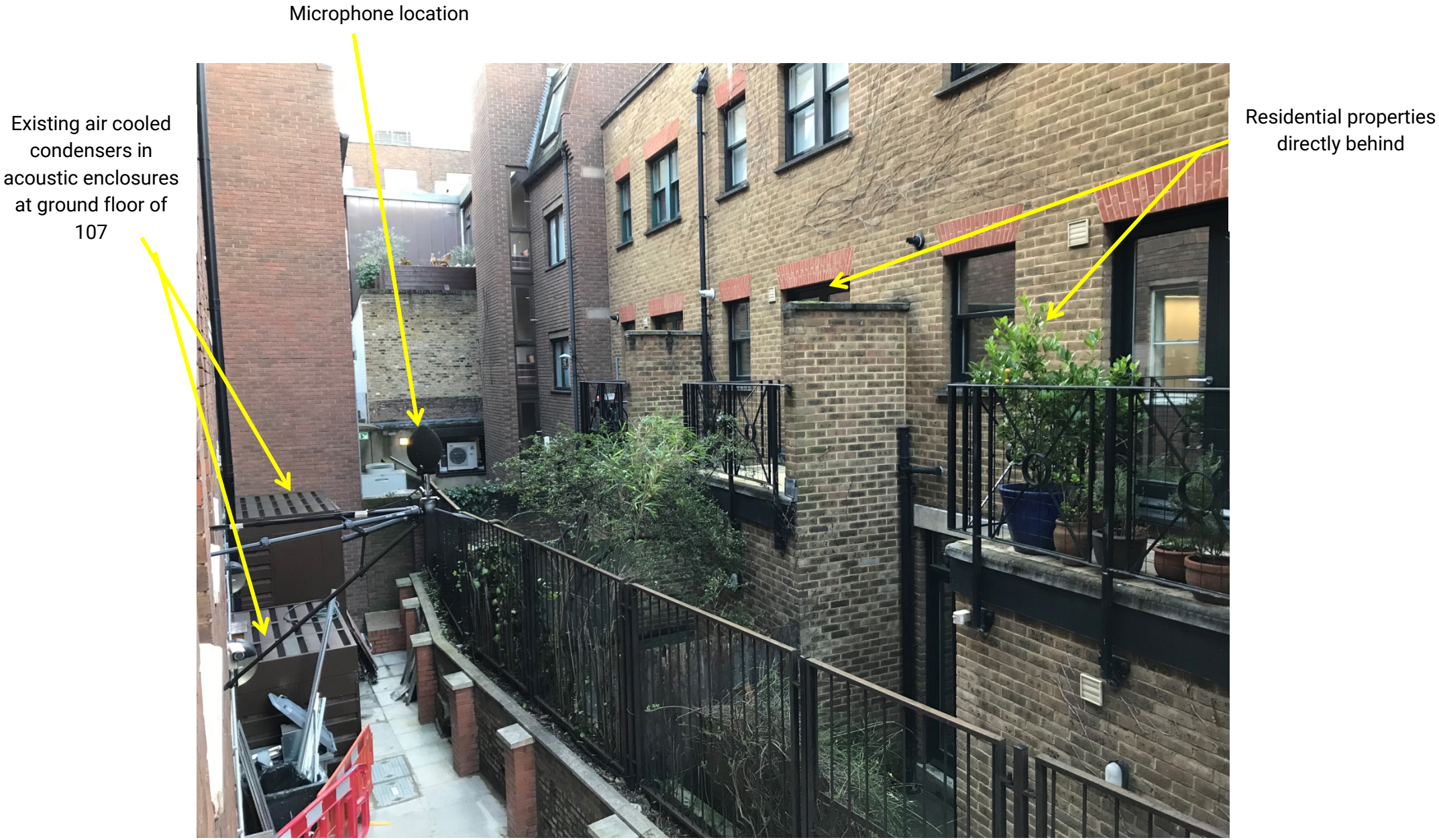


Photo B – Rear of 107 Grays Inn Road with Microphone Location, acoustically treated condensers & neighbouring properties

Photo C – Location of microphone above newly installed fresh air & exhaust louvres of ground floor heat recovery unit

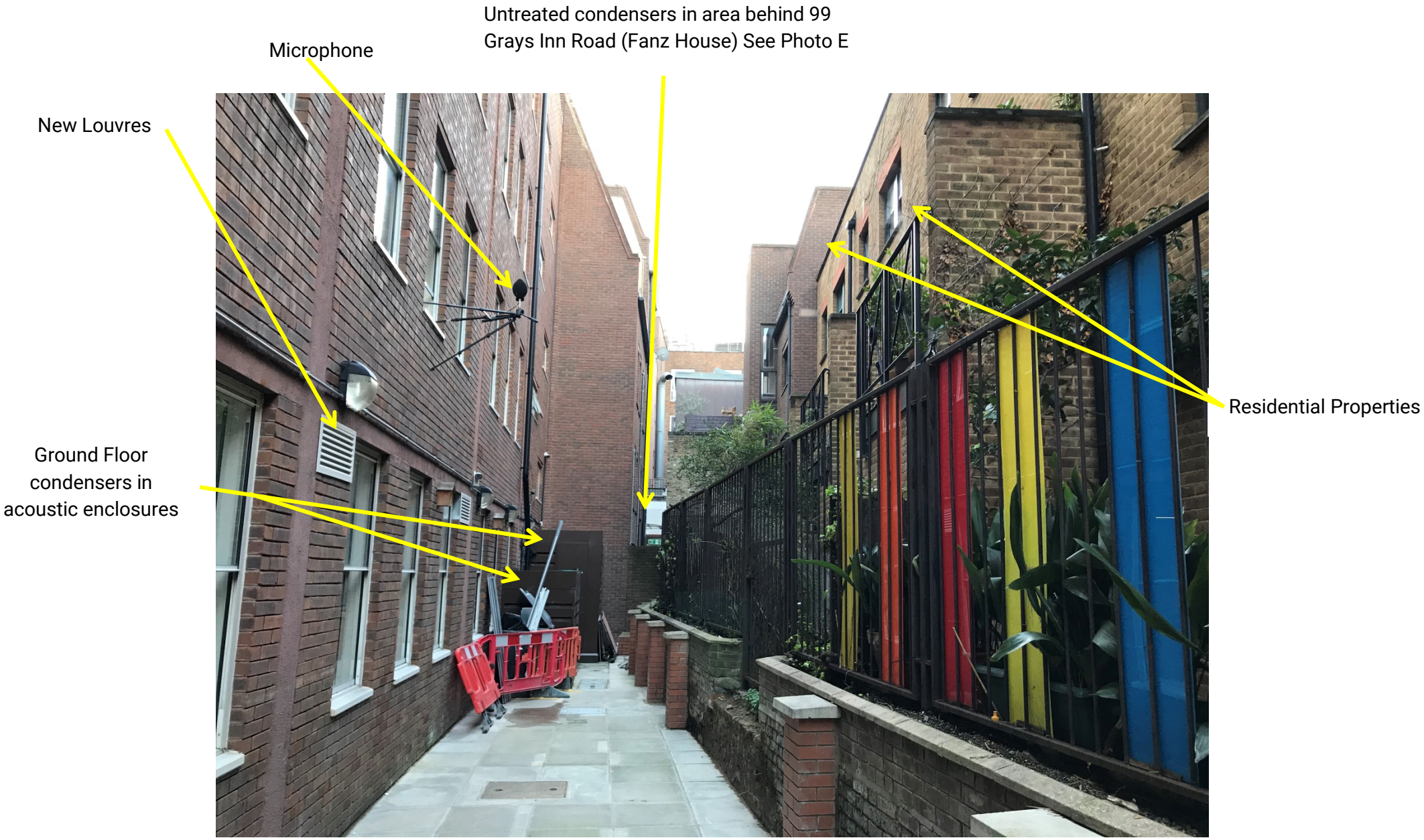


Photo D – Rear of 107 Grays Inn Road with residential properties directly behind

Photo E – Untreated Air Cooled Condensers behind 99 Grays Inn Road (Fanz House)

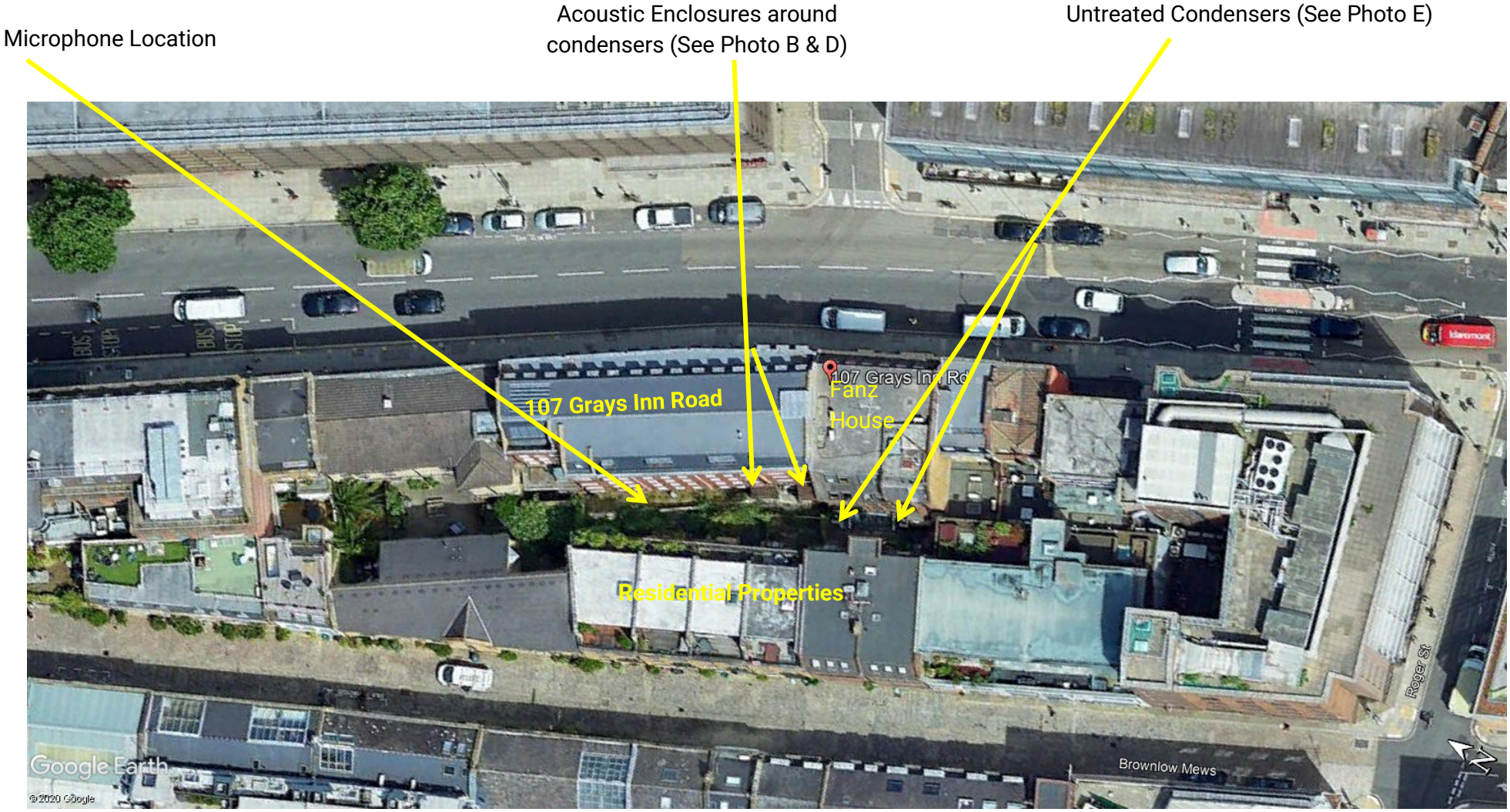
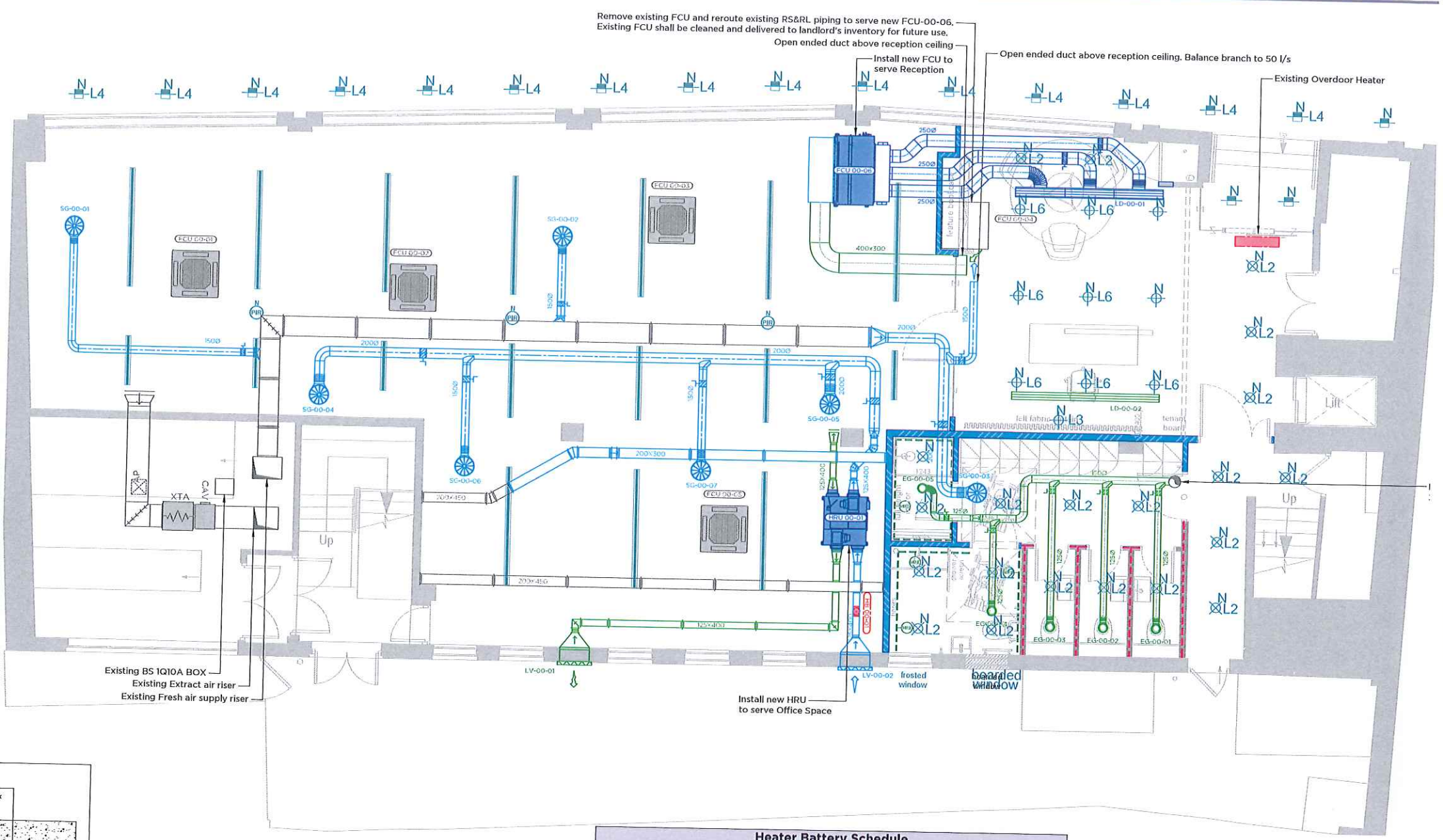


Photo F – Aerial View of 107 Grays Inn Road with Microphone Position and Adjacent Residential/Commercial Properties



Heater Battery Schedule

Reference	Manufacturer	Model	Location	Electrical Details		Dimensions			Options
				Power Supply	Power	Height	Width	Diameter	
				Ø, Hz, V	kW	mm	mm	mm	
HB 00-01	Daikin	VH4/AB	Floor 00 - Open Area	-	2.5	-	-	250Ø	

Notes:

Heat Recovery Unit Schedule

Reference	Manufacturer	Model	Location	Duty	Static Pressure	Electrical Details					Sound		Weight	Dimensions		
						Power Supply	Specific Fan Power	Motor Power	Running Current	Fuse Rating	Low	High		Height	Width	Depth