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43 STORE STREET, LONDON, WC1

Technical Note

Acoustic Assessment Report

4th July 2018 Peter Clark

1. INTRODUCTION

1.1 A noise survey has been carried out at the commercial/residential property 43 Store Street, London, WC1. The ground floor area of 43 Store Street is a Café/restaurant which is to be refurbished. A part of the proposed work includes the installation of a new kitchen extract and ventilation system. The noise survey and assessment report is required to accompany a Planning Application for the installation of the supply air and kitchen extract system with fan and ductwork which will run vertically at the rear of 43 Store Street to discharge above roof level. Although the ground floor of 43 Store Street is commercial use, the upper three floors above are divided into residential flats. 43 Store Street lies close to the corner of Gower Street and Store Street itself. The neighbouring properties in Store Street are also commercial/retail spaces at ground floor level with residential flats above. The Staunton Hotel lies on the corner of Gower Street/Store Street with rear windows overlooking the rear of 43 Store Street. The nearest neighbouring areas for assessment purposes are (a) the rear windows of the top floor flat in 43 Store Street and (b) the rear windows of the first floor flat in 43 Store Street.

1.2 The measurements have shown that the proposed installation will meet with the requirements of the London Borough of Camden (LBC) Environmental Noise Policy <u>with additional noise attenuation measures</u>.

These measures include ductwork silencers which are to be installed in both the supply air and kitchen extract systems.

1.3 The site location and surroundings are given in Figure 1 below:

Figure 1: Site Location (© Google Maps) – 43 Store Street (from rear)

2.0 NOISE MEASUREMENTS

2.1 Environmental noise measurements were carried out from Thursday 7th to Wednesday 13th June 2018. Sound level measurement equipment was installed on the roof at 41 Store Street close to the neighbouring properties and used to log noise levels over the six day period. The measurement equipment is listed below in Table 1.

Table 1 Environmental Noise Measurement Instrumentation

No.	Description
1.	Larson Davis Model 812 Sound Level Meter.
2.	Larson Davis Model 2541 1/2" Diameter Condenser Microphone.
3.	Larson Davis Model CAL200 Sound Level Meter Calibrator.

2.2 All acoustic equipment conforms to the relevant parts of BS EN 60651:1994 (equivalent to BS 5969:1981) for the requirements of Type 1 acoustic accuracy. Additionally, the relevant equipment conforms to the specifications contained within BS EN 60804:1994 (equivalent to BS 6698:1976) for integrating sound level meters.

2.3 In order to verify the correct operation of the equipment on site, an acoustic calibrator was applied during the course of the measurements. A maximum change of 0.1 dB(A) was noted, this can be considered as an insignificant change. The calibrator complies with the specifications of IEC 942:2003. The equipment was previously laboratory calibrated in January 2018.

2.4 Fast meter response was used for all measurements carried out during the course of the survey.

2.5 Noise levels are expressed in terms of continuous equivalent noise levels (L_{Aeq}) over an appropriate time period. The use of L_{Aeq} allows non-steady and non-continuous noise to be assessed and compared to the existing noise climate. L_{Aeq} is referred to as the ambient noise level. In addition to this background noise levels have also been measured and are expressed as L_{A90}. A full explanation of terminology commonly used in the measurement and assessment of noise levels is given in Appendix B at the end of this report.

3.0 RESULTS

3.1 Noise level measurements were carried out at 5 minute intervals during the survey period. Ambient (L_{Aeq}) and background (L_{A90}) noise levels were measured. Minimum noise levels for the day-time (07:00 to 19:00 hrs), evening time period (19:00 to 23:00 hrs) and night time period (23:00 to 07:00 hrs) have been determined. Results for each measurement location are summarised in Table 2 below:

Table 2: Summary Results

	Day	Evening	Night
L_{A90}	52.4	50.9	48.1 (45.3)*
L_{Aeq}	62.3	53.7	51.2

*Note: The lowest night time background noise level measured during the survey period was 45.3 dB(A) and occurred at 2am on Saturday 9th June 2018.

3.2 Although the survey was not attended on a full time basis, it was noted that during site visits that noise from traffic using Gower Street was audible. There are also a number of external air conditioning units on neighbouring buildings which could also be heard. Weather during the survey period was generally dry with light winds. A full listing of measured noise data for the period is given in the graph at the end of this report (Figure A1). A photograph showing the noise monitor in position at the property is shown in Figure A2.

3.3 Noise level data for the proposed supply air and kitchen extract fan units are given in Figure A3. Noise levels for the both fans are 69 dB(A) sound pressure level measured at 1m (See attached data sheets shown in Figures A3). For the kitchen extract system, the nearest neighbouring window/area of interest to be assessed is the rear window in the top floor flat in 43 Store Street. For the supply air and toilet extract system, the nearest window is at the rear of the first floor flat in 43 Store Street. Respective layouts are shown in Figures A4a and b. Calculated noise levels are as follows (see also Figure A5 at the end of this report):

Kitchen Extract (with respect to the top floor flat in 43 Store Street)

- Total Unit S.P.L at 1m: 69 dB(A)
- Attenuation from ductwork system and termination: - 15 dB(A)
- Attenuation from 2 off 1m long ductwork silencers: -16 dB(A) [1]
- Distance correction (2m): - 6.0 dB(A)
- Resultant predicted noise level: 32.0 dB(A)

Supply Air (with respect to 1st floor flat in 43 Store Street)

- Unit S.P.L. at 1m: 69 dB(A)

[1] See performance data of typical silencer shown in Figure A6. Note these silencers are internally lined with a "melinex" facing to aid cleaning.

- Attenuation from ductwork system and termination: - 5 dB(A)
- Attenuation from 1500mm long ductwork silencer: -26.5 dB(A)[2]
- Distance correction (1.5m): - 3.5 dB(A)
- Resultant predicted noise level: 34.0 dB(A)

3.4 The London Borough of Camden Local Plan (Adopted Version) Policy A4 "Noise and Vibration" states that *"The Council will seek to ensure that noise and vibration is controlled and managed"*. Furthermore the policy states that *"Developments should have regard to Camden's Noise and Vibration Thresholds (Appendix 3)"*. Appendix 3; Table C "Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)" is listed below. In Table C;

- NOEL refers to "No Observed Effect Level"
- LOAEL refers to "Lowest Observed Adverse Effect Level"
- SOAEL refers to "Significant Observed Adverse Effect Level"

Each of these terms are described in greater detail in the National Planning Policy Framework and Planning Practice Guidance"

Existing Noise Sensitive Receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Dwellings	Garden used for main amenity (free field) and	Day	"Rating level" 10dB* below background	"Rating level" between 9 dB below	"Rating level" greater than

[2] See performance data of typical silencer shown in Figure A6.

Dwellings	outside living or dining or bedroom window (façade)			and 5 dB above background	5 dB above background
	Outside bedroom window (façade)	Night	"Rating level" 10dB* below background and no events exceeding 57 dB L_{Amax}	"Rating level" between 9 dB below and 5 dB above background or noise events between 57 dB and 88 dB L_{Amax}	"Rating level" greater than 5 dB above background and/or events exceeding 88 dB L_{Amax}

** 10 dB should be increased to 15 dB if the noise contains audible tonal elements (day or night) …*

3.5 The proposed ventilation equipment does not attract the + 5 dB(A) correction referred to in *"BS4142" and Table C above* (i.e. contains no distinguishable discrete continuous note or distinct impulses)

3.6 It therefore follows that the criterion to meet is 35.3 dB(A)[3] for all neighbouring areas/windows (the noise level being 10 dBA less than the lowest night-time background noise level measured during the noise survey). The proposed installation is shown to meet with the criterion with the additional noise control measures (ductwork silencers) fitted.

[3] These levels being below the LOAEL as referred to in Appendix 3: Noise Thresholds of Camden Policy A4 and as such fall into the "Green" category *where noise is considered to be an acceptable level.*

3.7 London Borough of Camden Policy A4 Appendix 3 also states that in some cases *"… the Council will generally also require a NR curve specification of NR35 or below … 1 metre from the façade of the affected premises …"*. Detailed calculations (including frequency data) for each receptor is given in Figure A5 where the resulting noise levels are also plotted with reference to the NR35 spectrum.

4.0 CONCLUSION

4.1 A noise measurement survey and assessment has been carried out on the supply air and kitchen extract systems which are to be installed at 43 Store Street, London WC1. Each fan unit is to be located internal to the building fabric with intake and discharge at the rear of the building. The kitchen extract system will terminate above roof level and the supply air system will terminate at first floor level.

4.2 The proposed installation has been shown to meet with the London Borough of Camden's acoustic criteria. The required silencer acoustic performance is specified.

APPENDIX A: GRAPHS AND FIGURES.

Figure A1: Environmental Noise Data at 43 Store Street, London WC1 – 7th to 13th June 2018.

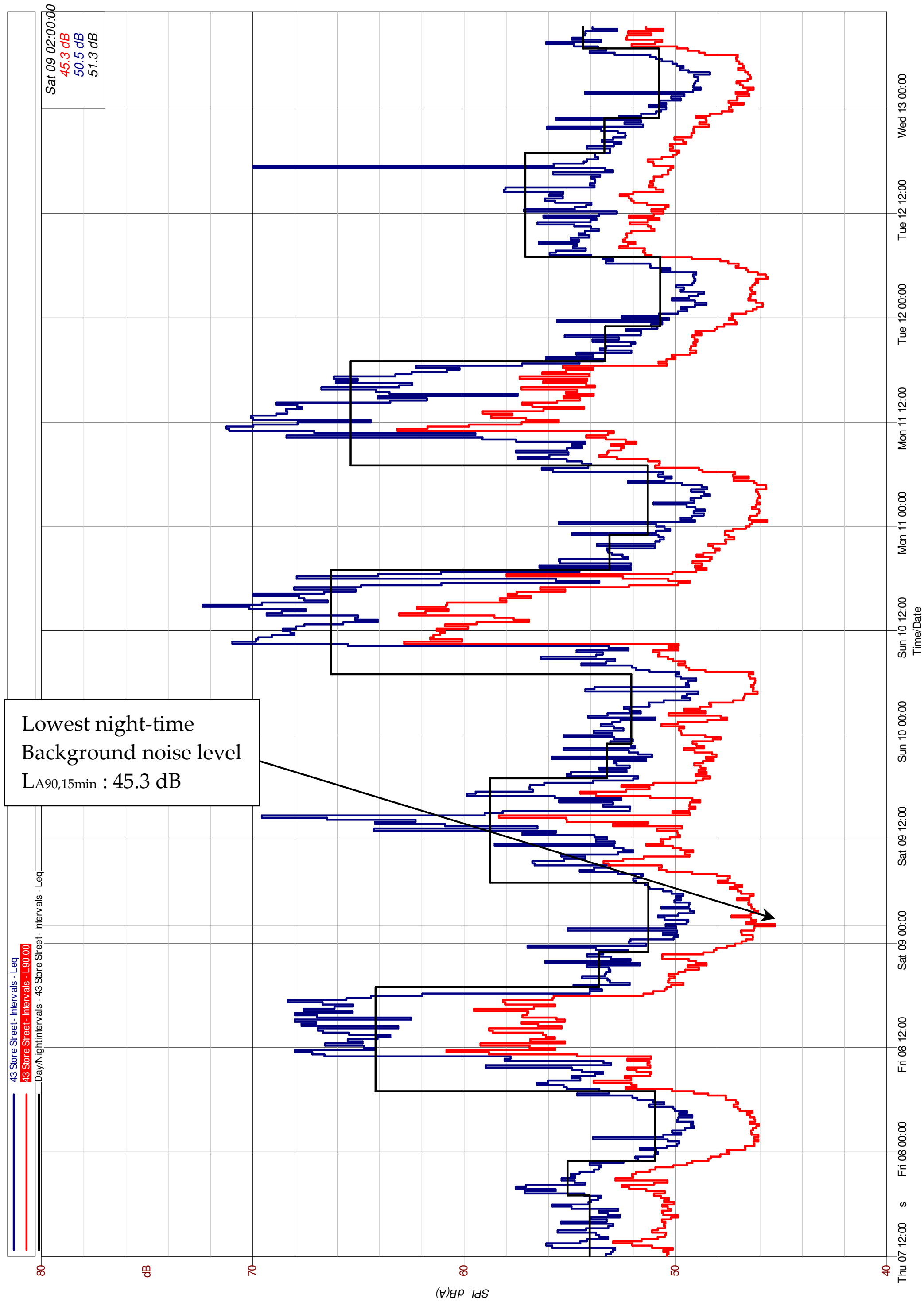


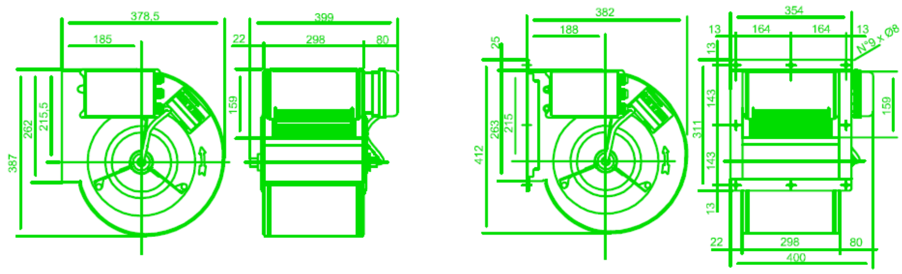
Figure A2: Noise Monitoring Equipment on the roof at 41 Store Street

Figure A3: Equipment Noise Data

Supply Fan

SUPPLY FAN

DDMP 9/9 Poles: 8



Sound pressure level for inlet side (Lp) in dB

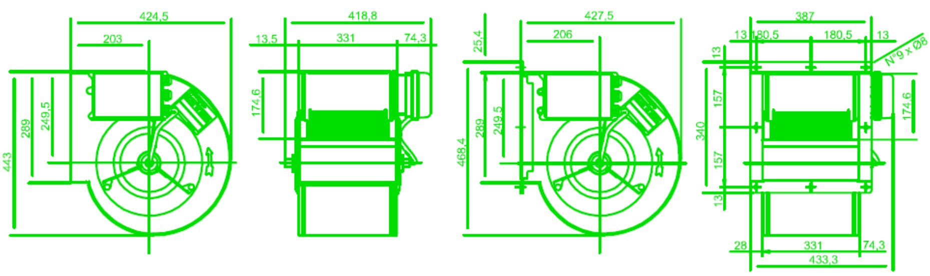
63	125	250	500	1k	2k	4k	8kHz	LpA
57.2	67.4	71.8	61.5	62.4	61.7	56.6	50.3	68.6

Data taken from ITD Consultants dwg ref 18/2540/M01 Rev P1 dated May 2018

Extract Fan

EXTRACT FAN

DDMP 10/10 Poles: 8

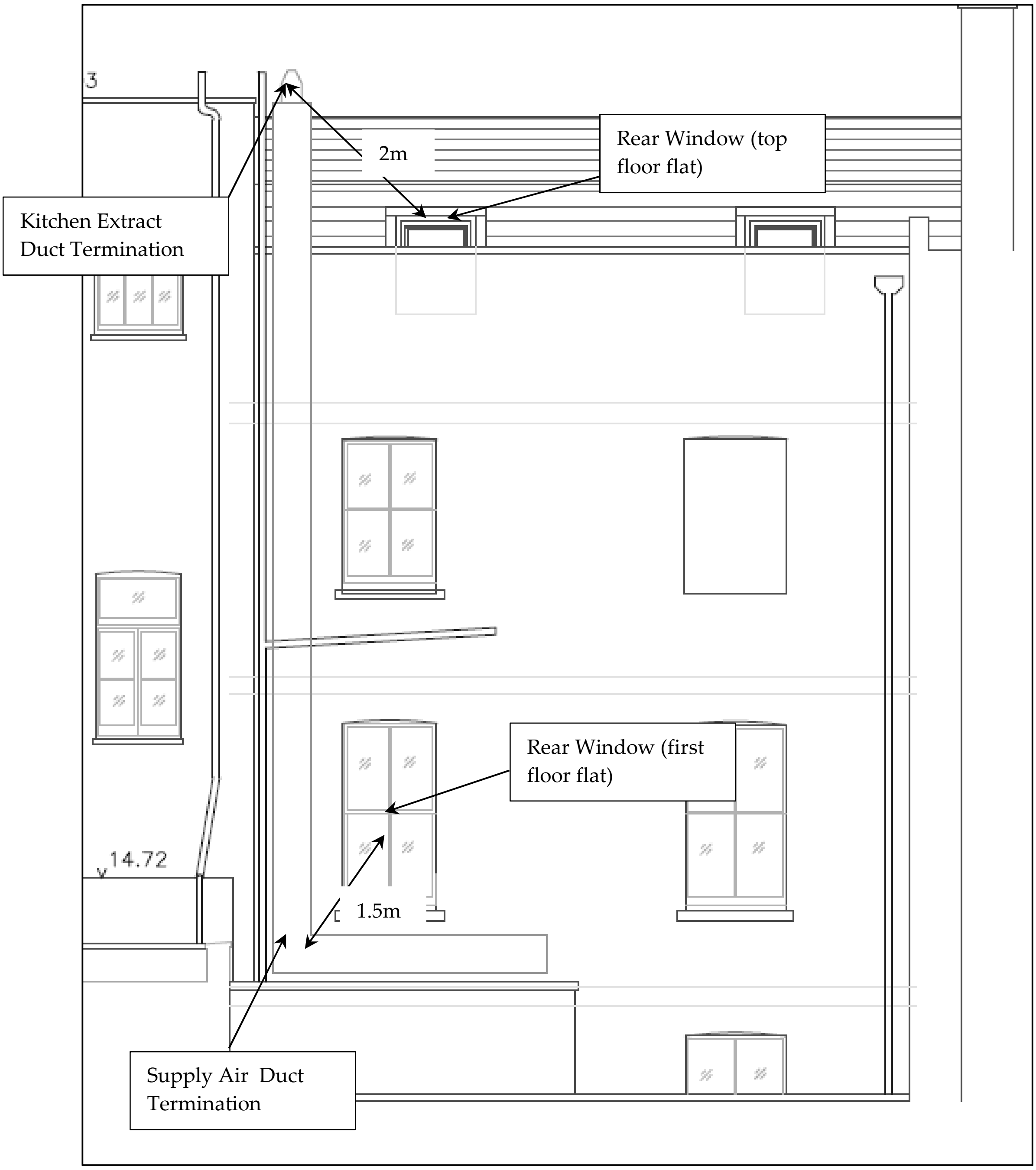


Sound pressure level for inlet side (Lp) in dB

63	125	250	500	1k	2k	4k	8kHz	LpA
58.4	71.4	73.4	62.0	62.8	59.1	58.7	51.5	69.2

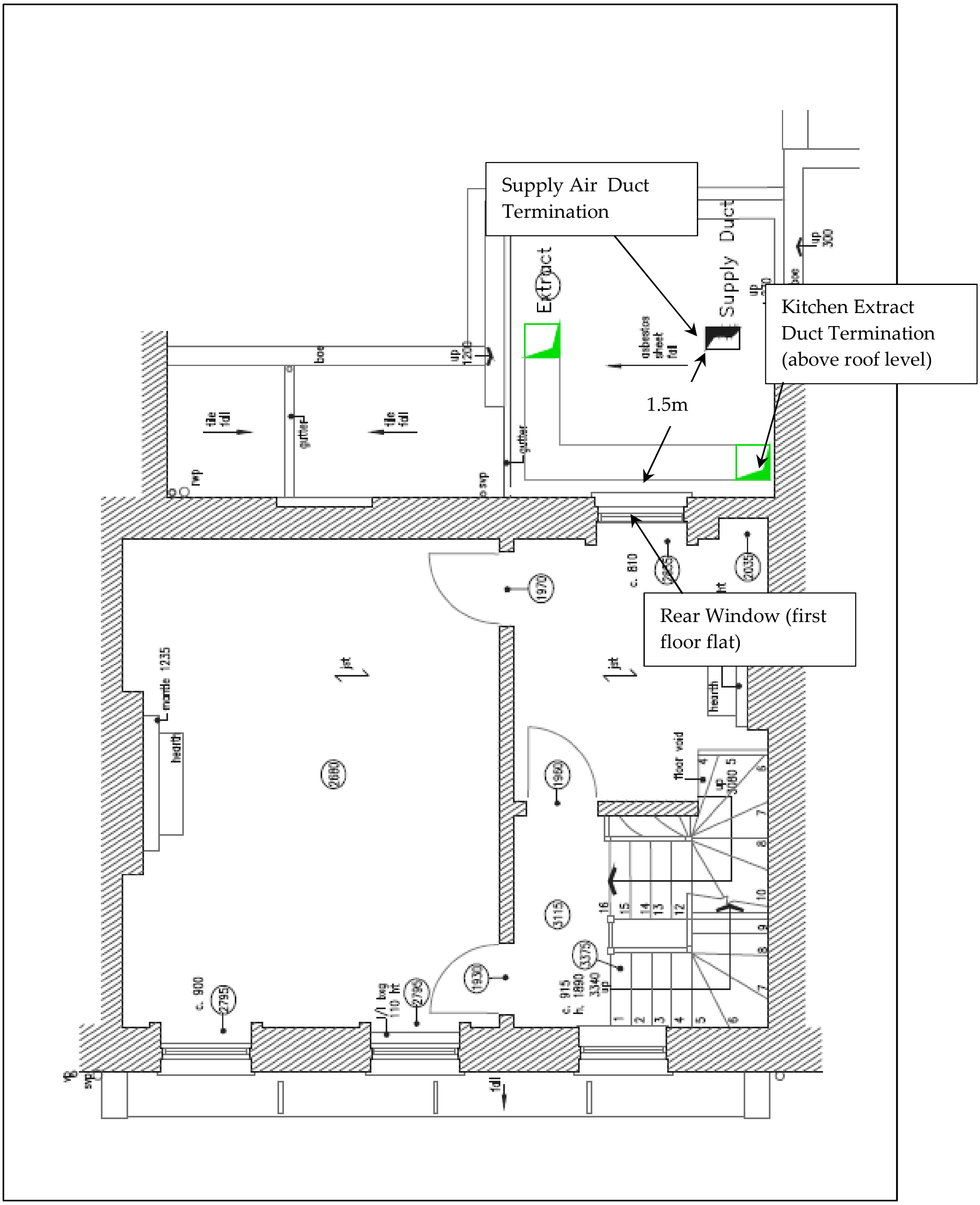
Data taken from ITD Consultants dwg ref 18/2540/M01 Rev P1 dated May 2018

Figure A4a: Layout Drawing (Rear Elevation)



Extract from The Bedford Estate Dwg BB261-2018-002 dated July 2018

Figure A4b: Layout Drawing (Plan)



Extract from The Bedford Estate Dwg BB261-2018-002 dated July 2018

Figure A5: Detailed Calculations and NR curves

Kitchen Extract Noise

Octave Band Frequency

		63	125	250	500	1k	2k	4k	8k	A
1. Extract Fan										
1.1 SPL at 1m		58.0	71.0	73.0	62.0	63.0	59.0	59.0	51.0	
A-weighting		-26.0	-16.0	-9.0	-3.0	0.0	1.0	1.0	-1.0	
		32.0	55.0	64.0	59.0	63.0	60.0	60.0	50.0	69
2. Ductwork										
Ductwork (Int)	10m	-1.0	-2.0	-3.0	-4.0	-5.0	-5.0	-5.0	-5.0	
External Duct	6m	0.0	-1.0	-2.0	-3.0	-4.0	-5.0	-5.0	-5.0	
End Reflection	450mm dia	-8.0	-6.0	-2.0	-1.0					
Directivity		-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	
3. Silencer										
4D (1m no pod - melinex)		0.0	-4.0	-7.0	-7.0	-15.0	-20.0	-19.0	-16.0	
4D (1m no pod - melinex)		0.0	-4.0	-7.0	-7.0	-15.0	-20.0	-19.0	-16.0	
4. Distance (2m)		-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
5. Receptor SPL										
Top Floor Window		10.0	25.0	30.0	24.0	11.0	-3.0	-1.0	-5.0	32

Supply Fan Noise

Octave Band Frequency

		63	125	250	500	1k	2k	4k	8k	A
1. Supply Fan										
1.1 SPL at 1m		57.0	67.0	72.0	61.0	62.0	62.0	57.0	50.0	
A-weighting		-26.0	-16.0	-9.0	-3.0	0.0	1.0	1.0	-1.0	
		31.0	51.0	63.0	58.0	62.0	63.0	58.0	49.0	68
2. Ductwork										
Internal Duct	6m	0.0	-1.0	-2.0	-3.0	-4.0	-5.0	-5.0	-5.0	
End Reflection	450mm dia	-8.0	-6.0	-2.0	-1.0					
3. Silencer										
33/1500		-7.0	-13.0	-23.0	-37.0	-43.0	-44.0	-35.0	-27.0	
4. Distance (1.5m)		-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	
5. Receptor SPL										
1st Floor Window		12.5	27.5	32.5	13.5	11.5	10.5	14.5	13.5	34

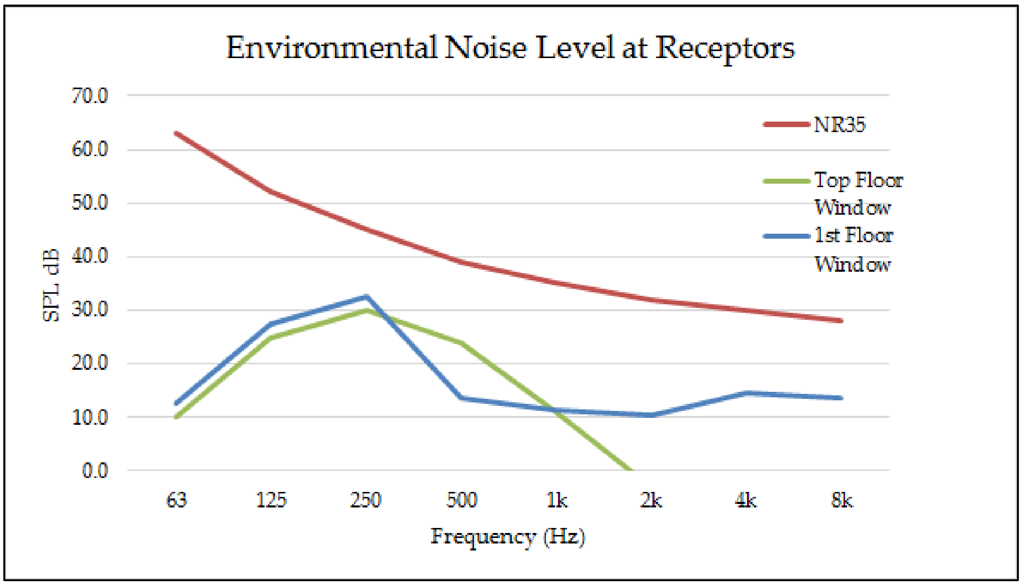
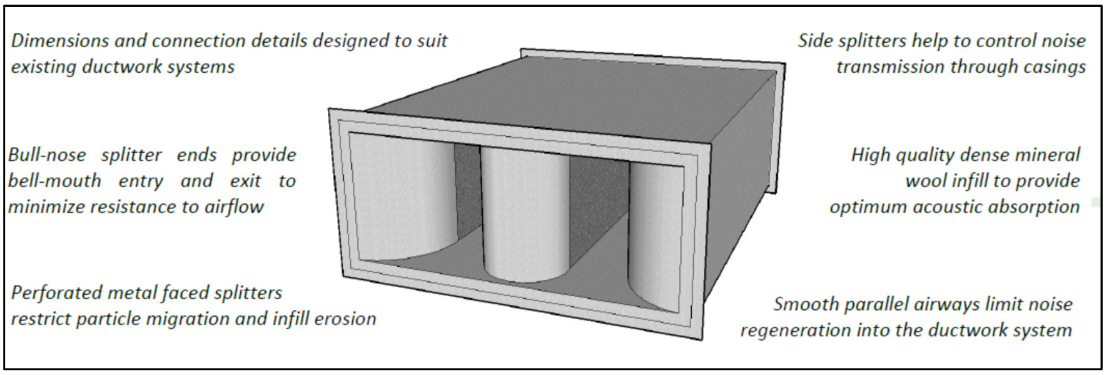


Figure A6: Ductwork Silencer Specification (Typical)



Kitchen Extract Silencer – Primary and Secondary Silencers

Insertion Loss dB/ Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
1. Kitchen Extract Silencer (4D Melinex Lined)	-	4	7	7	15	20	19	16

Supply Air System Silencer

Insertion Loss dB/ Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
2. Supply Air Silencer (Nominal 33% Free Area – 1500mm long)	7	13	23	37	43	44	35	27

APPENDIX B: GLOSSARY OF NOISE TERMS AND UNITS.

1.0 Noise

1.1 The sounds that we hear are as a result of successive air pressure changes. These air pressure changes are generated by vibrating sources, such as train engines or wheels, and they travel to a receiver, i.e. the human ear, as air pressure waves.

1.2. The human ear is capable of detecting a vast range of air pressures, from the lowest sound intensity that the normal ear can detect (about 10^{-12} watts/m^2) to the highest that can be withstood without physical pain (about 10 watts/m^2). If we were to use a linear scale to represent this range of human sensitivity it would encompass more than a billion units. Clearly this would be an unmanageable scale yielding unwieldy numbers.

1.3. The scale can be compressed by converting it to a logarithmic or Bel scale, the number of Bels being the logarithm to the base 10 of one value to another (as applied by Alexander Graham Bell to measure the intensity of electric currents). The Bel scale gives a compressed range of 0 to 12 units which in practice is a little too compressed. A more practical operating range of 0 to 120 is obtained by multiplying by 10, ie. 10 x Bel, which produces the scale units known as decibels or dB.

1.4. Examples of typical sound intensity levels within the decibel range of 0 to 120 dB are listed below:

Commercial four-engine jet aircraft at 100m	120dB
Riveting of steel plate at 10m	105dB
Pneumatic drill at 10m	90dB
Circular wood saw at 10m	80dB
Heavy road traffic at 10m	75dB

Male speech, average, at 10m	50dB
Whisper at 10m	25dB
Threshold of hearing, 1000Hz	0dB

1.5. Due to this logarithmic scale noise levels have to be combined logarithmically rather than arithmetically. For example, two equal sound sources of 70 dB each, when operated simultaneously, do not produce a combined level of 140 dB but instead result in a level of 73 dB, ie. A rise of 3dB for each doubling of sound intensity. Subjectively, a 3dB change does not represent a doubling or halving of loudness; to make a sound appear twice as loud requires an increase in sound pressure level of about 10dB.

1.6. The subjective loudness of noise can be measured by applying a filter or weighting which equates to the frequency response of the human ear. This is referred to as an A-weighting and when applied results in noise levels expressed as dB(A).

1.7. dB(A) noise levels can be measured using a variety of noise indices. The index which correlates best with human response due to machinery noise is the L_{Aeq} this is the A-weighted L_{eq} which is referred to as the 'equivalent continuous noise level' and is a measure of the total sound energy generated by a fluctuating sound signal within a given time period.