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ALEX COSTA

20 HEATH STREET, LONDON

PLANT NOISE ASSESSMENT

17 JANUARY 2022

1496-AF-00001-02

ALEX COSTA
20 HEATH STREET, LONDON
PLANT NOISE ASSESSMENT

DOCUMENT REFERENCE: 1496-AF-00001-02

REVIEW AND AUTHORISATION			
Authored and approved by Adrian Finn	**Position** Director	**Signature**	**Date** 17/01/2022

AMENDMENT HISTORY			
Issue	**Status**	**Description**	**Date**
01	Draft	Report issued as draft	04/05/2021
02	Draft	Update to include relocated condenser units	17/01/2022

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1. INTRODUCTION

1.1.1 Alex Costa has commissioned AF Acoustics Ltd. to undertake a plant noise assessment for proposed extract and supply fans and relocated condenser units to be installed at the rear of 20 Heath Street, London.

1.2 Brief and Scope

1.2.1 The brief is to undertake a plant noise assessment for the proposed plant to be installed at the rear of 20 Heath Street, London, to see if the proposed plant meets the requirement of the local authority. If the plant does meet the requirements of the local authority recommendations will be given so that the requirements are met.

2. SITE DESCRIPTION

2.1 Location

2.1.1 The site is located at 20 Heath Street, London within the London Borough of Camden. The property comprises basement and ground floors with existing residential over. The site is outlined in red in Figure 2.1. The building fronts the east side of Heath Street and has a side access route, Oriel Court, which is a narrow roadway leading down to the rear of the premises, and to residential cottages. Apartments exist over the premises on the first and second floors and are accessed via a side entrance off Oriel Court.

2.1.2 The noise profile at 20 Heath Street consisted mainly of local road traffic noise.

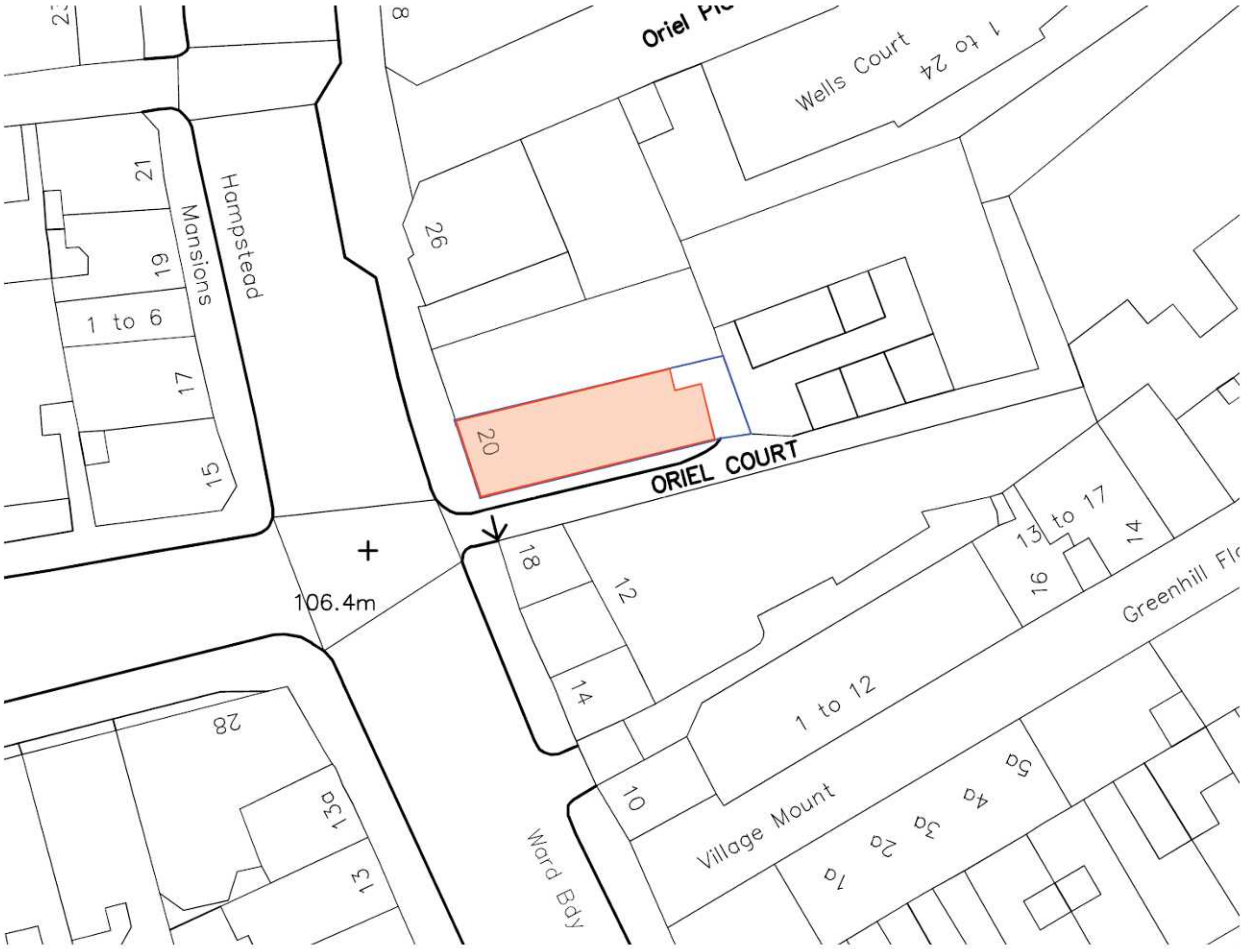

FIGURE 2.1: LOCATION MAP

3. GUIDANCE

3.1 British Standard 4142:2014

3.1.1 BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' describes methods for rating and assessing sound from "fixed installations which comprise mechanical and electrical plant and equipment", amongst other sources of noise.

3.1.2 The methodology contained within BS 4142:2014 uses outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

3.1.3 A summary of the approach set out within BS 4142:2014 is set out below:

- establish the specific sound level of the source(s);
- measure the representative background sound level, typically by measurement close to the receptor location;
- rate the specific sound level to account for any distinguishing characteristics;
- estimate the impact by subtracting the background sound level from the rating level; and
- consider the initial estimate of impact, in the context of the noise and its environment.

3.1.4 An initial estimate of the impact of the specific sound is obtained by subtracting the background sound level from the rating level. Using this approach, BS 4142 states:

> "Typically, the greater this difference, the greater the magnitude of impact
> A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context
> A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context
> The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

3.1.5 Certain acoustic features can increase the significance of the impact over that expected from a basic comparison between specific sound level and the background sound level. These features include tonality and impulsivity, as well as additional characteristics and intermittency of the sound.

3.1.6 If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor.

3.1.7 The specific sound level is rated to account for distinguishing characteristics by using the penalties below:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible

3.1.8 Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor.

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible

3.1.9 For noise which is equally both impulsive and tonal, then both features can be taken into account by linearly summing the corrections for both characteristics.

3.1.10 If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

3.1.11 If a subjective assessment is not appropriate then an objective assessment can be made. A noise source is deemed to be tonal if the time averaged sound pressure level in a one-third octave band exceeds the level in adjacent one-third octave bands by the level differences given below:

- 15 dB in the low frequency one-third octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency one-third octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency one-third octave bands (500 Hz to 10000 Hz)

3.1.12 If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

3.2 Local Authority Guidance – London Borough of Camden

3.2.1 The Camden Local Plan 2017 sets out Camden's position with regards to noise from industrial and commercial noise sources. The guidance states that it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion.

4. NOISE SURVEY AND MEASUREMENTS

4.1 Unattended Noise Survey

4.1.1 An unattended noise survey was undertaken by Adrian Finn of AF Acoustics on the flat roof of the rear ground floor extension of 20 Heath Street, near the 1st floor rear window. The measurement position is considered representative of the nearest noise sensitive receptors at the rear of 20 Heath Street.

4.1.2 The duration of the survey was between 12:00 on 27 April and 13:00 on 28 April 2021. This measurement location is labelled as LT1 in Figure 4.1. The measured noise levels are considered free field levels. The microphone was protected with a windshield during the noise survey. Measurements were carried out in accordance with the requirements of BS 7445-2:1991 and ISO 1996-2:1987.

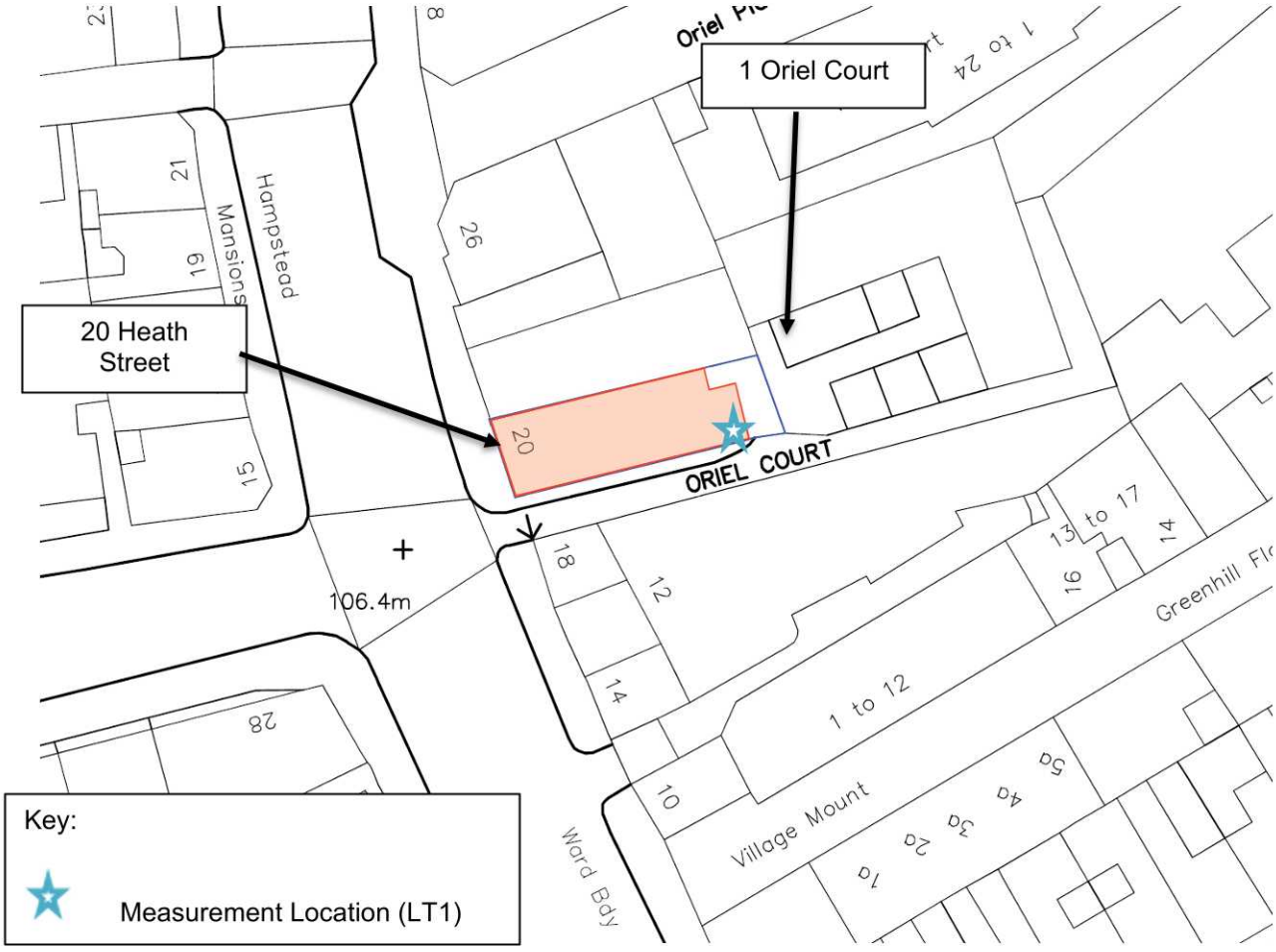

FIGURE 4.1: MEASUREMENT LOCATION

4.1.3 The noise profile at 20 Heath Street consisted mainly of local road traffic noise.

4.1.4 The sound level meter had calibration checks before and after the measurement surveys to generate a calibration level of 114 dB at 1 kHz. The equipment calibration was verified before and after the survey and no calibration drift was observed. The microphone was fitted with a windshield.

4.1.5 The equipment used for the noise measurements is shown in Table 4.1.

4.2 Attended Noise Survey

4.2.1 An attended noise survey was undertaken on 13 January 2022 by Adrian Finn of AF Acoustics to measure the relocated condenser units that were moved to the rear of 20 Heath Street, on the first floor flat roof overlooking Oriel Court. The condenser units were measured at 1m and the sound power level of the condenser units was calculated using a Q = 4 due to quarter spere radiation of the condenser units. The calculated Sound Power levels are shown in Table 5.4.

4.2.2 The sound level meter had calibration checks before and after the measurement surveys to generate a calibration level of 114 dB at 1 kHz. The equipment calibration was verified before and after the survey and no calibration drift was observed. The microphone was fitted with a windshield.

4.2.3 The equipment used is shown in Table 4.1.

Location	Name	Serial Number	Last Calibrated
LT1	NTI Audio XL2-TA Class 1 Sound Level Meter	A2A-18530-E0	January 2021
LT1	NTI Audio MA220 Pre-amplifier	9566	January 2021
LT1	NTI Audio MC230A Microphone	A19842	January 2021
LT1	Norsonic 1251 Calibrator	30900	March 2020

TABLE 4.1: MEASUREMENT EQUIPMENT – BOTH SURVEYS

4.3 Measurement Weather Conditions

4.3.1 The weather during both measurements was dry and clear. The temperature during the unattended noise survey ranged from 5 to 22°C. For the attended noise survey the temperature was 4°C. Average wind speeds remained below 3 ms^{-1}. The weather is deemed to have caused no significant effect during the measurement period.

4.4 Results

4.4.1 The results of the continuous noise monitoring survey are presented in graphical form in Figure A1 of Appendix A and summarised in Table 4.2.

4.4.2 The L_{A90} background noise level has been derived considering the most commonly occurring 1 hour period during the day and 15 minute period at night, whilst the $L_{Amax,F}$ maximum noise level is the 90th percentile of the measured maximum noise levels.

Time period	Measured Noise Levels (dB re 2.0 x 10^{-5} Pa)		
	$L_{Amax,F}$	$L_{Aeq,T}$	Typical $L_{A90,T}$
Daytime (07:00 – 23:00)	76	54	46
Nighttime (23:00 – 07:00)	64	43	33
Opening Hours (08:00 – 22:00)	65	52	46

TABLE 4.2: SUMMARY OF UNATTENDED NOISE MEASUREMENTS, LT1

5. PLANT NOISE ASSESSMENT

5.1 Noise Rating Limit

5.1.1 The table below presents the maximum noise rating level which must not be exceeded at the noise sensitive receptor.

Measurement Period	Assessed Background Noise Level dB L_{A90}	Noise Rating Level Design Criteria	Plant Noise Rating Level Limit dB $L_{Ar,Tr}$
Opening Hours (08:00 – 22:00)	46	-10	36

TABLE 5.1: TARGET BACKGROUND NOISE

5.2 Plant Noise Levels

5.2.1 It is proposed to the following fans at 20 Heath Street.

Plant		Sound Power Level, dB							
	Frequency Hz	63	125	250	500	1000	2000	4000	8000
Extract – CVAT/4-3000/35S		43	55	60	61	60	57	51	44
Supply CVAT/4-2000/315		39	58	61	64	61	57	55	50

TABLE 5.2: FAN PLANT NOISE LEVEL

5.2.2 The extract fan will be fitted with the following silencers.

Plant	Length (mm)	Insertion Loss, dB							
		Octave band mid-frequency, Hz							
		63	125	250	500	1000	2000	4000	8000
Extract	1200mm	5	5	13	22	30	27	17	13
Supply	900mm	3	7	9	19	29	25	16	13

TABLE 5.3: ATTENUATOR INSERTION LOSS

5.2.3 The measured Sound Power Levels of the two condenser units running together are presented below in Table 5.4.

Plant	Frequency Hz	Sound Power Level, dB							
		63	125	250	500	1000	2000	4000	8000
2 No. Fujitsu AOY24UNBKL		55	66	61	59	56	51	46	43

TABLE 5.4: MEASURED CONDENSER NOISE LEVELS

5.3 Calculated Noise Levels

5.3.1 Table 5.5 provides a summary of the calculated plant noise at the nearest receptor, Flat 1, 20a Heath Street. The plant noise levels have also been calculated to No. 1 Oriel Court.

5.3.2 The two nearest residential windows are set to be 3.7m from the extract outlet and 5m from the supply inlet and 4m from the condenser units. The supply inlet does not have a direct line of sight of the nearest residential receptor, there is an additional path length from the supply inlet to the Flat 1 20a Heath Street of 1m.

5.3.3 It is proposed to install a solid barrier between the relocated condenser units and 1 Oriel Court, which will extend 25cm above the condensers. This will give an additional path length of 20cm between the condensers and 1 Oriel Court. The additional path lengths are taken into account in the calculations and are shown in the calculation spreadsheet presented in Appendix B.

Property	Assessment Period	Target Plant Noise Rating Level dB $L_{Ar,Tr}$	Plant Specific Sound Level dB $L_{Aeq,Tr}$	Actual Noise Rating Level dB $L_{Ar,Tr}$
Flat 1, 20a Heath Street	Opening Hours (08:00 – 22:00)	36	36	31
1 Oriel Court	Opening Hours (08:00 – 22:00)	36	36	35

TABLE 5.5: PREDICTED NOISE AT NEAREST RESIDENTIAL RECEPTORS

5.3.4 No correction factors have been added in accordance with BS4142:2014. There are no tones or other acoustic characteristics present from the proposed plant.

5.3.5 The rating level from the proposed plant is equal to the typical background noise level. As per semantics of BS4142:2014, the assessment indicates little likelihood of adverse impact. The proposed plant noise also meets the requirements of the London Borough of Camden, that noise from the plant has a rating level 10 dB below background noise level at both calculated receptors.

6. CONCLUSION

6.1.1 Alex Costa commissioned AF Acoustics Ltd. to undertake a plant noise assessment for a proposed extract and supply fans to be installed at the rear of 20 Heath Street, London.

6.1.2 A noise survey was undertaken at the nearest residential receptor, 20a Heath Street. The representative noise levels measured at this location was used to establish the prevailing environmental noise climate.

6.1.3 Plant noise emission criteria have been set at the nearest receptor based on the results of the noise survey and in conjunction with the national guidance.

6.1.4 Noise calculations based on the plant data was undertaken to the nearest residential receptors.

6.1.5 The results of the assessment have been used to assess the impact of noise from the proposed plant to the nearest noise sensitive receptors. The assessment indicates that the proposed plant will have little likelihood of adverse impact and meet the requirements of the local authority that the rating level is 10 dB below the background noise level.

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APPENDIX A: FIGURES

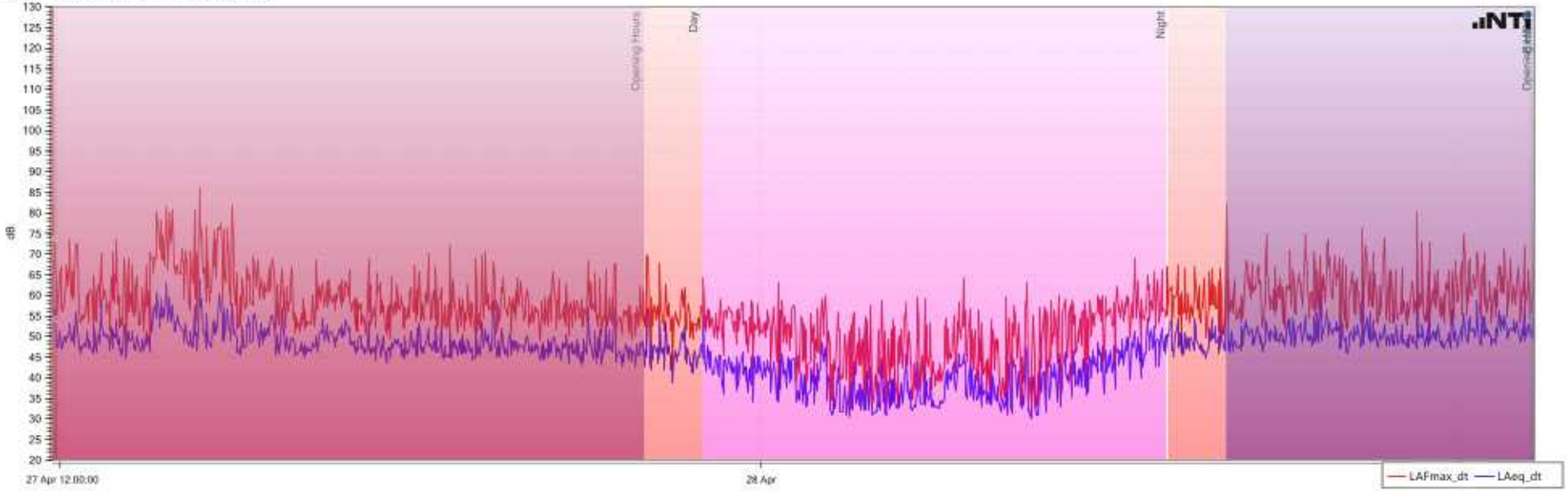

FIGURE A1: NOISE MEASUREMENT RESULTS AT 20 HEATH STEET

APPENDIX B: TABLES

Ductborne Fan Noise Calculation				AHU/Fan: CVAT/4-2000/315		Job no: 1496	
				Path: Supply		Date: 30-Apr-21	
Project: 20 Heath Street				Space Served: Atmosphere		By: AF	

Data: Manufacturer's	Reset Data	Octave Band Centre Frequency, Hz							
Type:	Pres: Vol:	63	125	250	500	1000	2000	4000	8000
Edit fan data	In duct sound power levels from fan:	39	58	61	64	61	57	55	50
Attenuator 1200 Melinex		3	7	9	19	29	25	16	13
No Element									
No Element									
No Element									
No Element									
No Element									
No Element									
No Element									
No Element									
No Element									
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No Element									
Grille 350 350		10	6	3	0	0	0	0	0
Grille: 350 x 350 mm	Calc. Type: Atmosphere side	26	45	49	45	32	32	39	37
Break-out	After Element: 1 Duct	36	51	52	45	32	32	39	37
Duct width: 700mm	Rectangula Standard guage ductwo	7	10	15	20	28	32	35	35
Roomside	Room: 3.0m 5.0m 2.7m None								
	Direct 1 Distance 1.5m Flush	11	10	9	8	7	6	6	6
	Reverb 10 Hard room	-10	-10	-8	-8	-8	-7	-7	-7
Atmosphere	Directivity 0° 0° Distance 5.0m	14.0	13.0	12.0	11.0	10.0	9.0	8.0	8.0
	Hemispherical	8	8	8	8	8	8	8	8
	NR 29 29dB(A) Lp	**4**	**24**	**29**	**26**	**14**	**15**	**23**	**21**
	NR 38	66	55	47	42	38	35	33	31
Print	Excess:	-	-	-	-	-	-	-	-
Standard	Length 900mm Free area 40%	**4**	**7**	**13**	**19**	**23**	**23**	**16**	**13**
	NR 16 13dB(A) Lp	**0**	**17**	**16**	**7**	**-9**	**-8**	**7**	**8**
$\Delta P_{(static)}$ 25 Pa	Excess:	-	-	-	-	-	-	-	-

Comments	
Revision:	
Checked:	

TABLE B1: SUPPLY FAN CALCULATIONS

Ductborne Fan Noise Calculation

AHU/Fan:	CVAT/4-3000/355	Job no:	1496
Path:	Extract	Date:	30-Apr-21
Space Served:	Atmosphere	By:	AF

Project: 20 Heath Street

Data: Manufacturer's — Reset Data

Type: Pres: Vol:

Edit fan data

	Octave Band Centre Frequency, Hz 63	125	250	500	1000	2000	4000	8000
In duct sound pow er levels from fan:	43	55	60	61	60	57	51	44
Attenuator 1200 Melinex	5	5	13	22	30	27	17	13
No Elemen								
No Elemen								
No Elemen								
No Elemen								
No Elemen								
No Elemen								
No Elemen								
No Elemen								
No Elemen								
No Elemen								
No Elemen								
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No Elemen								
No Elemen								
No Elemen								
No Elemen								
No Elemen								
No Elemen								
Grille 400 400	9	4	2	0	0	0	0	0
Grille: 400 x 400 mm Calc. Type: Atmosphere side	29	46	45	39	30	30	34	31
Break-out After Element: 1 Duct	38	50	47	39	30	30	34	31
Duct w idth: 700mm Rectangula Standard guage ductw	7	10	15	20	28	32	35	35
Roomside Room: 3.0m 5.0m 2.7m None								
Direct 1 Distance 1.5m Flush	11	10	9	8	7	6	6	6
Reverb 10 Hard room	-10	-10	-8	-8	-8	-7	-7	-7
Atmosphere Directivity 0° 0° Distance 3.7m	11.4	10.4	9.4	8.4	7.4	6.4	5.4	5.4
Hemispherical	8	8	8	8	8	8	8	8
NR 27 **26dB(A)** Lp	**10**	**28**	**28**	**23**	**15**	**16**	**21**	**18**
NR 38	66	55	47	42	38	35	33	31
Print — Excess:	-	-	-	-	-	-	-	-
Standard Length 900mm Free area 40%	**4**	**7**	**13**	**19**	**23**	**23**	**16**	**13**
NR 13 **12dB(A)** Lp	**6**	**21**	**15**	**4**	**-8**	**-7**	**5**	**5**
$\Delta P_{(static)}$ 25 Pa Excess:	-	-	-	-	-	-	-	-

Comments	
Revision:	
Checked:	

TABLE B2: EXTRACT FAN CALCULATIONS

Job No.	Job Title			
1496	20 Heath Street			
Date Created	By	Date Revised	Rev	Sheet
13 Jan 2022	AF	13 Jan 2022	8	4
Date Reviewed	By	Review Type	Review Status	
13 Jan 2022	AF	Self Check	No Comments	

Condenser units to Flat 1, 20a Heath Street

Item / Description	Rating/Broadband/Input Rating	dB	dB(A)	Octave Band Centre Frequency, Hz 31.5	63	125	250	500	1k	2k	4k	8k
Condenser units					55	66	61	59	56	51	46	43
Point Source Propagation Loss	4.0 m	6.0 dB		-17.0	-17.0	-17.0	-17.0	-17.0	-17.0	-17.0	-17.0	-17.0
Attenuation due to path difference 1m					-9.5	-11.8	-14.7	-17.6	-20.6	-23.6	-26.7	-29.7
Noise level at receptor from condenser unit			27		28.5	37.1	29.3	24.3	18.3	10.3	2.3	-3.7

TABLE B3: CALCULATION OF CONDENSER UNITS TO FLAT 1, 20 A HEATH STREET

Job No.	Job Title			
1496	20 Heath Street			
Date Created	By	Date Revised	Rev	Sheet
13 Jan 2022	AF	13 Jan 2022	3	5
Date Reviewed	By	Review Type	Review Status	
13 Jan 2022	AF	Self Check	No Comments	

Condenser units to 1 Oriel Court

Item / Description	Rating/Broadband/Input Rating	dB	dB(A)	Octave Band Centre Frequency, Hz 31.5	63	125	250	500	1k	2k	4k	8k
Condenser units					55	66	61	59	56	51	46	43
Point Source Propagation Loss	4.0 m	6.0 dB		-17.0	-17.0	-17.0	-17.0	-17.0	-17.0	-17.0	-17.0	-17.0
Attenuation due to path difference 0.2m					-6.2	-7.2	-8.8	-11.0	-13.7	-16.7	-19.7	-22.7
Noise level at receptor from condenser unit			33		31.8	41.8	35.2	30.9	25.2	17.3	9.3	3.3

TABLE B4: CALCULATION OF CONDENSER UNITS TO FLAT 1, 20 A HEATH STREET

Job No.	Job Title			
1469	20 Heath Street			
Date Created	By	Date Revised	Rev	Sheet
30 Apr 2021	AF	13 Jan 2022	2	2
Date Reviewed	By	Review Type	Review Status	
04/05/2021	AF	Self Check	No Comments	

Plant noise summation - 20A Heath Street

Item / Description	Rating/Broadband/Input Rating	dB	dB(A)	Octave Band Centre Frequency, Hz 31.5	63	125	250	500	1k	2k	4k	8k
Noise from Supply Fan					4.0	24.0	29.0	26.0	14.0	15.0	23.0	21.0
Attenuation due to path difference 1m					-9.5	-11.8	-14.7	-17.6	-20.6	-23.6	-26.7	-29.7
Noise at from supply fan at receptor after path difference			9		-5.5	12.2	14.3	8.4	-6.6	-8.6	-3.7	-8.7
Noise from Extract Fan			27		9.6	27.6	27.6	22.6	14.6	15.6	20.6	17.6
Noise from Condenser Units			27		28.5	37.1	29.3	24.3	18.3	10.3	2.3	-3.7
Total noise at receptor			**30**		**28.6**	**37.6**	**31.6**	**26.6**	**19.9**	**16.7**	**20.7**	**17.6**

TABLE B5: SUMMATION OF PLANT AT 20A HEATH STREET

Job No.	Job Title			
1469	20 Heath Street			
Date Created	By	Date Revised	Rev	Sheet
30 Apr 2021	AF	13 Jan 2022	3	3
Date Reviewed	By	Review Type	Review Status	
04/05/2021	AF	Self Check	No Comments	

Plant noise summation - 1 Oriel Court

Item / Description	Rating/Broadband/Input Rating	dB	dB(A)	Octave Band Centre Frequency, Hz 31.5	63	125	250	500	1k	2k	4k	8k
Noise from Supply Fan			29		4.0	24.0	29.0	26.0	14.0	15.0	23.0	21.0
Noise from Extract Fan			27		9.6	27.6	27.6	22.6	14.6	15.6	20.6	17.6
Noise from Condenser Units			33		31.8	41.8	35.2	30.9	25.2	17.3	9.3	3.3
Total noise at receptor			**35**		**31.8**	**42.0**	**36.7**	**32.6**	**25.9**	**20.8**	**25.1**	**22.7**

TABLE B6: SUMMATION OF PLANT AT 1 ORIEL COURT

APPENDIX C: TERMINOLOGY RELATING TO NOISE

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of 20_{μ}Pa ($20x10^{-6}$ Pascals) on a decibel scale.
Sound Power Level (Lw)	is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by 20 $\log_{10}$ (s_1 / s_2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20_{μ}Pa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
$\mathbf{L_{Aeq,T}}$	Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound
$\mathbf{L_{90,T}}$	L_{90} is the noise level exceeded for 90% of the period T (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
Specific Noise	The noise source under investigation for assessing the likelihood of complaints.
Rating Level	The specific noise level plus any adjustment for the characteristic features of the noise.
Free field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building façade.

APPENDIX D: LIMITATIONS TO THE REPORT

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