Kervan Sofrasi Ltd

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80 Church Street
Edmonton
N9 9PB

Residential/
Commercial
Development

Noise Impact
Assessment
Report

March 2024

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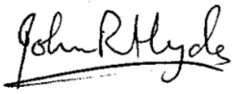
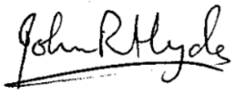
Issue/Revision	**Issue 1**	**Revision 1**	**Revision 2**
Description	Initial	Update with kitchen plant data	
Date	20/02/2024	29/03/24	
Prepared and Authorised by	John Hyde	John Hyde	
Signature			
Reference	A1670		

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1. INTRODUCTION

At the request of Kervan Sofrasi Ltd, and as instructed by Alexander Hopkins of TechnicalDetail Ltd, an assessment of external noise impact has been carried out for the construction of six residential units at first floor, and above, at 80 Church Street, Edmonton, London N9 9PB. The ground floor restaurant use is to be retained and the assessment includes the effects of noise from a revised kitchen extract system.

The impact assessment has been carried out according to national planning policy recommendations and the internal and external noise guidelines of BS8233:2014. The effects of noise from the kitchen plant have been assessed according to BS4142:2014 and internal building services noise criteria recommended by CIBSE. A noise survey has been carried out to take account of high levels of traffic noise on Church Street and Victoria Road.

The measurements and assessment have been carried out by John Hyde, a Chartered Physicist and Member of the Institute of Acoustics who has over 30 years' experience as a noise and acoustics consultant.

2. TERMINOLOGY

It has become practice to measure sound levels in decibels (dB). The decibel scale is logarithmic rather than linear. It is helpful to remember that a noise level change of 3dB on a sound meter reading would be just perceptible, and that an increase of 10 dB is perceived, subjectively, as a doubling of loudness. The human ear responds differently to sounds of different frequencies. The ear "hears" high frequency sound of a given level more loudly than low frequency sound of the same level. The A-weighted sound level, dB(A), takes this response into consideration and is commonly used for measurement of environmental noise in UK. It indicates the subjective human response to sound.

Environmental noise levels vary continuously from second to second. It is clearly impractical to specify the sound level for each second thus time averaging is required. In practice human response has been related to various units which include allowance for the fluctuating nature of sound with time. For the purpose of this report these include:

$L_{Aeq,T}$: the equivalent A-weighted continuous sound level over period T. This unit relates to the equivalent level of continuous sound for a specific time period T, for example 16 hr for daytime noise. It contains all the sound energy of the varying sound levels over the same time period, and expresses it as a continuous sound level over that period. The unit is used for assessing traffic, transportation and industrial noise for planning purposes.

$L_{A90,T}$: the A-weighted level of sound exceeded for 90% of the time period T. This latter unit is commonly used to represent the background noise, and is used in assessing the effects of industrial noise in UK.

L_{Amax} : the maximum A-weighted sound level over a period of measurement.

3 NOISE CRITERIA

Planning guidance on noise is set out in the 'Noise Policy Statement for England' (NPSE) which reinforces the three policy aims of the 'National Planning Policy Framework' as follows:

- *Avoid significant adverse impacts on health and quality of life*
- *Mitigate and minimise adverse impacts on health and quality of life*
- *Where possible, contribute to the improvement of health and quality of life*

In order to apply objective standards to the assessment of noise which uphold these policy aims, the effect of introducing a particular noise source may be determined by several methods, as follows:

- The effect may be determined by reference to guideline noise values. BS8233:2014 and WHO 'Guidelines for Community Noise' contain such guidelines
- The effect may be determined by considering the change in noise level that would result from the proposal in an appropriate noise index for the characteristic of the noise in question.
- Another method is to compare the resultant noise level against the background noise level of the area, as used in BS4142 to determine the likelihood of impact from noise of an industrial nature.

The requirements of BS8233:2014, relating to internal noise standards, are relevant for the assessment of traffic noise and are summarised as follows:

Criterion	*Situation*	$L_{Aeq,T}$
Reasonable resting or sleeping conditions	Living Rooms	35dB Day (16hrs)
	Bedrooms	30dB Night (8hrs)

In addition to internal average noise level criteria, BS8233 recommends that a limit should be placed on maximum internal noise levels at night due to individual external events, such as a passing vehicle, although a specific guideline is not proposed. However, WHO Noise Guidelines recommend that internal maximum noise levels due to individual events at night, should not regularly exceed 45dB(A) on no more than 10-15 occasions.

Noise from the kitchen extract plant affecting nearby residential receptors will be assessed according to BS4142:2014. The Standard describes methods for rating and assessing industrial and/or commercial sounds, to assess the likely effects on people who might be inside or outside a dwelling or other residential building.

This method would show that the effects of plant noise on the proposed residential units would be significant due to the close proximity of the plant to windows. Internal plant noise levels have therefore been calculated and compared with the BS8233 guidelines and with the indoor mechanical noise guidelines recommended by the Chartered Institute of Building Services Engineers, CIBSE, in terms of Noise Rating values (NR). For living rooms, the guideline is NR30 and for bedrooms the guideline is NR25.

For the BS4142 assessment, the plant noise is rated by taking into account the sound level of the source, known as the specific sound level, and its characteristics, such as the tonal, impulsive or intermittency nature of the source, and applying an appropriate correction to give the rating level. To gain an initial estimate of the potential impact of the sound source, it is compared to the background noise level, and the level by which the rating level exceeds the background noise level indicates the following potential impacts:

Difference	**Assessment**
Around 10 dB or more	Likely to be an indication of a significant adverse impact, depending on the context
Around 5 dB	Likely to be an indication of an adverse impact, depending on the context
0 dB or less	An indication of the specific sound source having a low impact depending on the context

The standard states that "where an initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following:

- The absolute level of the sound
- The character and level of the residual sound compared to the character and level of the specific sound
- The sensitivity of the receptor - The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

i) facade insulation treatment;
ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
iii) acoustic screening

4 NOISE MEASUREMENTS

Noise measurements were carried out from 5th to 7th February 2024 at the site. A microphone was located at a façade position at first floor level, one overlooking Church Street and another on the first-floor roof overlooking Victoria Road. Both were protected by an outdoor weatherproof system. The measurement locations are shown on Figure 1.

Weather conditions over the course of the survey period were checked on the Time and Date Weather records website for the nearest station. Throughout the measurement period, weather conditions were in accordance with BS7445 (Measurement and Description of Environmental Noise). Winds variable, westerly to southerly, with short periods of light rain during the night of 6th February. This is not considered to have affected the validity of the data.

The noise measurements were carried out using the following equipment:

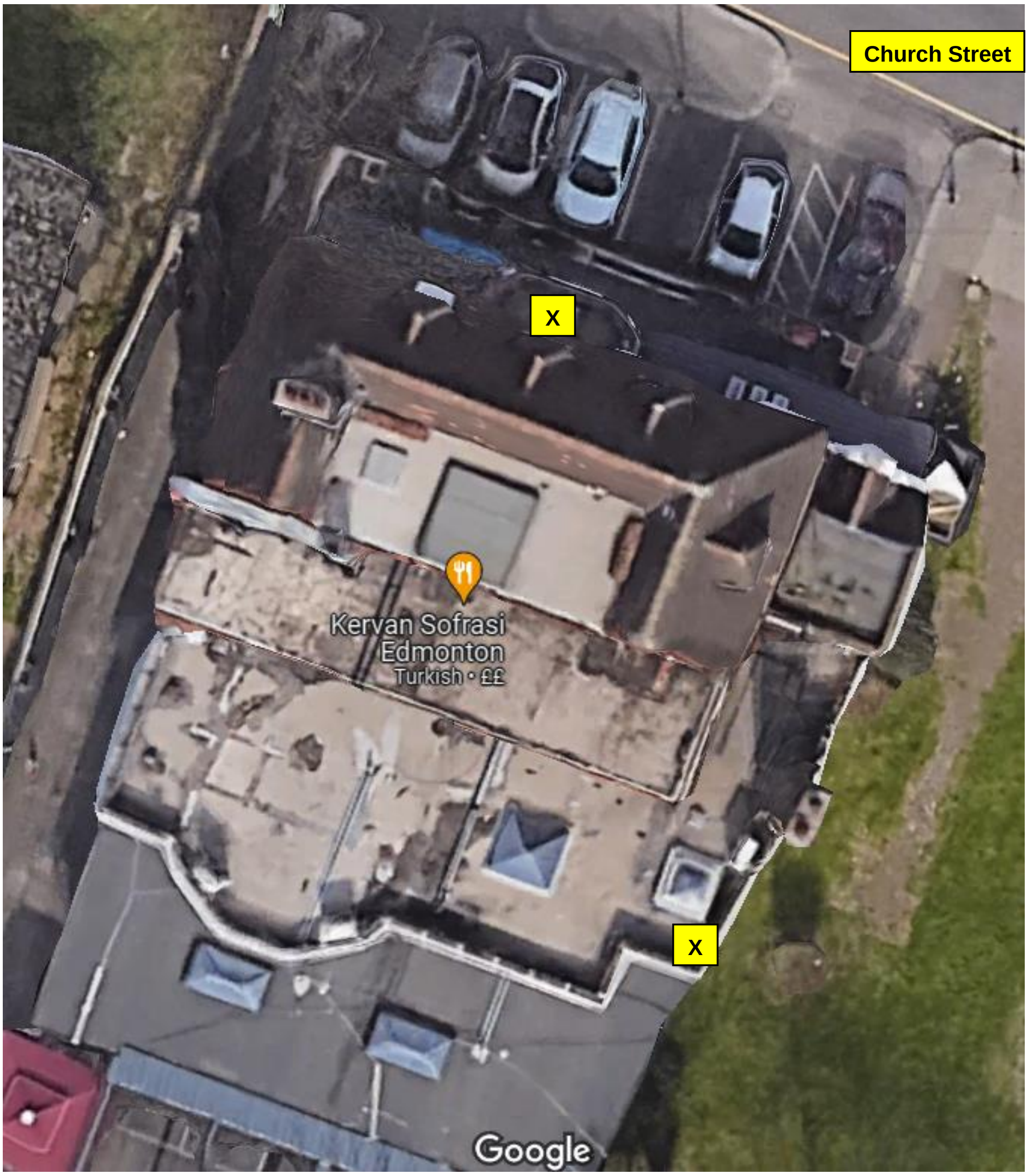
SVAN 955 Sound Level Meter	S/N 27330
SVAN 977 Sound Level Meter	S/N 36438
Rion NC-74 Calibrator	S/N 34167512

The above equipment fulfils IEC 61672 Class 1 and is traceable to calibration under BS7580: Part 1:1997. The meters were calibrated before and after the measurement and no significant drifting of the calibration signal was observed.

Measurements were undertaken for a two-day period and the following parameters were recorded:

L_{Aeq} The equivalent continuous noise level over 15-minute periods
L_{Amax} The maximum noise level during each period
L_{A90} The level exceeded for 90% of the time, the background level

Figure 1: Location of traffic noise measurement positions X



The site was observed at the start of the measurement and during this time the only distinguishable noise sources were from road traffic on Church Street and Victoria Road. The detailed fifteen-minute period results are shown in Appendix 1 and the average results are summarised in Tables 1 and 2.

Table 1: Summary of noise measurement results on Church Street façade

Date	Time Period	LAeq,T [dB]	LAmax# [dB]
03/12/2022	13:22 - 23:00	60.9	
03/12/2022	23:00 - 07:00	55.8	74
04/12/2022	07:00 - 23:00	62.3	
04/12/2022	23:00 - 07:00	57.5	73
05/12/2022	07:00 - 14:07	62.0	

Table 2: Summary of noise measurement results on Victoria Road façade

Date	Time Period	LAeq,T [dB]	LAmax# [dB]
03/12/2022	13:27 - 23:00	60.8	
03/12/2022	23:00 - 07:00	56.1	70
04/12/2022	07:00 - 23:00	62.7	
04/12/2022	23:00 - 07:00	58.3	74
05/12/2022	07:00 - 14:00	63.4	

Level exceeded on no more than 5 occasions

5 ASSESSMENT

5.1 Traffic Noise

The measured data has been used to determine noise levels at the facades of the proposed apartments, taking account of the restricted angle of view of Church Street on the western façade and the distance of the proposed windows from the front façade. Similarly, the restricted angle of view of Victoria Road on the southern façade.

Table 3: Noise levels at the façades of the proposed apartments

Apartments / Room	Façade Level [dB]	Attenuation needed to meet guidelines [dB]		
		Day	Night	LAmax
1 & 4/Living	63	28	-	-
1 & 4/Bedroom	58/74	-	28	29
2 & 5/Living	58	23	-	-
2 & 5/Bedroom 1/2	54/70	-	24	25
3 & 6/Living	62	27	-	-
3 & 6/Bedroom	58/74	-	20	29

The facade noise levels have been used to determine internal noise levels by selecting appropriate glazing and ventilation mitigation measures, using the BS8233:2014 Annexe G2 methodology. This takes account of the room dimensions, the façade area and the window area meaning that a particular form of glazing will result in varying internal noise levels depending on the room characteristics.

As windows need to remain closed to achieve the internal noise guidelines, provision for ventilation needs to be made. It is understood that the proposed strategy is to meet Part F System 1 with intermittent extraction through kitchens/bathrooms. Thus, acoustic ventilators have been included in the façade sound attenuation calculations. However, the kitchen extract ventilation and air conditioning condensers are located on the western façade, as shown in Figure 3, windows on this façade are considered further under the assessment of kitchen plant noise.

Calculations of internal noise levels for bedrooms and living rooms are shown in Appendix 2. The proposed apartments have similar room dimensions as can be seen in Figure 2, the first-floor layout plan. The second floor plan has a similar layout.

Figure 2: First floor layout plan

As shown in Appendix 2 and the summary in Table 4, the required day and night time guidelines in Apartments 1, 3, 4 and 6, would be achieved using Pilkington (6-16-6.8) Optiphon glazing with Greenwood 2500EAW.AC1 acoustic trickle ventilators. Apartments 2 and 5 are exposed to slightly lower noise levels and the required guidelines would be achieved using standard (6-16-4) glazing with Greenwood 2500EAW.AC1 acoustic trickle ventilators.

Table 4: Attenuation achieved with proposed measures

Flat/Room	Attenuation Required	Attenuation Achieved
	[dB]	[dB]
1 & 4/Living	28	31
1 & 4/Bedroom	29	34
2 & 5/Living	23	26
2 & 5/Bedroom 1/2	25	30
3 & 6/Living	27	32
3 & 6/Bedroom	29	35

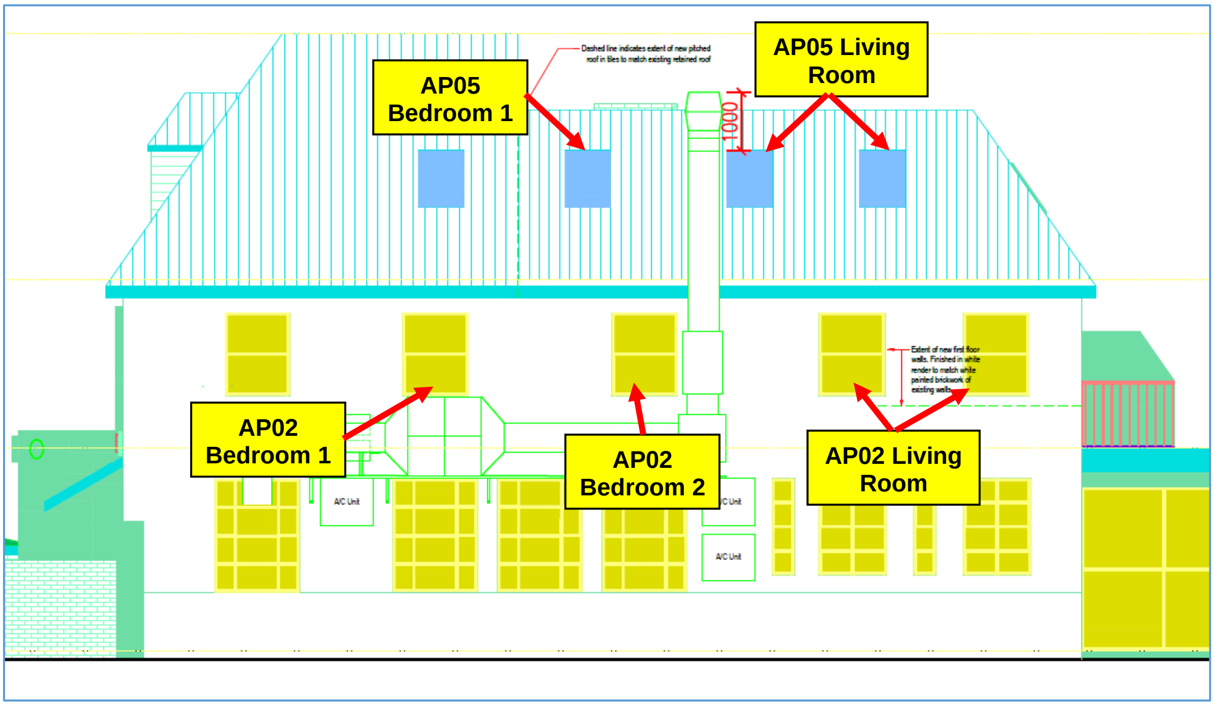
5.2 Kitchen Extract Noise at Proposed Apartments

The revised extract plant is located on the west façade of the building; an elevation is shown in Figure 3.

Figure 3: Elevation showing kitchen extract plant

Based on the plant location, noise levels have been predicted at the nearest windows of the proposed apartments. These are the bedroom and living room windows of Apartments 2 and 5, as shown in Figure 4.

Figure 4: Elevation showing room locations on the west facade



The noise emission levels of the plant and specification of the attenuator are shown in Appendix 3.

The calculations of external noise levels are shown in Appendix 4 and summarised in Table 5.

Table 5: Predicted kitchen plant noise levels at Apartments 2 and 5

Source	Calculated external plant noise levels dB(A)				
	AP02 Bedroom 1	AP02 Bedroom 2	AP02 Living Room	AP05 Living Room	AP05 Bedroom
Fan Casing Breakout	48	51	50	60	56
Duct Termination	48	60	52	48	48
Condenser FDC140VN	45	45	41	32	35
Condenser FDC100VNP-W	42	42	44	42	41
Condenser FDCVA402HENAR	36	41	31	34	34
Cumulative External	**52**	**60**	**55**	**61**	**57**

The calculations in Appendix 4 also show the cumulative spectrum of the fan case breakout noise and the duct termination noise. This was used to determine the internal plant noise levels using the BS8233 Annexe G2 method, as shown in Appendix 4. The resulting internal noise spectra were then used to determine the NR values. The glazing measures were specified to ensure that the internal noise levels were less than 35dB(A) and less than NR30 in living rooms and less than 30dB(A) and NR25 in bedrooms.

Clearly, the internal noise levels can only be achieved with the windows closed and due to the more disturbing nature of plant noise and potential ingress of extract fumes, the rooms should be ventilated by mechanical means rather than acoustic trickle vents. It has therefore been assumed that MVHR will be used for Apartments 2 and 5.

The results of the internal plant noise calculations are shown in Appendix 5 and summarised in Table 6

Table 6: Predicted internal plant noise levels at Apartments 2 and 5

	Calculated internal plant noise levels				
	AP02 Bedroom 1	AP02 Bedroom 2	AP02 Living Room	AP05 Living Room	AP05 Bedroom
Cumulative External, dB(A)	52	60	55	61	57
Calculated internal, dB(A)	17	24	30	31	27
Noise Rating Level, NR	15	19	22	22	19
Glazing required*	A	B	A	B	A
*A - As for traffic noise, Rw 32dB (6-16-4)					
B - Acoustic Glazing, Rw 40dB (6-16-6.8)					

The assessment shows that acoustic glazing would be needed for Bedroom 2 of Apartment 2 and for the Living Room of Apartment 5 while the proposed glazing for the remaining rooms would be the same as for traffic noise.

5.3 Kitchen plant noise at the nearest residential receptor

The nearest residential receptor outside the site is shown in Figure 5 at 195 Victoria Road, located at a distance of 32m from the proposed extract duct termination on the second-floor roof of the building. This would result in noise level of 19dB(A) at the receptor position and would result in a 'low impact' according to BS4142, as the level would be 25dB below the lowest measured daytime background noise $L_{A90,15min}$ 44dB. Noise from the kitchen plant is therefore not likely to be perceptible at the nearest residential receptor.

Figure 5: Location of nearest off-site residential receptor

5.4 Noise from the outdoor covered seating area

The potential noise impact from customers outside the restaurant under the covered area has been assessed due to the proximity of the nearest residential building shown in Figure 5. It is understood that the maximum accommodation would be for 60 people.

The sound level of voices was taken from a research paper entitled “Average Speech Levels and Spectra in Various Speaking/Listening Conditions: A Summary of the Pearson, Bennett, & Fidell (1977) Report” by Wayne O. Olsen of the Mayo Clinic, Rochester, MN and published by the American Journal of Audiology • Vol. 7 • 1059-0889, October 1998. Table 5 of that paper summarised sound levels of male voices at 58dB(A) for normal voice at 1m and 65dB(A) for a raised voice. Female voices were 3dB lower.

Assuming that one third of the maximum number of customers (20) are speaking at raised voice levels and the remainder (40) with normal voice levels, and that half were female and half male, the level at the receptor position has been calculated as shown in Table 7. The estimated attenuation is from the boundary fence at ground floor level and by the canvas canopy at first floor level and above while the estimated distance is from the centre of the area..

Table 7: Noise from the outdoor seating area

Predicted noise level from occupied outdoor seating			
		Raised Voice	Normal Voice
Reference distance	m	1	1
Source Level Male	dB(A)	65	58
Number of Voices		10	20
Source Level Female		62	55
Number of Voices		10	20
Total Noise level at source	dB(A)	77	73
Receptor distance	m	10	10
Noise level at Receptor	dB(A)	57	53
Total level at Receptor	dB(A)	58	
Attenuation by Canopy/Fence	dB	-5	
Final level at Receptor	dB(A)	53	

Based on the results of the measured noise levels in Appendix 1, the average daytime background noise level on the roof of the existing building was L_{A90} 55dB and the average ambient was $L_{Aeq,T}$ 62dB. It is considered that the same data would apply to the nearest off-site receptor at 195 Victoria Road, as it is located at a distance of just 19m from the measurement position. The impact of the external noise from the outdoor seating area at 53dB(A) is therefore likely to be low.

The living rooms and roof terraces of the proposed Apartments 1 and 2 would be located at a similar distance of 10m from the seating area where the noise impact is therefore also likely to be low.

5.5 Table 8: Glazing and ventilation measures to meet required guidelines

Apartment	Room	Glazing	Ventilation
1	Living Room	Rw 40dB (6-16-6.8)	Dnew 40 (GAV 2500EAW.AC1)
	Bedroom 1	Rw 40dB (6-16-6.8)	Dnew 40 (GAV 2500EAW.AC1)
	Bedroom 2	Rw 40dB (6-16-6.8)	Dnew 40 (GAV 2500EAW.AC1)
2	Living Room	Rw 32dB (6-16-4)	MVHR
	Bedroom 1	Rw 32dB (6-16-4)	MVHR
	Bedroom 2	Rw 40dB (6-16-6.8)	MVHR
3	Living Room	Rw 40dB (6-16-6.8)	Dnew 40 (GAV 2500EAW.AC1)
	Bedroom 1	Rw 40dB (6-16-6.8)	Dnew 40 (GAV 2500EAW.AC1)
4	Studio	Rw 40dB (6-16-6.8)	Dnew 40 (GAV 2500EAW.AC1)
5	Living Room	Rw 40dB (6-16-6.8)	MVHR
	Bedroom 1	Rw 32dB (6-16-4)	MVHR
6	Living Room	Rw 40dB (6-16-6.8)	Dnew 40 (GAV 2500EAW.AC1)
	Bedroom 1	Rw 40dB (6-16-6.8)	Dnew 40 (GAV 2500EAW.AC1)
	Bedroom 2	Rw 40dB (6-16-6.8)	Dnew 40 (GAV 2500EAW.AC1)

6 SUMMARY

A noise survey has been carried out at the site of the proposed development at 80 Church Street, Edmonton, to establish the external traffic noise levels on the building façades and to assess noise from the proposed kitchen extract plant.

The results showed that the guidance on internal noise levels resulting from external road traffic, as recommended in BS8322:2014 and WHO Noise Guidelines, can be achieved through appropriate acoustic glazing and acoustic ventilation measures.

Noise from the kitchen extract system has been assessed and, based on calculated plant and background noise levels, would result in a low impact at the nearest off-site residential receptor at 195 Victoria Road.

However, based on the proposed layout of Apartments 2 and 5 located nearest to the extract system, noise from the system would mean that windows on this façade would need to remain closed due to significant noise impact. Mechanical ventilation provided through MVHR would need to be installed

A schedule of acoustic glazing and ventilation requirements to all windows has been provided in Table 8.

.

APPENDIX 1 - Results of Ambient Noise Measurements, 5th to 7th February 2024

Church Street

Date & Time	LAmax [dB]	LAeq [dB]	LA90 [dB]
05/02/2024 13:22	81.4	61.7	56.8
05/02/2024 13:37	74.9	62.3	58.8
05/02/2024 13:52	77.1	61.6	58.0
05/02/2024 14:07	75.3	61.8	57.8
05/02/2024 14:22	74.0	61.9	57.5
05/02/2024 14:37	74.6	61.4	57.5
05/02/2024 14:52	83.9	63.0	57.3
05/02/2024 15:07	77.9	61.4	58.1
05/02/2024 15:22	80.8	61.6	58.4
05/02/2024 15:37	85.7	61.3	57.7
05/02/2024 15:52	80.3	60.6	56.8
05/02/2024 16:07	84.0	62.2	57.8
05/02/2024 16:22	81.3	62.7	57.9
05/02/2024 16:37	82.7	60.8	57.2
05/02/2024 16:52	80.3	61.1	57.4
05/02/2024 17:07	81.7	62.0	57.3
05/02/2024 17:22	76.6	61.1	57.0
05/02/2024 17:37	75.3	60.8	57.5
05/02/2024 17:52	84.7	61.7	57.9
05/02/2024 18:07	81.3	60.7	57.3
05/02/2024 18:22	72.8	60.5	56.7
05/02/2024 18:37	72.8	60.8	56.4
05/02/2024 18:52	73.9	60.4	55.8
05/02/2024 19:07	73.4	60.3	55.4
05/02/2024 19:22	80.6	61.0	56.1
05/02/2024 19:37	81.6	60.6	56.0
05/02/2024 19:52	81.6	61.1	54.5
05/02/2024 20:07	75.9	60.0	54.7
05/02/2024 20:22	73.2	59.6	53.7
05/02/2024 20:37	79.3	59.9	52.8
05/02/2024 20:52	72.7	59.9	53.3
05/02/2024 21:07	70.5	59.6	53.7
05/02/2024 21:22	74.1	59.8	53.6
05/02/2024 21:37	79.9	60.0	52.7
05/02/2024 21:52	72.8	58.7	51.3
05/02/2024 22:07	68.9	57.8	49.7
05/02/2024 22:22	72.3	58.9	52.1
05/02/2024 22:37	76.4	59.9	51.5
05/02/2024 22:52	79.7	60.1	51.6
05/02/2024 23:07	78.4	59.1	49.9
05/02/2024 23:22	74.2	59.1	50.8

Date & Time	LAmax [dB]	LAeq [dB]	LA90 [dB]
05/02/2024 23:37	77.4	58.3	49.8
05/02/2024 23:52	69.8	56.8	49.2
06/02/2024 00:07	69.3	56.8	49.1
06/02/2024 00:22	71.5	56.0	46.5
06/02/2024 00:37	74.5	55.5	45.7
06/02/2024 00:52	72.5	56.9	46.8
06/02/2024 01:07	74.0	55.5	45.2
06/02/2024 01:22	67.3	53.5	44.9
06/02/2024 01:37	68.4	52.9	43.7
06/02/2024 01:52	70.9	53.3	44.0
06/02/2024 02:07	70.6	53.2	44.6
06/02/2024 02:22	72.4	53.5	44.0
06/02/2024 02:37	71.7	52.8	43.0
06/02/2024 02:52	68.6	53.3	42.1
06/02/2024 03:07	68.6	49.9	42.0
06/02/2024 03:22	65.9	49.7	42.4
06/02/2024 03:37	70.1	53.3	43.1
06/02/2024 03:52	65.8	51.2	42.9
06/02/2024 04:07	72.4	51.8	42.4
06/02/2024 04:22	71.8	52.0	42.3
06/02/2024 04:37	68.0	52.3	43.9
06/02/2024 04:52	72.4	54.9	45.8
06/02/2024 05:07	71.7	55.3	45.9
06/02/2024 05:22	70.5	54.9	45.7
06/02/2024 05:37	68.4	56.1	46.9
06/02/2024 05:52	72.9	58.3	49.0
06/02/2024 06:07	68.4	56.9	49.4
06/02/2024 06:22	73.8	58.6	51.0
06/02/2024 06:37	70.4	59.3	51.4
06/02/2024 06:52	70.8	59.2	53.2
06/02/2024 07:07	69.8	60.2	55.1
06/02/2024 07:22	73.0	60.1	54.6
06/02/2024 07:37	73.1	62.3	55.4
06/02/2024 07:52	75.8	61.0	57.2
06/02/2024 08:07	73.8	61.1	57.7
06/02/2024 08:22	82.9	63.4	57.6
06/02/2024 08:37	71.1	60.6	57.4
06/02/2024 08:52	75.4	59.9	56.6
06/02/2024 09:07	79.7	60.1	56.6
06/02/2024 09:22	75.2	60.5	56.2
06/02/2024 09:37	72.5	61.0	56.4

Date & Time	LAmax [dB]	LAeq [dB]	LA90 [dB]
06/02/2024 09:52	77.3	61.7	56.5
06/02/2024 10:07	86.6	62.7	56.7
06/02/2024 10:22	77.1	61.4	57.2
06/02/2024 10:37	78.2	62.3	57.2
06/02/2024 10:52	79.6	61.9	57.4
06/02/2024 11:07	76.3	61.6	57.6
06/02/2024 11:22	80.0	61.7	57.5
06/02/2024 11:37	75.9	61.2	56.9
06/02/2024 11:52	74.1	61.6	57.9
06/02/2024 12:07	76.9	61.3	56.4
06/02/2024 12:22	76.4	61.7	57.7
06/02/2024 12:37	74.2	61.6	57.6
06/02/2024 12:52	76.8	61.6	57.0
06/02/2024 13:07	74.1	61.4	56.8
06/02/2024 13:22	73.4	61.2	56.7
06/02/2024 13:37	81.4	62.3	57.3
06/02/2024 13:52	73.6	61.1	57.1
06/02/2024 14:07	77.0	61.8	57.4
06/02/2024 14:22	87.0	62.1	57.0
06/02/2024 14:37	74.7	61.6	57.8
06/02/2024 14:52	82.9	62.3	58.2
06/02/2024 15:07	79.7	61.2	58.1
06/02/2024 15:22	87.5	63.6	57.3
06/02/2024 15:37	74.8	60.3	56.9
06/02/2024 15:52	86.3	62.1	57.1
06/02/2024 16:07	94.0	69.0	57.7
06/02/2024 16:22	79.4	61.6	57.5
06/02/2024 16:37	80.1	61.5	57.7
06/02/2024 16:52	75.0	60.8	57.8
06/02/2024 17:07	84.7	61.9	57.2
06/02/2024 17:22	81.2	60.4	56.4
06/02/2024 17:37	89.1	62.7	57.0
06/02/2024 17:52	74.6	60.1	57.0
06/02/2024 18:07	89.5	67.5	56.2
06/02/2024 18:22	71.2	59.0	55.8
06/02/2024 18:37	82.6	62.2	56.3
06/02/2024 18:52	91.2	67.2	56.1
06/02/2024 19:07	86.2	64.1	57.0
06/02/2024 19:22	92.6	67.3	57.4
06/02/2024 19:37	79.7	61.4	58.0
06/02/2024 19:52	79.3	61.7	58.0
06/02/2024 20:07	76.4	61.4	56.9
06/02/2024 20:22	71.8	60.9	57.1
06/02/2024 20:37	71.0	61.0	55.7
06/02/2024 20:52	72.9	61.4	56.2
06/02/2024 21:07	71.1	61.5	56.8
06/02/2024 21:22	72.9	61.0	56.2
06/02/2024 21:37	67.9	60.3	55.1

Date & Time	LAmax [dB]	LAeq [dB]	LA90 [dB]
06/02/2024 21:52	75.8	60.5	54.6
06/02/2024 22:07	76.2	60.9	55.2
06/02/2024 22:22	75.8	60.8	54.0
06/02/2024 22:37	77.1	63.4	58.4
06/02/2024 22:52	75.0	61.4	53.2
06/02/2024 23:07	77.0	62.0	52.9
06/02/2024 23:22	79.2	61.0	53.1
06/02/2024 23:37	72.1	60.6	53.3
06/02/2024 23:52	72.1	59.6	52.1
07/02/2024 00:07	72.5	60.5	52.7
07/02/2024 00:22	71.5	58.6	47.6
07/02/2024 00:37	70.4	57.2	46.8
07/02/2024 00:52	68.7	56.2	47.0
07/02/2024 01:07	69.6	55.5	46.1
07/02/2024 01:22	74.5	56.7	47.3
07/02/2024 01:37	68.9	56.4	47.2
07/02/2024 01:52	70.1	55.5	45.6
07/02/2024 02:07	67.5	52.2	45.0
07/02/2024 02:22	67.7	54.0	44.4
07/02/2024 02:37	67.2	52.8	45.1
07/02/2024 02:52	68.6	52.7	45.3
07/02/2024 03:07	66.9	52.3	45.2
07/02/2024 03:22	71.7	55.2	46.0
07/02/2024 03:37	66.2	52.4	43.4
07/02/2024 03:52	70.4	52.4	37.9
07/02/2024 04:07	67.0	52.3	37.1
07/02/2024 04:22	75.2	53.4	38.9
07/02/2024 04:37	68.8	54.5	48.5
07/02/2024 04:52	70.7	57.0	48.7
07/02/2024 05:07	68.9	56.5	49.4
07/02/2024 05:22	70.9	56.8	48.9
07/02/2024 05:37	72.9	58.0	49.6
07/02/2024 05:52	70.8	58.2	49.4
07/02/2024 06:07	70.7	57.9	50.1
07/02/2024 06:22	73.4	59.8	50.3
07/02/2024 06:37	71.2	59.7	51.8
07/02/2024 06:52	68.8	60.3	51.1
07/02/2024 07:07	71.3	60.5	53.1
07/02/2024 07:22	77.9	61.0	55.1
07/02/2024 07:37	77.0	61.3	56.1
07/02/2024 07:52	86.8	64.4	57.1
07/02/2024 08:07	77.6	61.9	58.0
07/02/2024 08:22	75.8	61.4	58.0
07/02/2024 08:37	77.8	61.6	57.9
07/02/2024 08:52	85.0	62.5	58.1
07/02/2024 09:07	78.4	60.7	56.2
07/02/2024 09:22	70.4	61.6	57.2
07/02/2024 09:37	75.1	62.0	56.7

Date & Time	LAmax [dB]	LAeq [dB]	LA90 [dB]
07/02/2024 09:52	71.0	61.7	56.9
07/02/2024 10:07	70.9	61.7	56.8
07/02/2024 10:22	69.2	61.3	55.3
07/02/2024 10:37	70.7	61.2	56.3
07/02/2024 10:52	91.2	65.8	55.8
07/02/2024 11:07	77.1	61.5	56.4
07/02/2024 11:22	75.8	61.7	56.4
07/02/2024 11:37	77.7	60.9	55.3
07/02/2024 11:52	73.8	62.0	56.3
07/02/2024 12:07	85.5	62.4	56.7
07/02/2024 12:22	84.4	63.3	56.3
07/02/2024 12:37	75.6	62.0	56.5
07/02/2024 12:52	78.4	62.0	56.4
07/02/2024 13:07	73.3	61.9	57.1
07/02/2024 13:22	77.9	61.8	56.7
07/02/2024 13:37	75.0	61.6	56.4
07/02/2024 13:52	79.3	61.4	56.1

Victoria Road

Date & Time	LAmax [dB]	LAeq [dB]	LA90 [dB]
05/02/2024 13:27	70.5	60.7	54.7
05/02/2024 13:42	72.6	61.6	55.9
05/02/2024 13:57	70.5	61.5	56.3
05/02/2024 14:12	70.9	61.1	55.7
05/02/2024 14:27	68.5	60.8	54.5
05/02/2024 14:42	73.6	61.0	54.6
05/02/2024 14:57	80.0	62.7	56.6
05/02/2024 15:12	75.2	61.0	55.1
05/02/2024 15:27	77.6	60.5	55.7
05/02/2024 15:42	77.2	60.3	54.0
05/02/2024 15:57	76.9	59.7	53.8
05/02/2024 16:12	74.8	61.3	55.6
05/02/2024 16:27	80.5	62.6	55.7
05/02/2024 16:42	68.4	60.1	54.7
05/02/2024 16:57	70.7	61.0	56.0
05/02/2024 17:12	78.1	61.5	55.3
05/02/2024 17:27	72.8	60.8	55.5
05/02/2024 17:42	69.1	60.5	55.8
05/02/2024 17:57	76.0	60.6	55.7
05/02/2024 18:12	71.5	60.4	55.4
05/02/2024 18:27	69.1	60.5	55.8
05/02/2024 18:42	67.7	60.7	54.2
05/02/2024 18:57	73.8	59.8	53.0
05/02/2024 19:12	74.8	60.9	53.2
05/02/2024 19:27	68.7	59.7	53.5
05/02/2024 19:42	81.8	61.5	53.8

Date & Time	LAmax [dB]	LAeq [dB]	LA90 [dB]
05/02/2024 19:57	85.0	62.5	55.1
05/02/2024 20:12	72.3	60.4	52.1
05/02/2024 20:27	66.7	59.5	51.6
05/02/2024 20:42	81.0	61.6	52.2
05/02/2024 20:57	78.0	61.9	54.5
05/02/2024 21:12	77.9	61.6	55.2
05/02/2024 21:27	75.9	61.4	54.8
05/02/2024 21:42	82.6	60.9	52.6
05/02/2024 21:57	72.5	59.2	51.0
05/02/2024 22:12	73.2	59.1	48.8
05/02/2024 22:27	67.5	59.1	49.3
05/02/2024 22:42	71.8	60.9	52.0
05/02/2024 22:57	81.1	61.8	52.0
05/02/2024 23:12	70.2	59.2	47.6
05/02/2024 23:27	68.0	59.1	46.6
05/02/2024 23:42	68.0	59.7	43.6
05/02/2024 23:57	67.8	57.2	43.7
06/02/2024 00:12	66.0	57.2	42.7
06/02/2024 00:27	66.3	55.8	40.3
06/02/2024 00:42	68.7	56.9	37.9
06/02/2024 00:57	75.7	57.1	42.0
06/02/2024 01:12	71.0	54.7	37.7
06/02/2024 01:27	67.2	52.8	37.1
06/02/2024 01:42	64.1	53.1	36.4
06/02/2024 01:57	61.8	50.2	36.1
06/02/2024 02:12	63.6	51.6	36.6
06/02/2024 02:27	67.9	52.6	36.4
06/02/2024 02:42	65.7	52.3	34.5
06/02/2024 02:57	64.2	52.5	33.2
06/02/2024 03:12	68.5	48.2	32.9
06/02/2024 03:27	63.5	49.7	33.8
06/02/2024 03:42	67.2	52.4	34.9
06/02/2024 03:57	63.5	51.6	35.2
06/02/2024 04:12	67.9	50.4	33.4
06/02/2024 04:27	67.8	52.8	34.9
06/02/2024 04:42	70.0	53.3	36.9
06/02/2024 04:57	68.2	55.6	40.0
06/02/2024 05:12	67.2	55.2	39.7
06/02/2024 05:27	69.2	55.0	37.3
06/02/2024 05:42	68.3	57.1	42.7
06/02/2024 05:57	68.0	57.3	42.9
06/02/2024 06:12	68.7	58.3	45.3
06/02/2024 06:27	68.5	59.1	47.9
06/02/2024 06:42	67.9	60.4	49.4
06/02/2024 06:57	75.2	59.9	49.9
06/02/2024 07:12	66.6	60.4	51.7
06/02/2024 07:27	64.2	60.0	52.3
06/02/2024 07:42	73.2	62.4	55.6

Date & Time	LAmax [dB]	LAeq [dB]	LA90 [dB]
06/02/2024 07:57	74.4	61.4	55.1
06/02/2024 08:12	75.2	61.2	56.5
06/02/2024 08:27	73.9	61.2	55.0
06/02/2024 08:42	71.5	60.6	54.3
06/02/2024 08:57	70.7	59.1	53.9
06/02/2024 09:12	71.3	59.1	52.9
06/02/2024 09:27	70.8	61.5	54.6
06/02/2024 09:42	67.0	60.2	52.8
06/02/2024 09:57	75.9	62.0	55.9
06/02/2024 10:12	85.0	63.4	54.7
06/02/2024 10:27	70.5	60.9	54.2
06/02/2024 10:42	70.5	61.7	54.4
06/02/2024 10:57	74.1	61.3	55.6
06/02/2024 11:12	71.3	61.2	54.6
06/02/2024 11:27	75.0	61.3	55.9
06/02/2024 11:42	68.2	61.4	55.3
06/02/2024 11:57	69.2	61.5	56.0
06/02/2024 12:12	73.3	61.9	55.0
06/02/2024 12:27	77.4	62.3	55.8
06/02/2024 12:42	76.0	61.7	56.0
06/02/2024 12:57	66.7	60.4	52.5
06/02/2024 13:12	75.3	61.3	54.6
06/02/2024 13:27	68.8	61.2	55.8
06/02/2024 13:42	78.8	62.2	54.9
06/02/2024 13:57	74.1	61.7	56.3
06/02/2024 14:12	74.5	61.3	54.2
06/02/2024 14:27	77.9	61.0	53.4
06/02/2024 14:42	71.2	61.1	55.5
06/02/2024 14:57	76.1	61.6	56.0
06/02/2024 15:12	66.2	60.7	55.9
06/02/2024 15:27	82.2	63.3	55.9
06/02/2024 15:42	69.9	58.9	53.5
06/02/2024 15:57	82.4	61.6	54.3
06/02/2024 16:12	92.7	64.5	55.5
06/02/2024 16:27	75.7	61.2	56.0
06/02/2024 16:42	73.2	61.3	55.9
06/02/2024 16:57	79.2	62.2	55.4
06/02/2024 17:12	67.7	61.0	55.6
06/02/2024 17:27	79.8	61.7	56.1
06/02/2024 17:42	77.0	61.0	55.7
06/02/2024 17:57	73.5	59.9	54.6
06/02/2024 18:12	100.3	69.8	54.1
06/02/2024 18:27	68.5	58.6	52.8
06/02/2024 18:42	85.0	64.0	54.0
06/02/2024 18:57	89.6	66.2	54.0
06/02/2024 19:12	71.1	61.5	56.7
06/02/2024 19:27	84.1	63.8	57.5
06/02/2024 19:42	79.1	63.5	57.7

Date & Time	LAmax [dB]	LAeq [dB]	LA90 [dB]
06/02/2024 19:57	82.6	65.8	58.0
06/02/2024 20:12	79.4	63.2	56.8
06/02/2024 20:27	77.9	64.4	56.1
06/02/2024 20:42	80.4	65.0	57.1
06/02/2024 20:57	79.0	64.7	57.1
06/02/2024 21:12	82.1	63.5	56.9
06/02/2024 21:27	80.1	63.2	56.3
06/02/2024 21:42	80.2	65.5	56.8
06/02/2024 21:57	83.8	65.2	55.9
06/02/2024 22:12	79.0	64.1	55.5
06/02/2024 22:27	75.6	63.7	54.6
06/02/2024 22:42	78.9	64.8	54.9
06/02/2024 22:57	76.4	61.7	52.1
06/02/2024 23:12	77.5	61.9	50.8
06/02/2024 23:27	73.9	61.5	52.3
06/02/2024 23:42	68.6	59.9	46.7
06/02/2024 23:57	70.0	60.4	46.6
07/02/2024 00:12	71.0	61.4	46.1
07/02/2024 00:27	70.3	58.6	42.8
07/02/2024 00:42	66.7	57.0	38.6
07/02/2024 00:57	65.7	55.7	38.8
07/02/2024 01:12	79.9	58.4	38.9
07/02/2024 01:27	72.6	59.0	40.8
07/02/2024 01:42	66.7	57.3	38.3
07/02/2024 01:57	64.7	53.2	36.5
07/02/2024 02:12	77.3	54.8	37.7
07/02/2024 02:27	73.4	54.2	34.6
07/02/2024 02:42	64.6	53.2	35.6
07/02/2024 02:57	63.2	50.6	35.0
07/02/2024 03:12	69.4	56.1	36.2
07/02/2024 03:27	70.9	54.1	36.2
07/02/2024 03:42	68.9	53.1	33.8
07/02/2024 03:57	63.0	52.7	33.8
07/02/2024 04:12	62.8	51.1	33.4
07/02/2024 04:27	81.5	57.2	34.0
07/02/2024 04:42	68.6	55.5	35.3
07/02/2024 04:57	68.0	58.4	39.2
07/02/2024 05:12	69.9	58.4	39.2
07/02/2024 05:27	67.8	57.1	38.9
07/02/2024 05:42	69.3	59.2	43.5
07/02/2024 05:57	70.2	59.1	42.0
07/02/2024 06:12	67.3	58.9	46.1
07/02/2024 06:27	70.8	61.5	45.1
07/02/2024 06:42	67.2	61.7	50.7
07/02/2024 06:57	67.3	61.7	49.6
07/02/2024 07:12	70.6	61.5	50.5
07/02/2024 07:27	76.9	63.0	55.3
07/02/2024 07:42	75.1	62.3	55.4

Date & Time	LAmax [dB]	LAeq [dB]	LA90 [dB]
07/02/2024 07:57	71.9	63.4	57.6
07/02/2024 08:12	70.9	62.8	57.6
07/02/2024 08:27	71.2	62.5	56.7
07/02/2024 08:42	71.2	62.2	56.1
07/02/2024 08:57	83.9	63.6	56.6
07/02/2024 09:12	76.5	63.0	56.4
07/02/2024 09:27	67.6	62.8	58.0
07/02/2024 09:42	67.3	62.8	56.1
07/02/2024 09:57	67.8	62.5	56.8
07/02/2024 10:12	75.8	62.9	55.7
07/02/2024 10:27	73.6	62.1	53.9
07/02/2024 10:42	71.5	62.1	54.1
07/02/2024 10:57	90.0	68.5	55.0
07/02/2024 11:12	76.5	62.3	54.8
07/02/2024 11:27	69.8	62.3	55.1
07/02/2024 11:42	72.4	62.8	55.9
07/02/2024 11:57	74.5	62.9	56.4
07/02/2024 12:12	85.6	66.0	57.4
07/02/2024 12:27	72.0	63.4	57.4
07/02/2024 12:42	80.4	64.3	58.4
07/02/2024 12:57	80.1	64.2	57.9
07/02/2024 13:12	74.6	63.8	58.6
07/02/2024 13:27	73.8	63.8	58.0
07/02/2024 13:42	72.1	62.3	55.2
07/02/2024 13:57	71.5	62.3	55.7
07/02/2024 14:11	78.6	62.0	54.4

APPENDIX 2 – Calculation of internal traffic noise levels

BS8233:2014 Annexe G2 - Rigorous Calculation of Façade Sound Insulation							
Apartment AP01/4 Living Room							
Wall area		24.5					
Window Area		7.2					
Ceiling/Roof		0.0					
Room Vol.		66.7					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Measured Façade Leq		62.3	58.0	56.4	58.4	53.9	**60.1**
Ventilator Dne	GAV 2500EAW.AC1	41	39	37	47	44	
Window R	6/16/6.8	21	28	37	48	48	
Wall	Masonry Cavity	40	44	45	51	56	
Ceiling+Roof R	Std. Roof	28	34	40	45	49	
Absorption		11	14	16	16	15	
Vent		0.000032	0.000051	0.000081	0.000008	0.000016	
		-44.9	-42.9	-40.9	-50.9	-47.9	
Windows		0.002333	0.000466	0.000059	0.000005	0.000005	
		-26.3	-33.3	-42.3	-53.3	-53.3	
Wall		0.000071	0.000028	0.000022	0.000006	0.000002	
		-41.5	-45.5	-46.5	-52.5	-57.5	
Ceiling/roof		0.000001	0.000000	0.000000	0.000000	0.000000	
		-61.9	-67.9	-73.9	-78.9	-82.9	
Composite R		-26.1	-32.6	-37.9	-47.3	-46.4	
Abs. Correction		3.5	2.4	1.9	1.9	2.1	
Leq (int)		42.7	30.8	23.3	15.9	12.6	
A-Weighting		-16.1	-8.6	-3.2	0	1.2	
LAeq (internal)		26.6	22.2	20.1	15.9	13.8	**29.0**
Façade Atten.		**31.2**	**dB**				
	External LAeq,16hr	62.7	Internal	31.5	Guideline	35	

BS8233:2014 Annexe G2 - Rigorous Calculation of Façade Sound Insulation							
Apartment AP01/4 Bedroom 1/2							
Wall area		16.8					
Window Area		2.9					
Ceiling/Roof		0.0					
Room Vol.		27.6					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Measured Façade Leq		62.3	58.0	56.4	58.4	53.9	**60.1**
Ventilator Dne	GAV 2500EAW.AC1	41	39	37	47	44	
Window R	6/16/6.8	21	28	37	48	48	
Wall	Masonry Cavity	40	44	45	51	56	
Ceiling+Roof R	Std. Roof	28	34	40	45	49	
Absorption		11	14	16	16	15	
Vent		0.000047	0.000075	0.000119	0.000012	0.000024	
		-43.3	-41.3	-39.3	-49.3	-46.3	
Windows		0.001370	0.000273	0.000034	0.000003	0.000003	
		-28.6	-35.6	-44.6	-55.6	-55.6	
Wall		0.000083	0.000033	0.000026	0.000007	0.000002	
		-40.8	-44.8	-45.8	-51.8	-56.8	
Ceiling/roof		0.000001	0.000000	0.000000	0.000000	0.000000	
		-60.3	-66.3	-72.3	-77.3	-81.3	
Composite R		-28.2	-34.2	-37.5	-46.7	-45.5	
Abs. Correction		1.8	0.8	0.2	0.2	0.5	
Leq (int)		38.9	27.6	22.1	14.9	12.0	
A-Weighting		-16.1	-8.6	-3.2	0	1.2	
LAeq (internal)		22.8	19.0	18.9	14.9	13.2	**26.0**
Façade Atten.		**34.1**	**dB**				
	External LAeq,8hr	58.3	Internal	24.2	Guideline	35	
	External LAmax	74.0	Internal	39.9	Guideline	45	

BS8233:2014 Annexe G2 - Rigorous Calculation of Façade Sound Insulation							
Apartment AP02/5 Living Room							
Wall area		27.4					
Window Area		8.3					
Ceiling/Roof		0.0					
Room Vol.		27.6					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Measured Façade Leq		64.3	63.8	62.7	62.4	58.0	**64.8**
Ventilator Dne	GAV 2500EAW.AC1	41	39	37	47	44	
Window R	6/16/4	21	20	26	38	37	
Wall	Masonry Cavity	40	44	45	51	56	
Ceiling+Roof R	Std. Roof	28	34	40	45	49	
Absorption		11	14	16	16	15	
Vent		0.000029	0.000046	0.000073	0.000007	0.000015	
		-45.4	-43.4	-41.4	-51.4	-48.4	
Windows		0.002405	0.003028	0.000761	0.000048	0.000060	
		-26.2	-25.2	-31.2	-43.2	-42.2	
Wall		0.000070	0.000028	0.000022	0.000006	0.000002	
		-41.6	-45.6	-46.6	-52.6	-57.6	
Ceiling/roof		0.000001	0.000000	0.000000	0.000000	0.000000	
		-62.4	-68.4	-74.4	-79.4	-83.4	
Composite R		-26.0	-25.1	-30.7	-42.2	-41.2	
Abs. Correction		4.0	2.9	2.3	2.3	2.6	
Leq (int)		45.3	44.6	37.3	25.6	22.5	
A-Weighting		-16.1	-8.6	-3.2	0	1.2	
LAeq (internal)		29.2	36.0	34.1	25.6	23.7	**39.0**
Façade Atten.		**25.8**	**dB**				
	External LAeq,16hr	58.3	Internal	32.5	Guideline	35	

BS8233:2014 Annexe G2 - Rigorous Calculation of Façade Sound Insulation							
Apartment AP02/5 Bedroom 1/2							
Wall area		13.0					
Window Area		2.6					
Ceiling/Roof		0.0					
Room Vol.		27.6					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Measured Façade Leq		64.3	63.8	62.7	62.4	58.0	**64.8**
Ventilator Dne	GAV 2500EAW.AC1	41	39	37	47	44	
Window R	6/16/4	21	20	26	38	37	
Wall	Masonry Cavity	40	44	45	51	56	
Ceiling+Roof R	Std. Roof	28	34	40	45	49	
Absorption		11	14	16	16	15	
Vent		0.000061	0.000097	0.000153	0.000015	0.000031	
		-42.1	-40.1	-38.1	-48.1	-45.1	
Windows		0.001587	0.001998	0.000502	0.000032	0.000040	
		-28.0	-27.0	-33.0	-45.0	-44.0	
Wall		0.000080	0.000032	0.000025	0.000006	0.000002	
		-41.0	-45.0	-46.0	-52.0	-57.0	
Ceiling/roof		0.000001	0.000000	0.000000	0.000000	0.000000	
		-59.1	-65.1	-71.1	-76.1	-80.1	
Composite R		-27.6	-26.7	-31.7	-42.7	-41.4	
Abs. Correction		0.7	-0.3	-0.9	-0.9	-0.6	
Leq (int)		40.4	39.8	33.1	21.8	19.0	
A-Weighting		-16.1	-8.6	-3.2	0	1.2	
LAeq (internal)		24.3	31.2	29.9	21.8	20.2	**34.5**
Façade Atten.		**30.3**	**dB**				
	External LAeq,8hr	53.5	Internal	23.2	Guideline	35	
	External LAmax	70.0	Internal	39.7	Guideline	45	

BS8233:2014 Annexe G2 - Rigorous Calculation of Façade Sound Insulation							
Apartment AP03/6 Living Room							
Wall area		24.5					
Window Area		7.2					
Ceiling/Roof		0.0					
Room Vol.		66.7					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Measured Façade Leq		64.3	63.8	62.7	62.4	58.0	**64.8**
Ventilator Dne	GAV 2500EAW.AC1	41	39	37	47	44	
Window R	6/16/6.8	21	28	37	48	48	
Wall	Masonry Cavity	40	44	45	51	56	
Ceiling+Roof R	Std. Roof	28	34	40	45	49	
Absorption		11	14	16	16	15	
Vent		0.000032	0.000051	0.000081	0.000008	0.000016	
		-44.9	-42.9	-40.9	-50.9	-47.9	
Windows		0.002333	0.000466	0.000059	0.000005	0.000005	
		-26.3	-33.3	-42.3	-53.3	-53.3	
Wall		0.000071	0.000028	0.000022	0.000006	0.000002	
		-41.5	-45.5	-46.5	-52.5	-57.5	
Ceiling/roof		0.000001	0.000000	0.000000	0.000000	0.000000	
		-61.9	-67.9	-73.9	-78.9	-82.9	
Composite R		-26.1	-32.6	-37.9	-47.3	-46.4	
Abs. Correction		3.5	2.4	1.9	1.9	2.1	
Leq (int)		44.7	36.6	29.6	19.9	16.7	
A-Weighting		-16.1	-8.6	-3.2	0	1.2	
LAeq (internal)		28.6	28.0	26.4	19.9	17.9	**32.9**
Façade Atten.		**31.9**	**dB**				
	External LAeq,16hr	62.3	Internal	30.4	Guideline	35	

BS8233:2014 Annexe G2 - Rigorous Calculation of Façade Sound Insulation							
Apartment AP03/6 Bedroom							
Wall area		16.8					
Window Area		2.9					
Ceiling/Roof		0.0					
Room Vol.		27.6					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Measured Façade Leq		64.3	63.8	62.7	62.4	58.0	**64.8**
Ventilator Dne	GAV 2500EAW.AC1	41	39	37	47	44	
Window R	6/16/6.8	21	28	37	48	48	
Wall	Masonry Cavity	40	44	45	51	56	
Ceiling+Roof R	Std. Roof	28	34	40	45	49	
Absorption		11	14	16	16	15	
Vent		0.000047	0.000075	0.000119	0.000012	0.000024	
		-43.3	-41.3	-39.3	-49.3	-46.3	
Windows		0.001370	0.000273	0.000034	0.000003	0.000003	
		-28.6	-35.6	-44.6	-55.6	-55.6	
Wall		0.000083	0.000033	0.000026	0.000007	0.000002	
		-40.8	-44.8	-45.8	-51.8	-56.8	
Ceiling/roof		0.000001	0.000000	0.000000	0.000000	0.000000	
		-60.3	-66.3	-72.3	-77.3	-81.3	
Composite R		-28.2	-34.2	-37.5	-46.7	-45.5	
Abs. Correction		1.8	0.8	0.2	0.2	0.5	
Leq (int)		40.9	33.4	28.4	18.9	16.1	
A-Weighting		-16.1	-8.6	-3.2	0	1.2	
LAeq (internal)		24.8	24.8	25.2	18.9	17.3	**30.3**
Façade Atten.		**34.5**	**dB**				
	External LAeq,8hr	57.5	Internal	23.0	Guideline	35	
	External LAmax	74.0	Internal	39.5	Guideline	45	

APPENDIX 3 – Kitchen Extract Plant Specification

Extract Fan Helios GBD 630/4 Noise Emission Data – Sound Power Levels

GBD 630/4 T120

Δp_{fa} Pa

Frequency		Hz	Total	125	250	500	1k	2k	4k	8k
L_{WA}	Case breakout	dB(A)	73	66	67	65	65	65	61	55
L_{WA}	Intake	dB(A)	87	74	83	80	79	78	75	67
L_{WA}	Exhaust	dB(A)	90	81	82	84	84	82	77	69

$\rho = 1{,}20$ kg/m³

Duct Attenuator – Helios RSD 630/1200

Nominal weight kg	Isolation standard D_0 dB							Average attenuation
	125	250	500	1000	2000	4000	8000	
68	5	10	16	15	15	11	8	15

APPENDIX 4 – Kitchen plant external noise levels at façade of nearest apartments

Kitchen Plant Noise Level at AP02 Bedroom 1										
CALCULATION OF DUCT TERMINATION NOISE										**Calculated**
Octave Frequency Hz		**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**
LWA Helios 630/4		76	81	82	84	84	82	77	69	86
Duct Attenuation		0	0	0	0	0	0	0	0	
Bend Attenuation		0	0	0	0	0	0	0	0	
End Reflection		-8	-4	-1	0	0	0	0	0	
Attenuator RSD 630/1200		-3	-5	-10	-16	-15	-15	-11	-8	
Sound Power at Outlet		65	72	71	68	69	67	66	61	74
Directivity Elevated Source		-11	-11	-11	-11	-11	-11	-11	-11	
SPL at distance of (m)	5.9	38.6	45.6	44.6	41.6	42.6	40.6	39.6	34.6	48
Fan case breakout at nearest receptor										
Octave Band		63	125	250	500	1000	2000	4000	8000	dB(A)
LWA Helios 630/4		60	66	67	65	65	65	61	55	73
SPL at m	4.1	40	46	47	45	45	45	41	35	48
Cumulative Spectrum		42	49	49	46	47	46	43	38	
AC Unit Mitsubishi FDC140VN										
SPL 1m		51								
Receptor Distance		2.1								
SPL at Receptor		45								
AC Unit Mitsubishi FDC100VNP-W										
SPL 1m		56								
Receptor Distance		5.0								
SPL at Receptor		42								
AC Unit Mitsubishi FDCVA402HENAR										
SPL 1m		50								
Receptor Distance		5.3								
SPL at Receptor		36								
Combined AC Units		**47**			**All sources cumulative level, dB(A)**					52.3

Kitchen Plant Noise Level at AP02 Bedroom 2										
CALCULATION OF DUCT TERMINATION NOISE										**Calculated**
Octave Frequency Hz		**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**
LWA Helios 630/4		76	81	82	84	84	82	77	69	86
Duct Attenuation		0	0	0	0	0	0	0	0	
Bend Attenuation		0	0	0	0	0	0	0	0	
End Reflection		-8	-4	-1	0	0	0	0	0	
Attenuator RSD 630/1200		-3	-5	-10	-16	-15	-15	-11	-8	
Sound Power at Outlet		65	72	71	68	69	67	66	61	74
Directivity Elevated Source		-11	-11	-11	-11	-11	-11	-11	-11	
SPL at distance of (m)	4.1	41.7	48.7	47.7	44.7	45.7	43.7	42.7	37.7	51
Fan case breakout at nearest receptor										
Octave Band		63	125	250	500	1000	2000	4000	8000	dB(A)
LWA Helios 630/4		60	66	67	65	65	65	61	55	73
SPL at m	1.1	51	57	58	56	56	56	52	46	60
Cumulative Spectrum		52	58	59	56	57	56	53	47	
AC Unit Mitsubishi FDC140VN										
SPL 1m		51								
Receptor Distance		2.1								
SPL at Receptor		45								
AC Unit Mitsubishi FDC100VNP-W										
SPL 1m		56								
Receptor Distance		5.0								
SPL at Receptor		42								
AC Unit Mitsubishi FDCVA402HENAR										
SPL 1m		50								
Receptor Distance		2.8								
SPL at Receptor		41								
Combined AC Units		**48**			**All sources cumulative level, dB(A)**					60.3

Kitchen Plant Noise Level at AP02 Living Room										
CALCULATION OF DUCT TERMINATION NOISE										**Calculated**
Octave Frequency Hz		**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**
LWA Helios 630/4		76	81	82	84	84	82	77	69	86
Duct Attenuation		0	0	0	0	0	0	0	0	
Bend Attenuation		0	0	0	0	0	0	0	0	
End Reflection		-8	-4	-1	0	0	0	0	0	
Attenuator RSD 630/1200		-3	-5	-10	-16	-15	-15	-11	-8	
Sound Power at Outlet		65	72	71	68	69	67	66	61	74
Directivity Elevated Source		-11	-11	-11	-11	-11	-11	-11	-11	
SPL at distance of (m)	4.7	40.6	47.6	46.6	43.6	44.6	42.6	41.6	36.6	50
Fan case breakout at nearest receptor										
Octave Band		63	125	250	500	1000	2000	4000	8000	dB(A)
LWA Helios 630/4		60	66	67	65	65	65	61	55	73
SPL at m	2.7	43	49	50	48	48	48	44	38	52
Cumulative Spectrum		45	52	52	50	50	49	46	41	
AC Unit Mitsubishi FDC140VN										
SPL 1m		51								
Receptor Distance		3								
SPL at Receptor		41								
AC Unit Mitsubishi FDC100VNP-W										
SPL 1m		56								
Receptor Distance		3.8								
SPL at Receptor		44								
AC Unit Mitsubishi FDCVA402HENAR										
SPL 1m		50								
Receptor Distance		8.9								
SPL at Receptor		31								
Combined AC Units		**46**			**All sources cumulative level, dB(A)**					54.6

Kitchen Plant Noise Level at AP05 Living Room										
CALCULATION OF DUCT TERMINATION NOISE										**Calculated**
Octave Frequency Hz		**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**
LWA Helios 630/4		76	81	82	84	84	82	77	69	86
Duct Attenuation		0	0	0	0	0	0	0	0	
Bend Attenuation		0	0	0	0	0	0	0	0	
End Reflection		-8	-4	-1	0	0	0	0	0	
Attenuator RSD 630/1200		-3	-5	-10	-16	-15	-15	-11	-8	
Sound Power at Outlet		65	72	71	68	69	67	66	61	74
Directivity Elevated Source		-11	-11	-11	-11	-11	-11	-11	-11	
SPL at distance of (m)	1.4	51.1	58.1	57.1	54.1	55.1	53.1	52.1	47.1	60
Fan case breakout at nearest receptor										
Octave Band		63	125	250	500	1000	2000	4000	8000	dB(A)
LWA Helios 630/4		60	66	67	65	65	65	61	55	73
SPL at m	4.1	40	46	47	45	45	45	41	35	48
Cumulative Spectrum		51	58	57	55	55	54	52	47	
AC Unit Mitsubishi FDC140VN										
SPL 1m		51								
Receptor Distance		8.6								
SPL at Receptor		32								
AC Unit Mitsubishi FDC100VNP-W										
SPL 1m		56								
Receptor Distance		5.3								
SPL at Receptor		42								
AC Unit Mitsubishi FDCVA402HENAR										
SPL 1m		50								
Receptor Distance		6								
SPL at Receptor		34								
Combined AC Units		**43**			**All sources cumulative level, dB(A)**					60.5

Kitchen Plant Noise Level at AP05 Bedroom 1										
CALCULATION OF DUCT TERMINATION NOISE										**Calculated**
Octave Frequency Hz		**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**
LWA Helios 630/4		76	81	82	84	84	82	77	69	86
Duct Attenuation		0	0	0	0	0	0	0	0	
Bend Attenuation		0	0	0	0	0	0	0	0	
End Reflection		-8	-4	-1	0	0	0	0	0	
Attenuator RSD 630/1200		-3	-5	-10	-16	-15	-15	-11	-8	
Sound Power at Outlet		65	72	71	68	69	67	66	61	74
Directivity Elevated Source		-11	-11	-11	-11	-11	-11	-11	-11	
SPL at distance of (m)	2.2	47.2	54.2	53.2	50.2	51.2	49.2	48.2	43.2	56
Fan case breakout at nearest receptor										
Octave Band		63	125	250	500	1000	2000	4000	8000	dB(A)
LWA Helios 630/4		60	66	67	65	65	65	61	55	73
SPL at m	4.4	39	45	46	44	44	44	40	34	48
Cumulative Spectrum		48	55	54	51	52	50	49	44	
AC Unit Mitsubishi FDC140VN										
SPL 1m		51								
Receptor Distance		6.5								
SPL at Receptor		35								
AC Unit Mitsubishi FDC100VNP-W										
SPL 1m		56								
Receptor Distance		5.6								
SPL at Receptor		41								
AC Unit Mitsubishi FDCVA402HENAR										
SPL 1m		50								
Receptor Distance		6.4								
SPL at Receptor		34								
Combined AC Units		**43**			**All sources cumulative level, dB(A)**					57.0

Kitchen Plant Noise Level at AP06 Bedroom 1										
CALCULATION OF DUCT TERMINATION NOISE										**Calculated**
Octave Frequency Hz		**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**
LWA Helios 630/4		76	81	82	84	84	82	77	69	86
Duct Attenuation		0	0	0	0	0	0	0	0	
Bend Attenuation		0	0	0	0	0	0	0	0	
End Reflection		-8	-4	-1	0	0	0	0	0	
Attenuator RSD 630/1200		-3	-5	-10	-16	-15	-15	-11	-8	
Sound Power at Outlet		65	72	71	68	69	67	66	61	74
Directivity Elevated Source		-11	-11	-11	-11	-11	-11	-11	-11	
SPL at distance of (m)	4.4	41.1	48.1	47.1	44.1	45.1	43.1	42.1	37.1	50
Fan case breakout at nearest receptor										
Octave Band		63	125	250	500	1000	2000	4000	8000	dB(A)
LWA Helios 630/4		60	66	67	65	65	65	61	55	73
SPL at m	4.4	39	45	46	44	44	44	40	34	48
AC Unit Mitsubishi FDC140VN										
SPL 1m		51								
Receptor Distance		5.3								
SPL at Receptor		37								
AC Unit Mitsubishi FDC100VNP-W										
SPL 1m		56								
Receptor Distance		7.1								
SPL at Receptor		39								
AC Unit Mitsubishi FDCVA402HENAR										
SPL 1m		50								
Receptor Distance		7.7								
SPL at Receptor		1								
Combined AC Units		**41**			**All sources cumulative level, dB(A)**					52.4

APPENDIX 5 – Kitchen plant noise levels inside nearest proposed apartments

BS8233:2014 Annexe G2 - Rigorous Calculation of Façade Sound Insulation							
Apartment AP02 Bedroom 1							
Wall area		13.0					
Window Area		2.6					
Ceiling/Roof		11.5					
Room Vol.		27.6					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Cumulative Ext. Plant noise		49	49	46	47	46	**54.8**
Ventilator Dne	MVHR	40	44	45	51	56	
Window R	6/16/4	21	20	26	38	37	
Wall	Masonry Cavity	40	44	45	51	56	
Ceiling+Roof R	Std. Roof	28	34	40	45	49	
Absorption		11	14	16	16	15	
Vent		0.000041	0.000016	0.000013	0.000003	0.000001	
		-43.9	-47.9	-48.9	-54.9	-59.9	
Windows		0.000843	0.001061	0.000267	0.000017	0.000021	
		-30.7	-29.7	-35.7	-47.7	-46.7	
Wall		0.000042	0.000017	0.000013	0.000003	0.000001	
		-43.7	-47.7	-48.7	-54.7	-59.7	
Ceiling/roof		0.000744	0.000187	0.000047	0.000015	0.000006	
		-31.3	-37.3	-43.3	-48.3	-52.3	
Composite R		-27.8	-28.9	-34.7	-44.2	-45.3	
Abs. Correction		3.5	2.4	1.9	1.9	2.1	
Leq (int)		27.4	25.3	16.6	7.5	5.9	NR15
LAeq (internal)							**19.4**
Façade Atten.		**35.4**	**dB**				
	External LAeq,T	52.3	Internal	16.9	Guideline	30	

BS8233:2014 Annexe G2 - Rigorous Calculation of Façade Sound Insulation							
Apartment AP02 Bedroom 2							
Wall area		13.0					
Window Area		2.6					
Ceiling/Roof		11.5					
Room Vol.		27.6					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Cumulative Ext. Plant noise		52	58	59	56	57	**60.1**
Ventilator Dne	MVHR	40	44	45	51	56	
Window R	6/16/6.8	21	28	37	48	48	
Wall	Masonry Cavity	40	44	45	51	56	
Ceiling+Roof R	Std. Roof	28	34	40	45	49	
Absorption		11	14	16	16	15	
Vent		0.000041	0.000016	0.000013	0.000003	0.000001	
		-43.9	-47.9	-48.9	-54.9	-59.9	
Windows		0.000843	0.000168	0.000021	0.000002	0.000002	
		-30.7	-37.7	-46.7	-57.7	-57.7	
Wall		0.000042	0.000017	0.000013	0.000003	0.000001	
		-43.7	-47.7	-48.7	-54.7	-59.7	
Ceiling/roof		0.000744	0.000187	0.000047	0.000015	0.000006	
		-31.3	-37.3	-43.3	-48.3	-52.3	
Composite R		-27.8	-34.1	-40.2	-46.4	-50.1	
Abs. Correction		3.5	2.4	1.9	1.9	2.1	
Leq (int)		30.3	29.1	23.2	15.0	11.5	NR19
LAeq (internal)							**24.2**
Façade Atten.		**35.9**	**dB**				
	External LAeq,T	60.3	Internal	24.4	Guideline	30	

BS8233:2014 Annexe G2 - Rigorous Calculation of Façade Sound Insulation							
Apartment AP02 Living Room							
Wall area		27.4					
Window Area		8.3					
Ceiling/Roof		33.0					
Room Vol.		27.6					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Cumulative Ext. Plant noise		52	52	50	50	49	**52.2**
Ventilator Dne	MVHR	40	44	45	51	56	
Window R	6/16/4	21	20	26	38	37	
Wall	Masonry Cavity	40	44	45	51	56	
Ceiling+Roof R	Std. Roof	28	34	40	45	49	
Absorption		11	14	16	16	15	
Vent		0.000017	0.000007	0.000005	0.000001	0.000000	
		-47.8	-51.8	-52.8	-58.8	-63.8	
Windows		0.001092	0.001374	0.000345	0.000022	0.000027	
		-29.6	-28.6	-34.6	-46.6	-45.6	
Wall		0.000032	0.000013	0.000010	0.000003	0.000001	
		-45.0	-49.0	-50.0	-56.0	-61.0	
Ceiling/roof		0.000866	0.000218	0.000055	0.000017	0.000007	
		-30.6	-36.6	-42.6	-47.6	-51.6	
Composite R		-27.0	-27.9	-33.8	-43.7	-44.5	
Abs. Correction		7.4	6.3	5.8	5.8	6.0	
Leq (int)		35.0	33.3	24.6	15.0	13.9	NR22
LAeq (internal)							**27.2**
Façade Atten.		**25.0**	**dB**				
	External LAeq,T	55.0	Internal	30.0	Guideline	35	
	External LAmax	70.0	Internal	45.0	Guideline	45	

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Apartment AP05 Living Room							
Wall area		27.4					
Window Area		8.3					
Ceiling/Roof		25.3					
Room Vol.		27.6					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Cumulative Ext. Plant noise		58	57	55	55	54	**57.6**
Ventilator Dne	MVHR	58	57	55	55	54	
Window R	6/16/6.8	21	28	37	48	48	
Wall	Masonry Cavity	40	44	45	51	56	
Ceiling+Roof R	Std. Roof	28	34	40	45	49	
Absorption		11	14	16	16	15	
Vent		0.000000	0.000000	0.000001	0.000001	0.000001	
		-65.5	-64.7	-61.8	-62.7	-60.9	
Windows		0.001251	0.000250	0.000031	0.000002	0.000002	
		-29.0	-36.0	-45.0	-56.0	-56.0	
Wall		0.000036	0.000014	0.000011	0.000003	0.000001	
		-44.4	-48.4	-49.4	-55.4	-60.4	
Ceiling/roof		0.000761	0.000191	0.000048	0.000015	0.000006	
		-31.2	-37.2	-43.2	-48.2	-52.2	
Composite R		-26.9	-33.4	-40.4	-46.8	-49.9	
Abs. Correction		6.8	5.8	5.2	5.2	5.5	
Leq (int)		41.2	32.8	22.4	16.9	12.2	
A-Weighting		0	0	0	0	0	
Leq (int)		41.2	32.8	22.4	16.9	12.2	NR22
							28.5
Façade Atten.		**29.1**	**dB**				
	External LAeq,T	60.5	Internal	31.4	Guideline	35	

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Apartment AP05 Bedroom 1							
Wall area		13.0					
Window Area		2.6					
Ceiling/Roof		11.5					
Room Vol.		27.6					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Cumulative Ext. Plant noise		55	54	51	52	50	**54.1**
Ventilator Dne	MVHR	40	44	45	51	56	
Window R	6/16/4	21	20	26	38	37	
Wall	Masonry Cavity	40	44	45	51	56	
Ceiling+Roof R	Std. Roof	28	34	40	45	49	
Absorption		11	14	16	16	15	
Vent		0.000041	0.000016	0.000013	0.000003	0.000001	
		-43.9	-47.9	-48.9	-54.9	-59.9	
Windows		0.000843	0.001061	0.000267	0.000017	0.000021	
		-30.7	-29.7	-35.7	-47.7	-46.7	
Wall		0.000042	0.000017	0.000013	0.000003	0.000001	
		-43.7	-47.7	-48.7	-54.7	-59.7	
Ceiling/roof		0.000744	0.000187	0.000047	0.000015	0.000006	
		-31.3	-37.3	-43.3	-48.3	-52.3	
Composite R		-27.8	-28.9	-34.7	-44.2	-45.3	
Abs. Correction		3.5	2.4	1.9	1.9	2.1	
Leq (int)		33.4	30.4	21.3	12.6	10.1	
A-Weighting		0	0	0	0	0	
Leq (int)		33.4	30.4	21.3	12.6	10.1	NR19
							24.5
Façade Atten.		**29.7**	**dB**				
	External LAeq,T	56.9	Internal	27.2	Guideline	30	