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94 CAMDEN HIGH STREET,
LONDON

NOISE IMPACT ASSESSMENT

Report **12517-NIA-01**

Prepared on 06 October 2017

Issued For:

Baladi Kitchens

94 Camden High Street

London

NW1 0LT

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1.0 INTRODUCTION

Clement Acoustics has been commissioned by Baladi Kitchens to measure existing background noise levels at 94 Camden High Street, London NW1 0LT. The measured noise levels have been used to determine noise emission criteria for a proposed plant installation in agreement with the planning requirements of the London Borough of Camden.

This report presents the results of the environmental survey followed by noise impact calculations and outlines any necessary mitigation measures.

2.0 SITE DESCRIPTION

Current proposals are to install kitchen extract plant serving the ground floor restaurant. The fan is understood to be located within the light well above the restaurant, with ducting running up to the roof, terminating above 3rd floor level.

There are no residential units within the building. The nearest noise sensitive receiver has been identified as the rear facing 3rd floor window in the building adjacent, which is assumed to be a residential flat. Locations are shown in attached site plan 12517-SP1.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Procedure

Measurements were undertaken at one position as shown on indicative site drawing 12517-SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the site.

The microphone was mounted on the 1st storey flat roof within the light well of the building. The position was considered not to be free-field, and a correction for reflections has therefore been applied. Noise levels at Position 1 were dominated by plant noise during the installation and collection of equipment.

Continuous automated monitoring was undertaken for the duration of the survey between 18:20 on 19 September 2017 and 20:35 on 21 September 2017.

Weather conditions were generally dry with light winds, therefore suitable for the measurement of environmental noise.

The measurement procedure generally complied with BS 7445:1991: '*Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use*'.

3.2 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 957 Class 1 Sound Level Meter
- Norsonic Type 1251 Class 1 Calibrator

4.0 RESULTS

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured at the location shown in site drawing 12517-SP1.

The measured noise levels are shown as a time history in Figure 12517-TH1, with ambient and background noise levels summarised in Table 4.1. Note, the average levels stated omit periods where the plant in question was running.

	Average ambient noise level $L_{eq: T}$ dB(A)	Minimum background noise level $L_{90: 5min}$ dB(A)
Daytime (07:00 - 23:00)	58 dB(A)	41 dB(A)
Night-time (23:00 - 07:00)	55 dB(A)	34 dB(A)

Table 4.1: Minimum background noise levels

5.0 NOISE CRITERIA

In this instance, the *London Borough of Camden* criteria for noise emissions are as follows:

> *"The 'A' weighted sound pressure level from the plant, when operating at its noisiest, shall not at any time exceed a value of 10 dB below the minimum external background noise, at a point 1 metre outside any window of any residential property."*

It is understood that the proposed plant units will be (state what the units are for commercial use operational between 07:30 and 20:00 We therefore propose to set the noise criteria at 31 dB(A), the value 10 dB below the minimum measured background noise level during the day time hours.

6.0 DISCUSSION

6.1 Proposed Installation

The proposed plant installation comprises the following:

- 1 No. S&P TCBBx2/4/560 Co-Axial Kitchen Extract Fan

Noise emissions, as provided by the manufacturer, are shown in Table 6.1. Loudest modes of operation have been used in order to present a robust worst case assessment.

	Sound Power Levels (dB) in each Frequency Band								
Unit	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
S&P TCBBx2/4/560	96	98	93	91	92	86	80	75	95

Table 6.1: Manufacturer Noise Emissions Levels

The proposed plant location on the first floor roof within the light well with ductwork extending up to the main roof, terminating at roof level as shown on indicative site plan 12517-SP1.

The closest receiver has been identified as the window on the rear facade of a residential property adjacent which is a minimum of 3m from the proposed plant location and partially screened from direct line of sight by the building envelope.

As the fan will be located externally, the casing breakout of the fan must also be taken into account. The manufacturer states an overall breakout sound pressure level of 73dB at 3m. In order to undertake a spectral analysis, the noise curve from the in-duct noise levels has been used, shifted to meet 73dB overall. An additional duct reduction has also been applied.

6.2 Proposed Mitigation Measures

In-Line Attenuator

In order to sufficiently reduce duct noise at the outlet duct terminal we would recommend installing an attenuator within the sections of duct between the fan and the roof level outlet. The attenuator should provide (as a minimum) the insertion losses shown in Table 6.4.

	Required Attenuation (dB) in each Frequency Band							
Mitigation	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
In-Line Attenuator	-7	-15	-28	-45	-50	-45	-35	-22

Table 6.4: Required Attenuation from In-Line Attenuator

The attenuator should be installed immediately adjacent to the fan on the outlet side.

Acoustic Cladding

In order to mitigate casing breakout noise from the unit we would recommend encasing it in additional acoustic cladding. This may be achieved by lagging the fan unit with mineral wool then cladding with 0.9mm sheet steel. This would be expected to achieve the noise reduction as shown in Table 6.3. The cladding should provide sufficient attenuation to achieve a maximum operational sound pressure level of 41dB(A) when measured at 1 m in all directions.

	Required Attenuation (dB) in each Frequency Band							
Mitigation	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Acoustic Cladding	8	8	14	20	26	32	38	40

Table 6.3: Required Attenuation from cladding

6.3 Noise Impact Assessment

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.4. Detailed calculations are shown in Appendix B.

Receiver	Night Time Hours Criterion	Noise Level at Receiver (due to proposed plant)
Nearest Residential Property	31 dB(A)	31 dB(A)

Table 6.4: Noise levels and criteria at noise sensitive receivers

As presented in Table 6.4 and Appendix B, the proposed plant installation with acoustic enclosure would be expected to meet the requirements of the proposed criteria.

6.4 British Standard Requirements

Further calculations have been undertaken to assess whether the noise emissions from the proposed plant unit would be expected to meet recognised British Standard recommendations, in order to further ensure the amenity of nearby noise sensitive receivers.

British Standard 8233:2014 '*Guidance on sound insulation and noise reduction for buildings*' gives recommendations for acceptable internal noise levels in residential properties. As the fan will only be in use during daytime hours, BS 8233:2014 recommends 35dB(A) as being acceptable internal resting conditions during daytime.

With loudest external levels of 31dB(A), acceptable internal conditions would be met without taking the attenuation of the window itself into consideration. According to BS 8233:2014, a typical building facade with a partially open window offers 15 dB attenuation.

It can therefore be predicted that, in addition to meeting the requirements of the set criteria, the emissions from the proposed plant would be expected to meet the most stringent recommendations of the relevant British Standard, with neighbouring windows partially open. Predicted levels are shown in Table 6.4.

Receiver	Recomended Target – *For resting conditions in a Living Room, in BS8233:2014*	Noise Level at Receiver (due to plant installation)
Inside Residential Window	35 dB(A)	17 dB(A)

Table 6.4: Noise levels and criteria inside nearest residential space

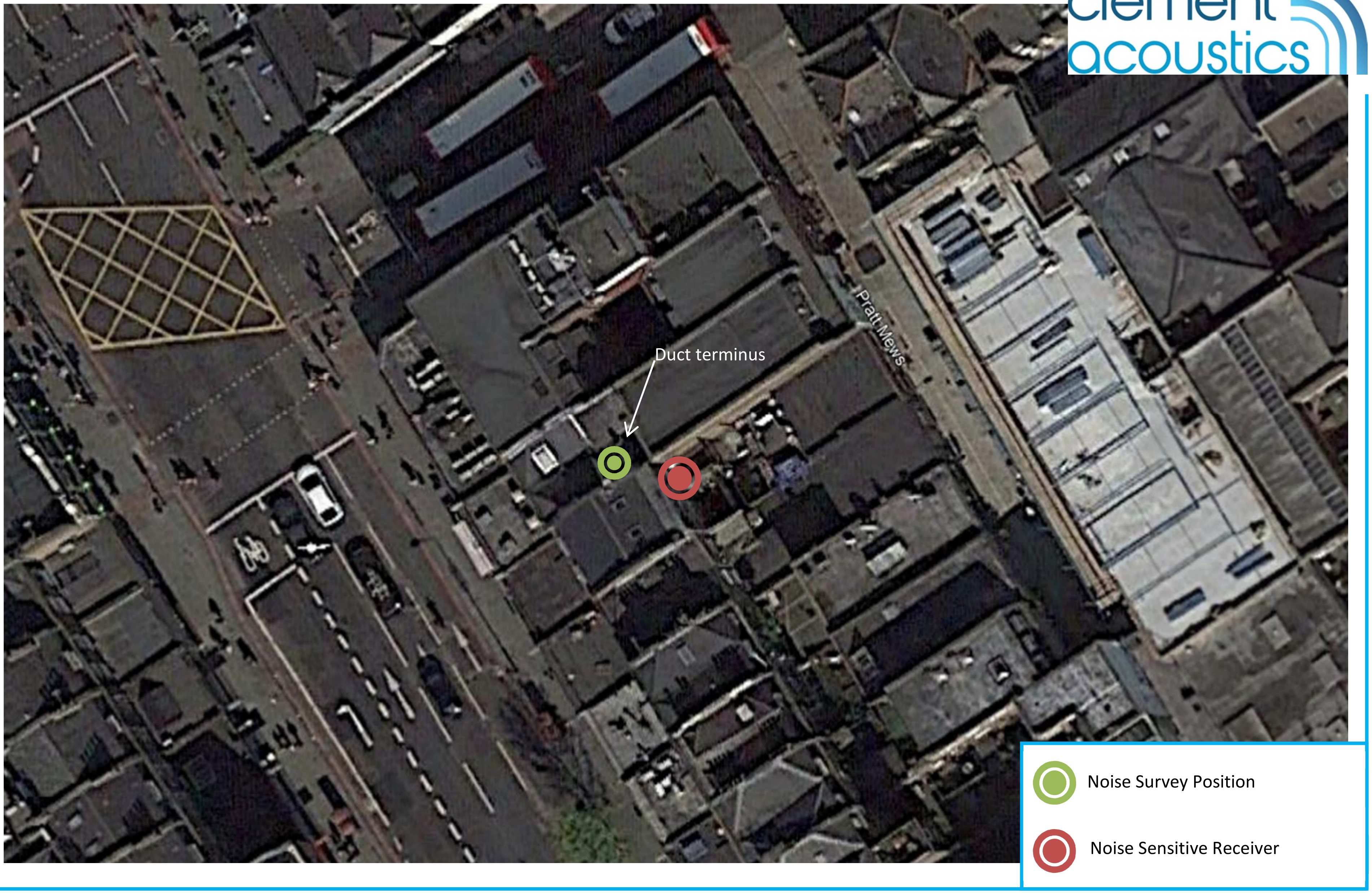
7.0 CONCLUSION

An environmental noise survey has been undertaken at 94 Camden High Street, London. The results of the survey have enabled criteria to be set for noise emissions from the proposed plant units in accordance with the requirements of the London Borough of Camden.

A noise impact assessment has then been undertaken using manufacturer noise data to predict the noise levels, due to the proposed plant, at the nearby noise sensitive receivers.

Calculations show that noise emissions from the proposed plant units should meet the requirements of the London Borough of Camden with the recommended mitigation installed as stated herein.

Report by	Checked by
Matt Markwick AMIOA	**Duncan Martin MIOA**

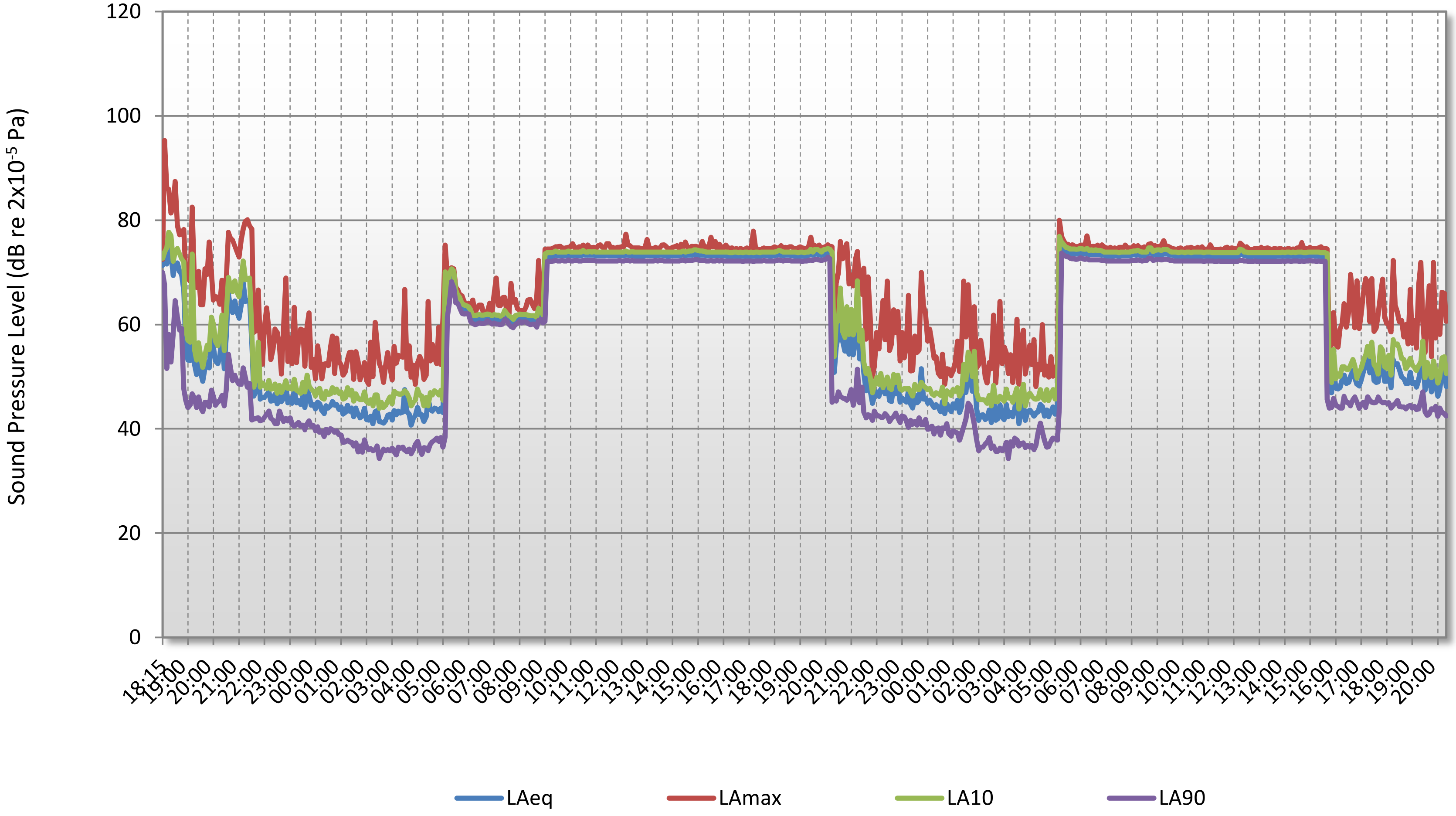


12517-SP1 Indicative site plan indicating noise monitoring position and nearest noise sensitive receiver

Date: 06 October 2017

94 Camden High Street, London

Environmental Noise Time History
19 September 2017 to 21 September 2017



12517-TH1

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for not more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise

L_{90}

This is the level exceeded for not more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 10 such octave bands whose centre frequencies are defined in accordance with international standards.

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than one alone and 10 sources produce a 10dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.

APPENDIX B

12517

94 Camden High Street, London

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: Nearest Residential Receiver

Source: Installed Extract Fan - Oulet

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Manufacturer provided sound power level									
S&P TCBBx2/4/560 Ducted Outlet	74	86	85	91	94	88	81	75	96
Installation effect, dB	3	6	7	8	8	6	5	3	
Duct Attenuation, dB	-7	-6	-3	-1	-1	-1	-1	-1	
Correction for End reflection, dB	-7	-3	-1	0	0	0	0	0	
Conversion to Sound Pressure level@1m, dB	-11	-11	-11	-11	-11	-11	-11	-11	
Required attenuation from proposed silencer, dB*	-7	-15	-28	-45	-50	-45	-35	-22	
Correction for screening by building envelope (dB)	-2	-3	-5	-7	-10	-13	-16	-18	
Distance correction to receiver, dB (3.5m)	-11	-11	-11	-11	-11	-11	-11	-11	
Sound pressure level at receiver	**32**	**43**	**33**	**24**	**19**	**13**	**12**	**15**	**30**

***Based on a 2100mm silencer with a free area of 40%**

Source: Installed Extract Fan - Casing Breakout

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Installer provided sound pressure level at 3m									
Spectral levels (based on in-duct curve)	51	63	62	68	71	65	58	52	73
Correction for ducting	-7	-10	-15	-20	-28	-32	-33	-35	
Correction for reflections	9	9	9	9	9	9	9	9	
Required attenuation from proposed cladding, dB	-8	-8	-14	-20	-26	-32	-38	-40	
Distance correction to top of lightwell	-7	-7	-7	-7	-7	-7	-7	-7	
Correction for screening by building envelope (dB)	-2	-3	-5	-7	-10	-13	-16	-18	
Distance correction to receiver, dB (total distance 3.5m)	-11	-11	-11	-11	-11	-11	-11	-11	
Sound pressure level at receiver	**25**	**33**	**19**	**12**	**-2**	**-21**	**-38**	**-50**	**18**

Cumulative level at reciever	**31**
Design Criterion	**31**

BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window

Source: Cumulative level of plant units

	equency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Sound pressure level outside window	33	44	33	24	19	13	12	15	31
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	**18**	**29**	**18**	**13**	**11**	**6**	**0**	**0**	**18**

Design Criterion	**30**