Sound Licensing Ltd.
Suite 4, Broxbourne Business Centre
New River Trading Estate
Cheshunt
Herts EN8 0NL

T: +44 (0) 20 7096 1555
www.soundlicensing.co.uk
enquiries@soundlicensing.co.uk

NOISE IMPACT ASSESSMENT REPORT - KITCHEN EXTRACTION SYSTEM

111 KING'S CROSS ROAD, LONDON WC1X 9LR

FOR

MR N MAHMOOD

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AUTHOR: D ROONEY DIP ACOUSTICS
CHECKED: M LAUEZZARI, MIOA MIOL
APPROVED: M LAUEZZARI, MIOA MIOL

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1. EXECUTIVE SUMMARY

It is proposed to install mechanical plant (1no. kitchen extraction unit) to service a commercial premises at King's Cross Road, London WC1X 9LR.

Sound Licensing has undertaken an environmental noise assessment at the site in order to determine prevailing background noise levels that are representative of the nearest noise sensitive properties, which have been identified as the 3rd floor residential premises directly above the site.

The results of the noise survey are considered reasonable given the location of the measurement position and the existing noise sources in the local vicinity.

Noise calculations of the mechanical plant have been undertaken using all available details and plans provided by the client and obtaining manufacturers' specifications wherever possible. The data and information form the basis of the assessment.

Noise break-out limits for the mechanical plant have been proposed based on the methodologies of British Standard (BS) 4142:2014 and in accordance to Local Authority policy. A robust, worst-case assessment of the noise levels associated to the proposed mechanical plant has been undertaken.

In accordance with BS 4142:2014 guidance, the predicted noise impact due to the operation of the mechanical plant ***"is an indication of the specific sound source having a low impact"***. The predicted noise level of the mechanical plant at the nearest noise sensitive properties is considered to comply with the Camden Borough Council's policy.

2. INTRODUCTION

The client is proposing to install mechanical plant (a kitchen extraction unit) at the rear of the premises, 111 King's Cross Road, London WC1X 9LR, the noise from which could have the potential to affect existing noise sensitive properties nearby.

The purposes of this report are:

- To determine prevailing environmental noise levels affecting surrounding properties due to nearby noise sources (e.g. road traffic, aircraft etc);
- Based on the above, to present noise emission limits in accordance with the requirements of BS4142:2014 and the City of Westminster's policy, and
- To undertake an assessment to demonstrate compliance with the Local Authority noise requirements.

Following this introductory section, a description of the site is given in Section 3. Section 4 gives a description of the environmental noise survey methodology, with noise criteria presented in Section 5. A description of the external noise emission limits is presented in Section 6. Details of the proposed mechanical plant are provided in Section 7. A noise impact assessment is presented in Section 8. Appendix A presents an explanation of the acoustic terminology used in this report, Appendix B presents data sheets and figures and Appendix C provides the noise survey monitoring data.

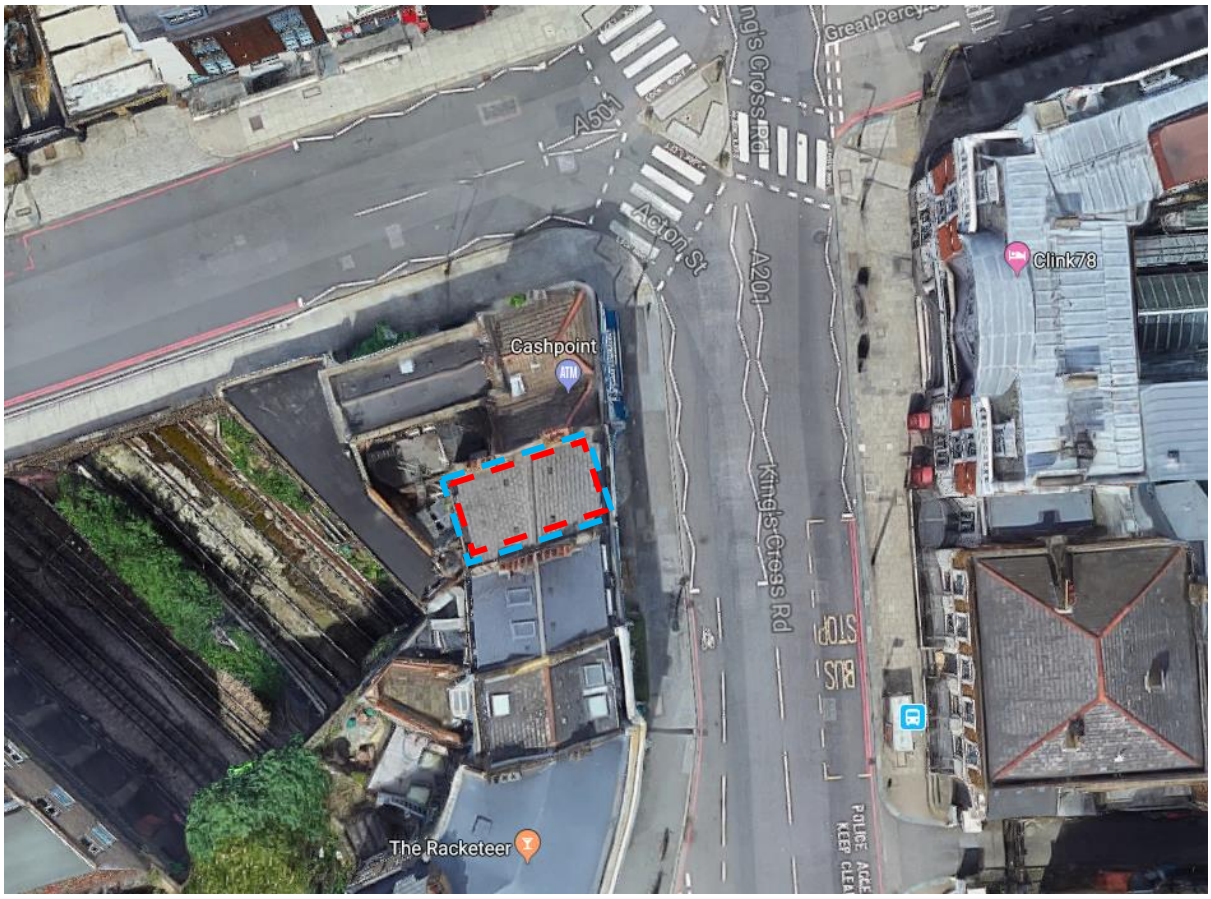
3. SITE DESCRIPTION

King's Cross Road, London WC1X 9LR (hereafter 'the site') is a traditionally brick built four-storey building in a mixed area of commercial units at ground floor level and residentials on the floors above.

The nearest noise sensitive receptor to the proposed plant is noted to be the rear windows of the residential flat located on the third floor above the site at approximately 3 metres distance from the terminus of the flue. If the noise impact assessment details that there is an indication of the specific sound source having a low impact at this premises then it can be safely assumed it will be met at other properties of equal distance and/or those further away.

Figure 3.1 shows the site highlighted in blue with the nearest identified residential property highlighted in red. The proposed mechanical plant locations are provided in Appendix B.

Figure 3.1 Site Location and Surrounding Land Use



Source: Google Maps

4. ENVIRONMENTAL NOISE SURVEY METHODOLOGY

An unmanned environmental noise survey was undertaken at a single measurement location at the rear of the site. The survey was undertaken between 11:00 hours on Friday 25th January 2019 and 11:00 hours on Monday 28th January 2019. A survey over this time represents a typical period in which the mechanical plant may be operational.

Ambient, background and maximum noise levels (L_{Aeq}, L_{A90} and L_{Amax} respectively) were measured throughout the noise survey in continuous 15-minute periods. The measurement position is indicated in **orange** on Figure 4.1 below.

Figure 4.1 Site Plan Showing Approximate Location of Measurement Position

Source: Google Maps

The sound level meter was positioned on a flat roof at 1st floor level on a tripod 1.5 metres above ground level. The position was in free-field therefore no acoustic corrections have been applied to the results. The monitoring location is considered representative of background noise levels at the nearest identified noise sensitive properties. The location was chosen for monitoring equipment security reasons also.

The equipment used for the noise survey is summarised in Table 4.1.

Table 4.1 Description of Equipment used for Noise Survey

Equipment	Description	Quantity	Serial Number
Larson Davis Sound Expert LxT	Type 1 automated logging sound level meter	1	0004720
Larson Davis 377B02	½" microphone	1	159605
Larson Davis	Pre-amplifier	1	028021
Larson Davis CAL200	Class 1 Calibrator	1	12245

The noise survey and measurements were conducted in accordance with BS7445-1:2003 '*Description and measurement of environmental noise. Guide to quantities and procedures'*.

Weather conditions throughout the entire noise survey period were noted to be cool (approx. 1-11° Celsius), some cloud cover (0-50% cloud cover approximately) with a light wind (<5m/s) and light sporadic precipitation. These weather conditions were checked against and confirmed by the use of the Met Office mobile application available on smart phone technology. These conditions were maintained throughout the majority of the survey period and are considered reasonable for undertaking environmental noise measurements.

The noise monitoring equipment was field calibrated before and after the noise survey period. No significant drift was recorded (±0.3 dB). Equipment calibration certificates can be provided upon request.

5. NOISE SURVEY RESULTS AND OBSERVATIONS

5.1 Results

A summary of the measured average-ambient and typical background noise levels at the measurement position is shown in Table 5.1 below. Full noise measurement data is provided in Appendix C.

Table 5.1 Measured Average Ambient and Typical Background Noise Levels

Date	Period	Average Ambient Sound Pressure Level, dB $L_{Aeq,15min}$	Typical Background Sound Pressure Level, dB L_{A90*}
25/01/2019	11:00 - 00:00	59	51
26/01/2019	11:00 - 00:00	58	50
27/01/2019	11:00 - 00:00	57	50

*Daytime – $L_{A90,1hour}$, Night-time – $L_{A90,15min}$

The typical background noise level at the measurement position during the survey, at the time in which the plant could be operational, is **50dB** $L_{A90,1hour}$.

5.2 Observations

Given that the noise survey was unmanned, noise sources could not be identified. However, at the beginning and end of the survey background noise was dominated by the local traffic network and a national railway line. After analysis of the data no significant abnormal noise source(s) were identifiable. It is considered that the measured noise levels are reasonable given the location of the measurement position.

6. EXTERNAL NOISE EMISSION LIMITS

6.1 Local Authority Requirements

The site lies within the jurisdiction of the Local Authority, Camden Borough Council. The following requirements for commercial plant have previously been requested by the Local Authority:

"Where appropriate and within the scope of the document 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."

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

For the purposes of this report, an assessment has been undertaken in line with BS 4142:2014. A design criterion of achieving a minimum 10dB(A) below the background noise level has been adopted in line with the Local Authorities policy. Taking the noise monitoring data in Section 5 and Local Authority requirements above, the following design target has been adopted for mechanical plant as provided in Table 6.1.

Table 6.1 Maximum noise emission design target at residential premises

26th January 2019	Measured Background Noise Level, dB $L_{A90,1hour}$	Rating noise level at nearest residential facade, dB L_{Aeq}
11:00 - 00:00	50	40

6.2 BS 4142:2014

BS 4142:2014 "Methods for rating and assessing industrial and commercial sound" presents a method for assessing the significance and possible adverse impact due to an industrial noise source, based on a comparison of the source noise levels and the background noise levels, both of which are measured or predicted at a noise sensitive receiver e.g. a residential property.

The specific noise level due to the source is determined, with a series of corrections for tonality, impulsivity, intermittency or other unusual characteristic. The rating level is then compared to the background noise level and the significance of the new noise source likelihood of any adverse impact is determined in accordance with the following advice:

"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occur. 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."

7. KITCHEN EXTRACTION SYSTEM AND ASSOCIATED NOISE LEVELS

The following items of plant have been installed at the rear of the premises.

Table 7.1 Kitchen Extraction Fan Motor

External Plant Item	Make	Model	Reference Noise Level* $L_{w(A)}$
Kitchen Extract Fan	Helios	GBD EC 450	80dB Outlet

*Reference sound power levels (A weighted). Manufacturer's specifications are provided in Appendix B.

The kitchen extractor fan will be located internally and therefore noise from the fan casing breakout will be contained within the structure, only noise from the discharge point of the duct will be considered. The ducting is 500mm rectangular duct work which will terminate a minimum 1m above eaves level.

In reference to section 6 of this report, a penalty addition (+3dB) has been applied for intermittency as the system will be turned on/off whilst the premises are open. Penalty additions have not been applied for tonality as manufacturers' data shows no significant characteristics, or for impulsiveness as it is considered that these characteristics will not be perceptible sufficient to attract attention at the noise receptors. Penalty additions have not been applied for any other sound characteristics as mechanical plant of this type generally do not demonstrate such features.

7.1 Silencer

The extraction system will be fitted with a Flakt Woods Silencer (Model: C2DM 500), as specified by the client, post-fan to atmosphere. The silencer provides the attenuation provided in table 7.2. All silencers should be Melinex lined.

125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
5	8	15	20	20	15	16

7.2 Directivity

A directivity correction should be applied as the extract fan duct aperture is to terminate vertically approximately 120˚ to the nearest residential location. A duct opening of 500mm has been used. The levels of attenuation (dB) at each octave frequency band (Hz) is provided below.

125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
6	10	14	16	21	21	24

8. NOISE IMPACT ASSESSMENT

This section presents calculations to predict the noise impact of the kitchen extraction system, located at the rear of the site, at the nearest noise sensitive properties.

8.1 Operational Hours and Background Noise Levels

The kitchen extraction system will operate from 11:00 to 00:00 hours daily.

The typical measured background noise level at the measurement position during the survey is **50dB** $L_{A90,1hour}$. The design range is **40dB** L_{Aeq} at the façade of the nearest residential premises.

8.2 Nearest Noise Sensitive Properties

The nearest noise sensitive residential receptors to the proposed mechanical plant were noted to be a residential flat on the third floor, directly above the site (approximately 3m distance from the duct terminus).

8.3 Description of Calculation Process

In accordance with the methodologies of BS 4142:2014, calculations have been undertaken to predict noise levels in which the kitchen extraction system could be operational at its typical level. Given the distances between the noise sources and the noise sensitive receptors, point source calculations have been used.

8.4 Noise Level Ratings

Calculations to predict the noise of the kitchen extraction system operating at the facade of the residential properties are given below.

The rating noise level (corrected for distance & directivity) at the 3rd floor residential façade, with the mechanical plant operating, is predicted to be **36dB L_{Aeq}** which is **14dB(A) below** the typical background noise level (50dB $L_{A90,1hour}$).

In accordance with BS 4142:2014 guidance, the rating noise ***"is an indication of the specific sound source having a significant adverse impact depending on the context"***. *The lower the rating level is relative to the measured background level, the less likely it is that the specific sound source will have an adverse impact*.

8.5 Vibration

In addition to the control of airborne noise transfer, it is important to consider the transfer of noise as vibration to adjacent properties as well as any sensitive areas of the same building. Vibration from the system is not expected, however, as a precaution plant should wherever possible be installed on suitable isolators. The isolators shall incorporate rubber or neoprene high-frequency isolation pads. The fan should be installed with flexible connections to adjacent structures.

Uncertainty

The levels of uncertainty in the data and calculations are considered to be low given the robust exercise undertaken in noise monitoring and the confidence in the data statistical analysis. Manufacturers' data for the plant is highly likely to be robust. Detailed calculations and resultant noise levels at the residential location are considered to be confidently predicted.

9.0 Conclusion

Sound Licensing has undertaken an environmental noise survey at the site in order to determine the prevailing background noise levels that are representative of the nearest noise sensitive properties. The operation of the kitchen extraction system with the specified acoustic silencer installed, in accordance with BS 4142:2014 guidance, indicates to creating a low impact. All typical-case scenarios have been applied to the assessment. The predicted operating noise level of the mechanical plant is demonstrated to comply with the London Borough of Camden Council's policy.

APPENDIX A – Acoustic Terminology

Parameter	Description
Acoustic environment	Sound from all sound sources as modified by the environment
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far
Ambient sound level, La = LAeq,T	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T
Background sound level, LA90,T	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels
Decibel (dB)	A logarithmic scale representing the sound pressure or power level relative to the threshold of hearing ($20x10^{-6}$ Pascals).
Equivalent continuous A-weighted sound pressure level, LAeq,T	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = t2 – t1, has the same mean-squared sound pressure as a sound that varies with time
Measurement time interval, Tm	Total time over which measurements are taken
Rating level, LAr,Tr	Specific sound level plus any adjustment for the characteristic features of the sound
Reference time interval, Tr	Specified interval over which the specific sound level is determined
Residual sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound
Residual sound level, Lr = LAeq,T	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T
Specific sound level, Ls = LAeq,Tr	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr
Specific sound source	Sound source being assessed

References:

BS 4142:2014 'Methods for rating and assessing industrial and commercial sound'

APPENDIX B – Data Sheets and Figures

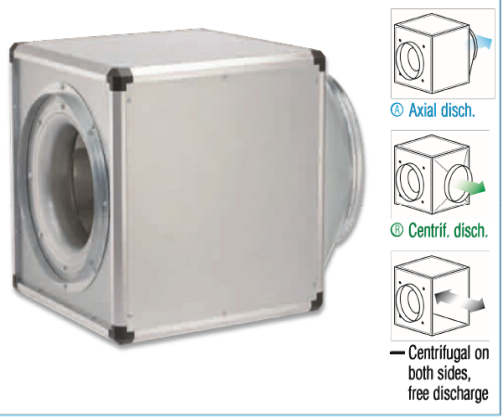
Helios GBD EC 450

Helios ECgreen Vent

GigaBox EC centrifugal fans 450 mm ø

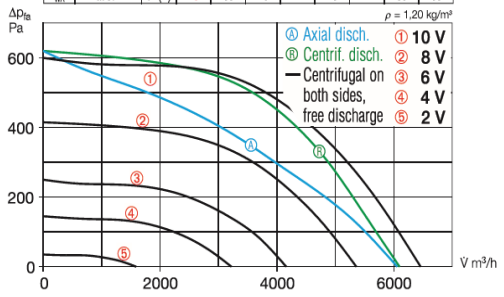
GB EC

Arbitrary installation position and assembly in five possible discharge directions.

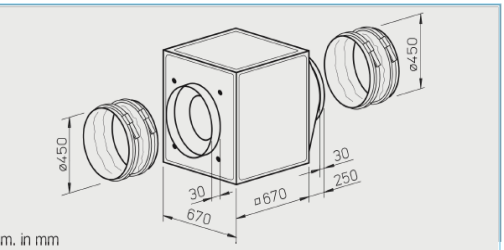


GBW EC 450

Frequency		Hz	Total	125	250	500	1k	2k	4k	8k
L_{WA}	Case breakout	dB(A)	58	48	56	48	47	46	42	31
L_{WA}	Intake	dB(A)	75	54	66	68	70	69	64	57
L_{WA}	Exhaust	dB(A)	79	60	70	74	75	74	65	60

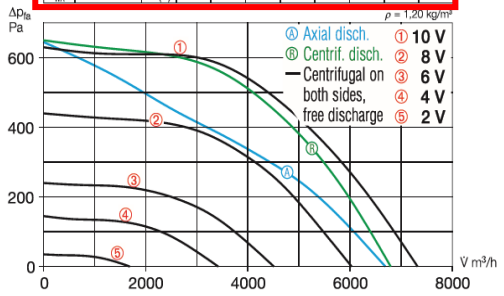


	Free discharge					
Voltage V	n min⁻¹	V̇ m³/h	P W	I A	Lp dB(A)	SFP kW/m³/s
10	1450	6460	614	3,71	38	0,34
8	1200	5360	363	2,35	35	0,24
6	930	4160	185	1,27	31	0,16
4	710	3220	92	0,68	26	0,10



GBD EC 450

Frequency		Hz	Total	125	250	500	1k	2k	4k	8k
L_{WA}	Case breakout	dB(A)	59	49	57	49	48	47	43	32
L_{WA}	Intake	dB(A)	76	55	67	69	71	70	65	58
L_{WA}	Exhaust	dB(A)	80	61	71	75	76	75	66	61



	Free discharge					
Voltage V	n min⁻¹	V̇ m³/h	P W	I A	Lp dB(A)	SFP kW/m³/s
10	1500	7320	640	1,20	39	0,31
8	1250	6030	380	0,80	36	0,23
6	930	4510	170	0,45	31	0,14
4	710	3420	90	0,27	28	0,10

Specification

Casing

Self-supporting frame construction made from hollow aluminium profiles. Lined with 20 mm thick double-walled side panels made from galvanised sheet steel, sound and thermally insulated with flame-retardant mineral wool. Intake cone for ideal airflow, spigot and flexible connector for duct connection. With discharge adapter (from square to circular) on the pressure side for low-loss discharge and flexible sleeve to reduce vibration transmission. Simple positioning with standard crane hooks.

Impeller

Impeller and remaining design see description on page 241.

Accessories

Anti vibration mounts for installation indoors. 1 set = 4 pcs.
SDD-U Ref. no. 5627

Wall bracket for wall mounting.
GB-WK 450 Ref. no. 5626

External weather louvre to cover exhaust opening.
GB-WSG 450 Ref. no. 5639

Outdoor cover hood for protected outdoor installation.
GB-WSD 450 Ref. no. 5748

Condensate collector with condensate spigot (centre) for pipe connection.
GB-KW 450 Ref. no. 5644

ECgreen Vent **60% Saving *** * with speed control

Accessory details Page

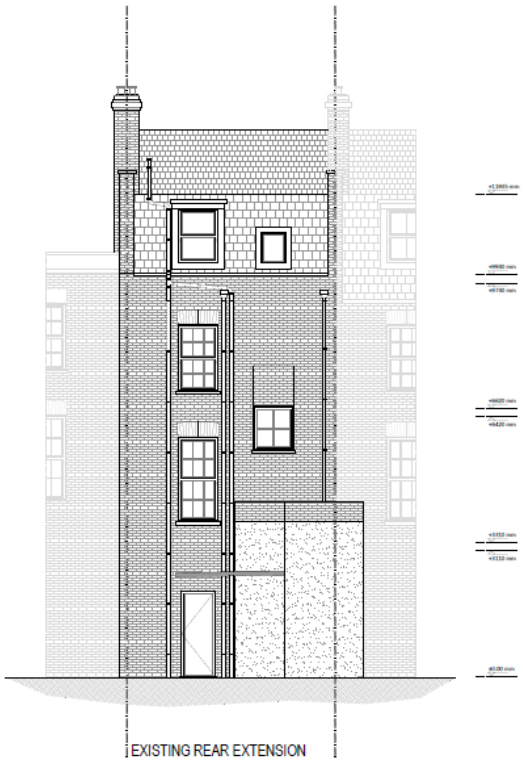
Universal control system, electronic controller, speed-potentiometer 539 on

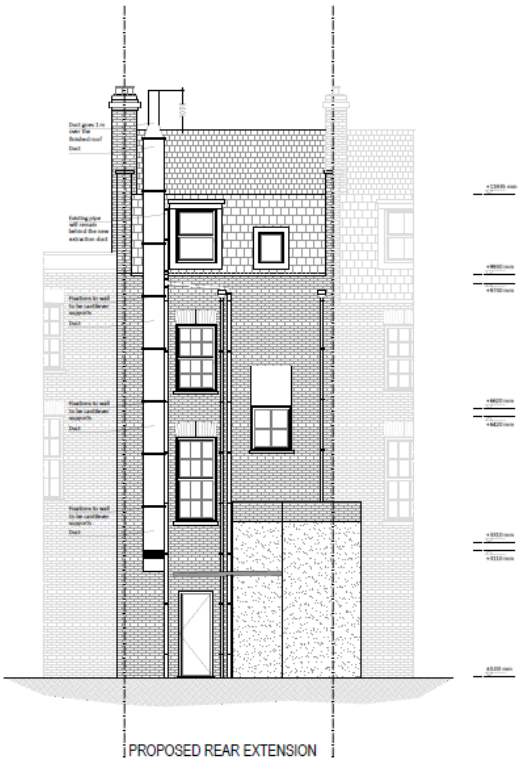
Flakt Woods C2DM x 500 Silencer

Flakt Woods Limited
Axial Way, Colchester, CO4 5ZD, UK.
Telephone: +44 (0) 1206 222555 Facsimile: +44 (0) 1206 222777

Index	Description	Type	Bore dia	Length	Melinex	63	125	250	500	1000	2000	4000	8000
57	B1D x 1400	B	1400	1D	-	4	6	12	16	10	8	7	6
58	B2D x 1400	B	1400	2D	-	4	7	14	18	13	10	10	8
59	B1DM x 1400	B	1400	1D	M	4	5	10	12	7	6	5	4
60	B2DM x 1400	B	1400	2D	M	4	6	11	14	9	7	7	6
61	B1D x 1600	B	1600	1D	-	4	7	12	16	10	8	7	6
62	B2D x 1600	B	1600	2D	-	4	8	15	18	12	10	9	7
63	B1DM x 1600	B	1600	1D	M	4	6	10	12	7	6	5	4
64	B2DM x 1600	B	1600	2D	M	4	7	12	14	8	7	6	5
65	C1D x 315	C	315	1D	-	2	5	5	9	18	20	18	15
66	C2D x 315	C	315	2D	-	2	6	6	12	20	25	20	17
67	C1DM x 315	C	315	1D	M	2	5	5	7	13	15	13	11
68	C2DM x 315	C	315	2D	M	2	5	6	10	18	19	15	12
69	C1D x 355	C	355	1D	-	2	5	6	9	18	22	19	16
70	C2D x 355	C	355	2D	-	2	6	7	13	25	27	21	17
71	C1DM x 355	C	355	1D	M	2	5	5	8	13	17	14	12
72	C2DM x 355	C	355	2D	M	3	6	6	11	20	20	16	13
73	C1D x 400	C	400	1D	-	2	6	6	10	19	24	20	17
74	C2D x 400	C	400	2D	-	3	7	8	14	29	29	23	18
75	C1DM x 400	C	400	1D	M	2	4	6	10	14	16	15	12
76	C2DM x 400	C	400	2D	M	2	5	7	12	20	20	15	14
77	C1D x 450	C	450	1D	-	2	4	7	13	20	23	22	17
78	C2D x 450	C	450	2D	-	2	5	9	16	29	29	21	20
79	C1DM x 450	C	450	1D	M	2	3	6	12	15	15	15	12
80	C2DM x 450	C	450	2D	M	2	4	8	15	20	21	14	18
81	C1D x 500	C	500	1D	-	2	3	8	16	21	22	21	17
82	C2D x 500	C	500	2D	-	2	4	10	20	29	30	20	26
83	C1DM x 500	C	500	1D	M	3	5	6	12	14	13	13	11
84	C2DM x 500	C	500	2D	M	4	5	8	15	20	20	15	16
85	C1D x 560	C	560	1D	-	3	5	8	16	20	18	19	15
86	C2D x 560	C	560	2D	-	4	5	10	20	29	28	21	23
87	C1DM x 560	C	560	1D	M	3	5	6	11	13	11	10	8
88	C2DM x 560	C	560	2D	M	5	5	8	14	20	18	15	14
89	C1D x 630	C	630	1D	-	3	5	8	15	19	16	14	12
90	C2D x 630	C	630	2D	-	5	6	10	19	29	25	21	20
91	C1DM x 630	C	630	1D	M	3	5	6	11	13	11	10	8
92	C2DM x 630	C	630	2D	M	5	5	8	15	18	16	13	12
93	C1D x 710	C	710	1D	-	3	5	8	15	19	15	14	12
94	C2D x 710	C	710	2D	-	5	6	10	20	26	23	18	17
95	C1DM x 710	C	710	1D	M	4	5	6	12	13	11	10	9
96	C2DM x 710	C	710	2D	M	5	6	9	17	16	15	11	10
97	C1D x 800	C	800	1D	-	4	5	8	16	19	15	14	13
98	C2D x 800	C	800	2D	-	5	7	11	22	23	21	16	14
99	C1DM x 800	C	800	1D	M	4	5	7	13	13	11	10	9
100	C2DM x 800	C	800	2D	M	5	6	10	18	16	15	11	11
101	C1D x 900	C	900	1D	-	4	5	9	17	19	15	14	13
102	C2D x 900	C	900	2D	-	5	7	12	24	23	21	16	15
103	C1DM x 900	C	900	1D	M	5	5	9	14	13	11	10	9
104	C2DM x 900	C	900	2D	M	5	6	10	20	17	14	11	11
105	C1D x 1000	C	1000	1D	-	5	5	11	18	19	15	14	13
106	C2D x 1000	C	1000	2D	-	5	7	13	26	24	20	16	16
107	C1DM x 1000	C	1000	1D	M	5	6	9	14	13	10	9	8
108	C2DM x 1000	C	1000	2D	M	5	7	10	19	16	13	11	9
109	C1D x 1120	C	1120	1D	-	5	7	11	19	18	14	13	12
110	C2D x 1120	C	1120	2D	-	5	8	13	25	23	18	16	13
111	C1DM x 1120	C	1120	1D	M	5	7	10	14	12	10	8	7
112	C2DM x 1120	C	1120	2D	M	5	7	11	19	12	12	12	8

Existing and Proposed Rear Façade





APPENDIX C – Noise Monitoring Data

Date	Time	LAeq	LAFmax	LAF90	1hr LAF90	Date	Time	LAeq	LAFmax	LAF90	1hr LAF90
25/01/2019	11:00:00	58.1	72.0	50.8	51.0	25/01/2019	17:30:00	60.7	80.2	50.3	50.1
	11:15:00	59.0	71.7	50.8			17:45:00	58.5	68.2	50.2	
	11:30:00	57.6	69.3	51.1			18:00:00	58.8	77.0	50.2	50.7
	11:45:00	58.6	69.6	51.4			18:15:00	58.2	70.2	50.2	
	12:00:00	59.3	72.8	51.4	50.3		18:30:00	58.8	68.2	51.6	
	12:15:00	59.1	69.4	50.6			18:45:00	58.6	74.9	50.8	
	12:30:00	57.7	68.8	49.5			19:00:00	58.7	69.4	51.7	50.9
	12:45:00	58.8	71.1	49.5			19:15:00	59.6	77.2	51.1	
	13:00:00	58.4	69.1	50.7	51.7		19:30:00	58.5	73.3	50.8	
	13:15:00	59.1	68.1	52.6			19:45:00	59.2	74.9	50.1	
	13:30:00	59.1	69.5	51.4			20:00:00	58.2	69.4	50.3	50.7
	13:45:00	58.7	76.4	52.1			20:15:00	58.9	74.7	50.6	
	14:00:00	59.2	74.0	51.7	50.7		20:30:00	58.3	69.2	50.6	
	14:15:00	59.0	73.5	50.7			20:45:00	58.3	69.6	51.4	
	14:30:00	59.3	75.7	50.6			21:00:00	58.1	70.1	48.3	49.8
	14:45:00	59.4	76.3	49.7			21:15:00	58.5	74.6	49.5	
	15:00:00	58.8	72.1	50.4	50.3		21:30:00	58.4	69.0	51.2	
	15:15:00	58.4	69.6	49.6			21:45:00	57.5	69.5	50.0	
	15:30:00	58.3	69.6	50.3			22:00:00	58.3	68.6	51.1	49.9
	15:45:00	59.2	82.2	50.9			22:15:00	58.3	74.2	49.5	
	16:00:00	58.6	72.7	50.4	50.5		22:30:00	57.9	69.5	49.1	
	16:15:00	59.4	72.8	51.5			22:45:00	57.9	74.2	50.0	
	16:30:00	58.0	68.6	49.4			23:00:00	57.3	70.5	49.0	48.9
	16:45:00	59.5	75.9	50.8			23:15:00	57.4	69.8	49.4	
	17:00:00	58.0	70.9	49.3	50.1		23:30:00	56.6	70.3	48.3	
	17:15:00	58.8	74.7	50.7			23:45:00	56.9	68.9	48.8	

Date	Time	LAeq	LAFmax	LAF90	1hr LAF90	Date	Time	LAeq	LAFmax	LAF90	1hr LAF90
26/01/2019	11:00:00	57.6	69.8	49.7	49.3	26/01/2019	17:30:00	58.4	73.8	51.1	51.5
	11:15:00	57.8	69.4	48.9			17:45:00	58.6	68.9	53.5	
	11:30:00	57.9	76.7	49.2			18:00:00	58.0	69.0	51.9	55.4
	11:45:00	58.0	69.9	49.2			18:15:00	59.5	71.9	53.3	
	12:00:00	57.6	69.5	49.3	48.8		18:30:00	63.4	71.9	59.3	
	12:15:00	57.9	77.7	48.7			18:45:00	63.4	74.5	57.1	
	12:30:00	57.7	69.2	48.7			19:00:00	59.5	70.4	54.8	52.2
	12:45:00	57.3	68.1	48.6			19:15:00	59.5	77.6	51.7	
	13:00:00	56.7	69.2	49.1	49.4		19:30:00	57.6	69.6	51.5	
	13:15:00	58.8	69.3	50.1			19:45:00	58.4	72.7	50.6	
	13:30:00	57.4	71.0	48.4			20:00:00	57.3	68.4	50.5	50.9
	13:45:00	58.3	72.1	49.9			20:15:00	59.6	74.4	51.5	
	14:00:00	57.3	68.5	49.4	50.0		20:30:00	57.6	68.5	50.9	
	14:15:00	58.8	73.2	50.5			20:45:00	57.9	69.7	50.6	
	14:30:00	57.5	68.6	50.6			21:00:00	56.9	70.6	49.8	49.7
	14:45:00	57.7	74.3	49.3			21:15:00	57.1	70.1	50.2	
	15:00:00	59.5	75.9	50.1	50.1		21:30:00	57.0	72.7	49.4	
	15:15:00	58.6	77.4	49.5			21:45:00	56.7	68.7	49.2	
	15:30:00	57.5	69.3	50.9			22:00:00	57.3	68.6	50.3	49.6
	15:45:00	58.4	84.1	49.8			22:15:00	57.1	67.6	50.3	
	16:00:00	58.3	69.3	50.5	49.9		22:30:00	58.1	74.9	49.5	
	16:15:00	57.3	69.4	49.6			22:45:00	57.4	68.4	48.5	
	16:30:00	57.4	68.9	49.9			23:00:00	58.4	73.3	48.6	49.0
	16:45:00	58.6	73.9	49.5			23:15:00	56.3	69.3	49.1	
	17:00:00	60.6	83.0	50.4	51.5		23:30:00	55.6	69.0	48.6	
	17:15:00	58.1	71.9	50.8			23:45:00	57.0	68.3	49.8	

Date	Time	LAeq	LAFmax	LAF90	1hr LAF90	Date	Time	LAeq	LAFmax	LAF90	1hr LAF90
27/01/2019	11:00:00	57.3	70.4	48.9	49.2	27/01/2019	17:30:00	58.1	70.6	51.1	
	11:15:00	57.3	69.5	49.8			17:45:00	56.4	73.3	49.9	50.6
	11:30:00	59.0	77.9	49.9			18:00:00	58.3	78.6	50.3	49.9
	11:45:00	57.9	80.3	48.1			18:15:00	56.7	69.5	50.2	
	12:00:00	57.4	76.1	49.1	49.7		18:30:00	58.2	78.8	50.0	
	12:15:00	56.8	71.6	49.7			18:45:00	56.8	68.8	49.1	
	12:30:00	59.9	79.1	50.0			19:00:00	57.8	69.0	50.6	50.4
	12:45:00	57.5	73.4	50.1			19:15:00	57.0	72.3	49.3	
	13:00:00	58.4	75.1	49.9	50.0		19:30:00	57.8	69.0	51.5	
	13:15:00	57.5	73.2	50.7			19:45:00	56.7	69.3	50.0	
	13:30:00	58.5	80.8	49.5			20:00:00	57.2	68.7	50.2	49.3
	13:45:00	57.8	73.9	49.9			20:15:00	56.5	68.8	48.8	
	14:00:00	58.5	74.1	50.4	50.6		20:30:00	57.3	77.0	49.2	
	14:15:00	58.1	71.4	51.2			20:45:00	56.1	67.3	48.8	
	14:30:00	58.1	78.2	50.8			21:00:00	57.1	68.6	49.4	48.9
	14:45:00	56.8	69.4	49.9			21:15:00	56.0	69.3	48.8	
	15:00:00	57.6	70.2	51.0	50.9		21:30:00	56.4	68.7	48.3	
	15:15:00	56.7	68.5	50.7			21:45:00	58.3	78.3	48.9	
	15:30:00	59.3	76.7	51.6			22:00:00	56.5	68.0	49.7	48.6
	15:45:00	56.7	68.4	50.3			22:15:00	57.6	75.9	48.6	
	16:00:00	57.7	68.2	50.5	50.7		22:30:00	56.2	69.4	48.1	
	16:15:00	58.0	71.6	50.7			22:45:00	56.5	68.7	47.9	
	16:30:00	57.8	68.6	50.6			23:00:00	56.6	68.9	48.2	47.4
	16:45:00	57.1	76.3	50.8			23:15:00	56.4	79.4	47.2	
	17:00:00	58.0	69.4	51.0	50.6		23:30:00	56.3	69.6	49.2	
	17:15:00	56.3	69.2	50.3			23:45:00	54.9	68.7	45.0	

APPENDIX D - Calculations

Attenuation per double distance required =			6	dB			Metres	
(6dB for LpA recommended)				Enter Distance =			3	
	Frequency Hz							
	125	**250**	**500**	**1000**	**2000**	**4000**	**8000**	Total
	61	71	75	76	75	66	61	80.87
Total LW	61.0	71.0	75.0	76.0	75.0	66.0	61.0	80.87
'A' Weight	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	44.9	62.4	71.8	76.0	76.2	67.0	59.9	80.19
LPA at New Dist'	27.39	44.89	54.29	58.49	58.69	49.49	42.39	62.68
SILENCER	5	8	15	20	20	15	16	
DUCT LENGTH, 8m	3	2	1	1	1	1	1	
DIRECTIVITY 120°	2	6	10	13	20	22	22	
LPA After Insert	**17.19**	**28.49**	**28.49**	**24.69**	**17.89**	**11.69**	**3.59**	**32.64**

Sound Pressure Level @ Residential Façade +3dB Intermittency Correction = 36dB(A)