

4 Arnolds Crescent, Newbold Verdon, Leicestershire, LE9 9LD

July 2024

Project Information

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Table of Contents

Project Information	i
1. Introduction	3
1.1 Overview	3
1.2 Information Provided	3
1.3 Objective	4
2. Policy, Standards & Guidance	5
2.1 The British Standard 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings	5
2.2 WHO Guidance	5
2.3 British Standard BS4142	6
3. Kitchen Extract Fan Installation, Selection & Performance	7
3.1 Fan Specification	8
3.2 Fan Acoustic Performance	9
3.3 Noise Control Equipment Performance	9
4. Acoustics Calculations & Results	11
4.1 Fan Noise Control Calculations	11
4.2 Presentation of Calculation Results	12
5. Assessment of Results	13
6. Conclusions	13
7. Noise Control Recommendations	13
Appendix A: Supplementary Fan Information	14
Appendix B: Acoustic Calculations	17

1. Introduction

1.1 Overview

AVAL Consulting Group Limited (ACGL) has been commissioned to respond to consultee comments on noise (Giles Rawdon – Pollution 2) dated 31 May 2024 concerning a planning application (Ref: Hinkley & Bosworth BC 24/00503/FUL) for change of use from a sandwich shop (Class E) to hot food takeaway (sui generis) including replacing an existing extract system. It was agreed that this scope of acoustic consultancy would be undertaken as a desk study.

The development is located at 4 Arnolds Crescent, Newbold Verdon, Leicester, Leicestershire, LE9 9LD. We understand from the officer's comments that the kitchen exhaust is close to existing dwellings and there is a risk of noise adversely affecting those properties. As such, full details of the kitchen ventilation system need to be submitted, including justification for the stated 33dB(A) sound level.

1.2 Information Provided

In addition to the consultee comments referred to above, the client also provided photographs of the development and a set of design drawings produced by Spectrum Management & Services Ltd (Ref: 2409-100 to 103) representing both the existing and proposed development. As regards the kitchen extract system, the following relevant information was included in one of these drawings that includes the reference to a 33dB(A) sound level:

Extractor canopy manufactured from 430 grade stainless steel dull polished both sides, complete with 8 no. grease filterers. Canopy size 200 x 380 x 400 x 2400 L shaped.
Fan motor will be from Falkwoods size 560 mm long case.
2 no silencers size 560 mm x 600 long each
Fan will also be connected to
- Gas Interlock system
- Carbon filter to reduce smoke and fumes
- Anti- vibration system
The part of the exhaust ducting one the exterior of the premises will be constructed from galvanised , rust- proof steel
240 volt- 1420 rpm
Sound level 56 dba when monitored at 3 meters
The attenuator we use, before and after fan. This would reduce the dba level by 10 dba to the canopy side and 19 dba to extraction side, thus producing 33 dba when mounted at 3 m form the fan

The development's opening hours are 4pm to 11pm, 7 days a week. The client has confirmed that the associated extract fan will therefore operate between the hours of 4pm to 11pm.

No detailed information has been provided regarding the existing kitchen extract system that is to be replaced, other than what is shown in the relevant drawings and a photograph. These show a horizontal discharge duct orientated horizontally in a northerly direction. There does not appear to be any silencing of the fan discharge on the existing system, hence it cannot be assumed that the baseline situation equates to no significant noise impact. As such, the proposed replacement extract system, with silencing incorporated into the design and a vertically orientated discharge, clearly has the potential to improve upon the existing situation.

Subsequent to the initial batch of information set out above, further supporting information was provided by the client regarding the selection of the Flaktwoods' fan, which is included in Appendix A together with the associated 'Fan Selector – Technical Datasheet'.

1.3 Objective

The envisaged scope of work for the preparation of a noise control scheme for the development's replacement kitchen extract system included the following tasks and deliverables:

- To review all the relevant information provided by the client (refer to Section 1.2 above) regarding the design of the kitchen extract system and identify any gaps in the necessary information.
- Take steps to acquire any identified missing information, in order to allow a comprehensive explanation of the relevant noise levels and a justification of the 33dB noise level cited on Drawing 2109-102.
- Conduct acoustic calculations on the fan system, its silencers and for the propagation of sound to the nearest noise-sensitive receptor.
- Assess the likely noise impact at the nearest noise-sensitive receptor, referencing BS4142:2014+A1:2019 and BS8233:2014/WHO.
- Produce a consultant's technical report documenting the above in the form of a noise control scheme, including consideration of the proposed noise mitigation measures.

2. Policy, Standards & Guidance

Generally, in relation to environmental noise and planning the relevant policy context, standards and methodologies, include NPPF, NPSE (i.e. NOEL, LOAEL, SOAEL), NPPG, BS4142, BS8233 and WHO. In the case of commercial sound, such as a hot food take-away kitchen extract system, the most relevant standard is BS4142:2014+A1:2019 '*Methods for rating and assessment industrial and commercial sound*', which in turn also references BS8223:2014 '*Guidance on sound insulation and noise reductions for buildings*'.

2.1 The British Standard 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings*' gives recommendations for the control of noise in and around buildings. The Standard suggests appropriate criteria and limits for different situations to guide the design of new or refurbished buildings undergoing a change of use. Desirable upper noise levels inside residential habitable rooms are specified in the Standard and are reproduced below:

Activity	Location	Desirable Internal Noise Level, dB $L_{Aeq,T}$	
		07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35	-
Dining	Dining Room/Area	40	-
Sleeping (daytime resting)	Bedroom	35	30

As the kitchen extract system will not operate at night, the above guidance values for the daytime hours 07:00 to 23:00 are applicable. Considering that a partially open window offers around 15dB(A) attenuation to ingress sound, the above internal noise levels equate in external environmental levels in the range 50dB to 55dB $L_{Aeq,16hrs}$.

In external amenity spaces, such as private gardens and patios, BS 8233 indicates that it is desirable that the external noise level in these areas does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ in noisier environments.

2.2 WHO Guidance

The guidelines presented in the World Health Organization (WHO) [6] document reflect conclusions drawn up after consideration of international research evidence on the health effects of exposure to noise. The guidelines define the goal of noise management as '*to maintain low noise exposures such that human health and well-being are protected*', with '*specific objectives to develop criteria for the maximum safe exposure levels and to promote noise assessment and control as part of environmental health programmes*'. These WHO guideline values are based on precautionary limits for community noise in specific environments and are reproduced below.

Specific Environment	Critical Health Effect(s)	dB $L_{Aeq,T}$	Time Base hours
Outdoor living area	Serious annoyance, daytime and evening	55	16
	Moderate annoyance, daytime and evening	50	16
Dwelling indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16
Inside bedrooms	Sleep disturbance, night-time	30	8

It should be noted that the above values generally apply to 'anonymous' or everyday levels of environmental noise from road traffic, trains and aircraft. Human reaction to tonal and low frequency noise may be underestimated by the dB(A) noise level and hence lower limits may apply.

2.3 British Standard BS4142

Guidance on the rating and assessing of sound of an industrial and/or commercial nature is contained in British Standard BS4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'.

The standard states:

"This standard is applicable to the determination of the following levels at outdoor locations:

- a) rating levels for sources of sound of an industrial and/or commercial nature; and
- b) ambient, background and residual sound levels
- c) for the purposes of:
 - 1) investigating complaints;
 - 2) assessing sound from proposed, new, modified or additional source(s) of sound of an industrial nature and/or commercial nature; and
 - 3) assessing sound at proposed new dwellings or premises used for residential purposes."

The determination of noise amounting to a nuisance is beyond the scope of this British Standard.

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 occurs.

Typically, the greater the difference between rating level and background noise level, the greater the magnitude of the impact:

- a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- a difference of around +5 dB is likely to be an indication of an adverse impact, depending on context; and
- the lower the rating level is relative to the measured background sound level, the less likely it is that the specific 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.

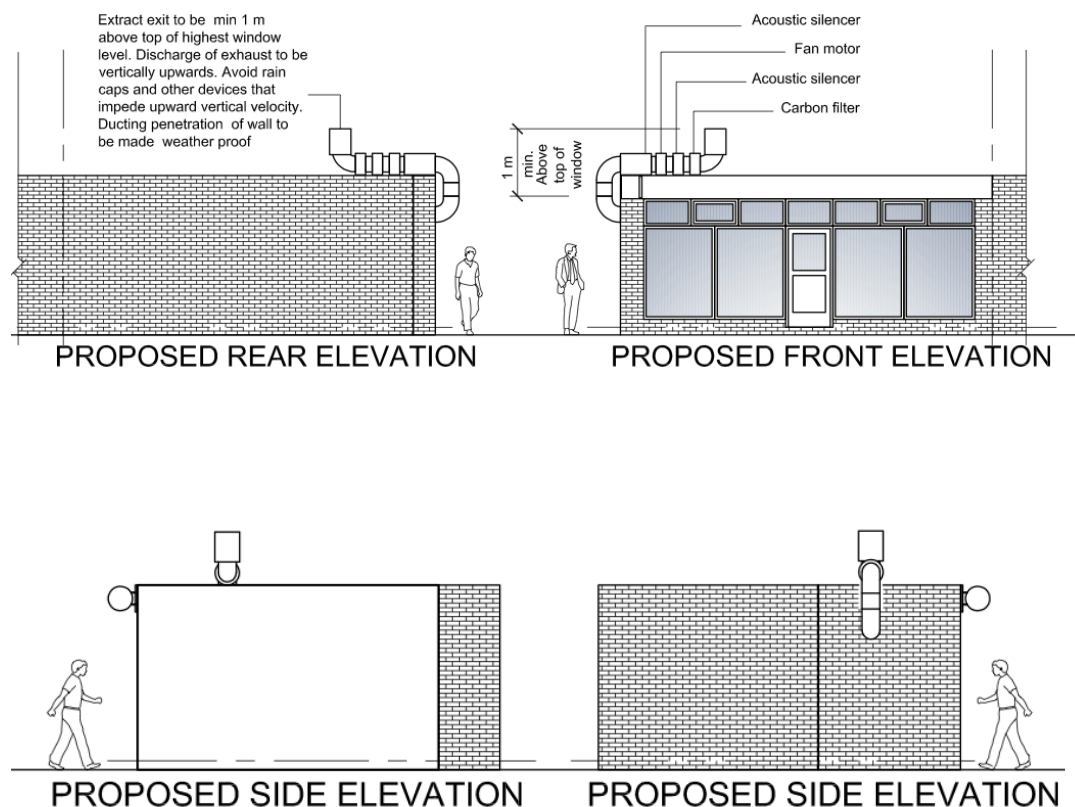
Certain acoustic features can increase the significance of the impact over that expected from a basic comparison between specific sound level and the background sound level. These features include tonality and impulsivity, as well as additional characteristics and intermittency of the sound.

Where appropriate, a rating penalty for sound based on a subjective assessment of its characteristics should be established. In other circumstances an objective appraisal of tonal and/or impulsive characteristics may be appropriate.

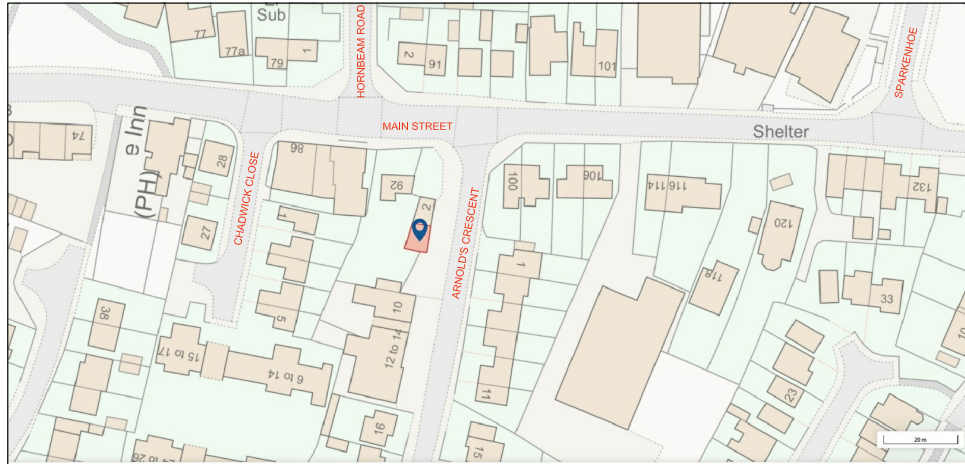
The Standard also identifies the importance of context and acknowledges that the '*initial estimate of the impact*' may need to be modified due to the context, taking all pertinent factors into consideration.

3. Kitchen Extract Fan Installation, Selection & Performance

The installation arrangement of the proposed replacement kitchen extract system is shown below:



The following site location plan shows the development located at 4 Arnolds Crescent (blue pointer) and the nearest noise-sensitive receptor at 92 Main Street.



3.1 Fan Specification

The selected extract fan for the development is as follows:

- Flaktwoods JM Aerofoil
- Model 45JM/16/4/5/40
- Type DX461466
- 450mm diameter x 330mm length fan casing
- 40° impeller angle
- 4 pole motor (CT5)
- 5 blades
- Fan speed 1420 rpm
- Actual duty 1.93m³/s
- Outlet dynamic pressure 89 Pa

Additional technical details concerning the selected fan can be found in Appendix A, which include the acoustic performance.

3.2 Fan Acoustic Performance

The relevant acoustic data for the above selected fan, as published by the manufacturer is as follows:

ACOUSTICS									
	Sound Spectrum (Hz)								Overall
	63	125	250	500	1k	2k	4k	8k	Lw* LpA @ 3 m **
Inlet	79	81	77	74	72	70	65	60	85 57
Outlet	80	81	77	74	72	70	66	62	85 57
Breakout	70	63	55	51	47	42	44	38	71 34
Sound Data At Requested Duty . * Lw dB re 10 ⁻¹² W ** dBA re 2x10 ⁻⁵ Pa									
Axial Way Colchester Essex CO4 5DZ +44 (0) 1206 222 555 UK									
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In terms of the acoustic calculations (refer to Appendix B) undertaken for this noise control scheme the above sound spectra (Hz) have been adopted, as it is more accurate to carry out the noise mitigation predictions in 1/1 octave band centre frequencies (OBCF) than solely in dB(A). As this an extract fan, the inlet side is connected by steel ductwork to the kitchen canopy within the building. As such, this is deemed to have no effect upon environmental noise levels for planning purposes. Conversely, the outlet side of the fan extracts to the environment via the ductwork, which has a vertical cowl.

The proposed design of the kitchen extract system includes for duct silencers on both the inlet and outlet sides of the fan, attenuating noise to both the kitchen and the environment, respectively.

3.3 Noise Control Equipment Performance

The performance of the Flaktwoods' silencers is given in the tables below for models without (Type B) and with a central pod (Type C):

Acoustic Performance B Type (without Pod)									
Bore Dia. mm (D)	Length	Acoustic Performance (dB) ~ Octave Band Mid Frequency ~ Hz							
		63	125	250	500	1K	2K	4K	8K
315	1D	1	2	4	9	11	10	9	7
355	1D	1	2	4	10	12	10	9	7
400	1D	2	3	5	10	13	11	9	8
450	1D	2	3	6	12	13	11	10	8
500	1D	2	3	6	13	14	10	10	5
560	1D	2	4	7	14	14	19	10	7
630	1D	2	5	7	15	13	8	9	8
710	1D	3	5	7	15	13	9	9	8
800	1D	3	5	8	16	12	9	9	8
900	1D	3	5	10	17	13	11	10	8
1000	1D	4	5	11	16	11	10	8	9

Acoustic Performance C Type (with Pod)

Bore Dia. mm [D]	Length	Acoustic Performance (dB) – Octave Band Mid Frequency – Hz							
		63	125	250	500	1K	2K	4K	8K
315	1D	2	5	5	9	18	20	18	15
355	1D	2	5	6	9	18	22	19	16
400	1D	2	6	6	10	19	24	20	17
450	1D	2	4	7	13	20	23	22	17
500	1D	2	3	8	16	21	22	21	17
560	1D	3	5	8	16	20	18	19	15
630	1D	3	5	8	15	19	16	14	12
710	1D	3	5	8	15	19	15	14	12
800	1D	4	5	8	16	19	15	14	13
900	1D	4	5	9	17	19	15	14	13
1000	1D	5	5	11	18	19	15	14	13

For both the Type B and C silencers the length is stated as a multiple of the bore diameter (i.e. 1D). The design's installation arrangement of the intake and outlet silencers is shown in the drawings above, namely bolted immediately on each side of the fan. Based upon the information given in Section 1.2, it's noted that the length of the two silencers attenuators is the same, though the overall acoustic performance is stated at 10dB(A) and 19dB(A) for the canopy and extraction side, respectively. This indicates that a Type C silencer is intended for the canopy side and a Type B for the environmental extraction side, or an equivalent performing product.

4. Acoustics Calculations & Results

4.1 Fan Noise Control Calculations

The acoustic calculations are presented in Appendix B at the rear of this report. The manufacturer's data has been adopted in 1/1 OBCF format and set out in both LIN and A-weighted noise levels. Additionally, the overall dB(LIN) and dB(A) levels are calculated. The fan's three sources of noise are considered, namely 'Inlet SWL', Outlet SWL and 'Breakout SWL'.

The Sound Power Levels (SWLs) are converted to Sound Pressure Levels (SPL) for the reference range of 3 metres and at a range of 12 metres, corresponding the location of the nearest residential receptor (i.e. rear of 92 Main Street). The SPL at 3 metres provided in the manufacturer's datasheet is evaluated based upon the assumption of spherical freefield sound radiation. As this extract roof is to be installed on a flat roof, the sound radiation will be freefield hemispherical. This location directivity effect will result in a 3dB increase in SPLs.

Table 4.1 Fan Sound Power Levels

Fan Noise Source	dB(LIN)	dB(A)
Inlet SWL	85dB	77dB
Outlet SWL	85dB	78dB
Breakout SWL	71dB	55dB

Table 4.2 Fan Sound Pressure Levels

Fan Noise Source	dB(LIN)	dB(A)
Inlet SPL @ 3m	67dB	60dB
Outlet SPL @ 3m	68dB	60dB
Breakout SPL @ 3m	53dB	37dB

As regards the explanation for the 56dB noise level stated in Section 1.2, it can be inferred that this relates to the 57dB(A) SPL at 3 metres as given in the manufacturer's datasheet (refer to Section 3.2) for both the inlet and outlet noise levels. This 57dB(A) is subject to a +3dB correction to account for hemispherical radiation, resulting in 60dB(A) at 3 metres as presented in Table 4.2 above.

As regards the explanation for the 33dB noise level stated in Section 1.2, it can be inferred that this relates to the 34dB(A) SPL at 3 metres as given in the manufacturer's datasheet (refer to Section 3.2) for both the breakout noise level. This 34dB(A) is subject to a +3dB correction to account for hemispherical radiation, resulting in 37dB(A) at 3 metres as presented in Table 4.2 above.

4.2 Presentation of Calculation Results

All relevant acoustic calculations are presented in Appendix B, undertaken in 1/1 OBCFs over the frequency range 63Hz to 8kHz with results given in dB(LIN) and dB(A). These calculations are intended to represent a worst-case, whereby certain noise attenuating effects have been ignored, such as terminal end reflection loss, in-duct losses and directivity effects. As such, the results should be considered to be an overestimation of the actual noise levels likely to impact the nearest noise-sensitive receptor (NSR), in effect building in a tolerance for uncertainties.

The calculations consider the fan noise level at the reference distance of 3 metres and at 12 metres, corresponding to the nearest NSR (rear of 92 Main Street). Two noise control options are considered in terms of a Type B and Type C duct silencers as explained in Section 3.3. The overall results are summarised in Table 4.3 below.

Table 4.3 Summary of Results

Noise Level at Nearest NSR	Silencer Type B	Silencer Type C
Breakout SPL @ 12m	25dB(A)	25dB(A)
Outlet SPL @ 12m	39dB(A)	36dB(A)
Cumulative SPL @ 12m	39dB(A)	39dB(A)

5. Assessment of Results

It can be seen from the results presented in Table 4.3 above that the noise contribution from the fan's casing radiated breakout noise is very low and hence has no effect upon the cumulative noise level at the nearest NSR. As such, the NSR noise level is solely dependent upon the noise emitted from the extract system's outlet duct, which is orientated vertically. Analysis of the two silencer options indicate that the Type C would offer a 3dB(A) reduction over and above the Type B.

As regards the relevant guidance on absolute noise levels (i.e. BS8233 & WHO) during the daytime, it can be seen from the results the extract fan noise levels at the NSR will be significantly below such targets by at least 10dB. As regards BS4142, it's considered that the context is important in this case, as the prevailing residual sound level during the daytime (e.g. 45dB and above, with the fan inoperative) would be greater than the specific sound level of the fan at the receptor. As such, it's likely that the attenuated extract fan noise would not be discernible (or measurable) at the receptor. Under such circumstances the assessment would not warrant the imposition of any acoustic feature corrections. As regards a representative daytime background noise level ($L_{A90,T}$) over the period when the fan will operate, this is likely to be well above 40dB, indicating low impact.

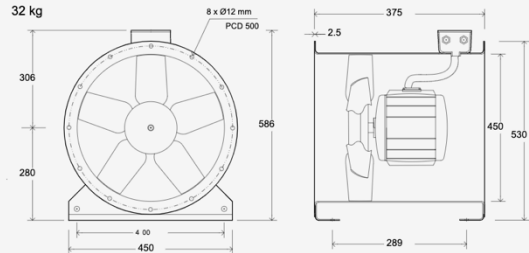
6. Conclusions

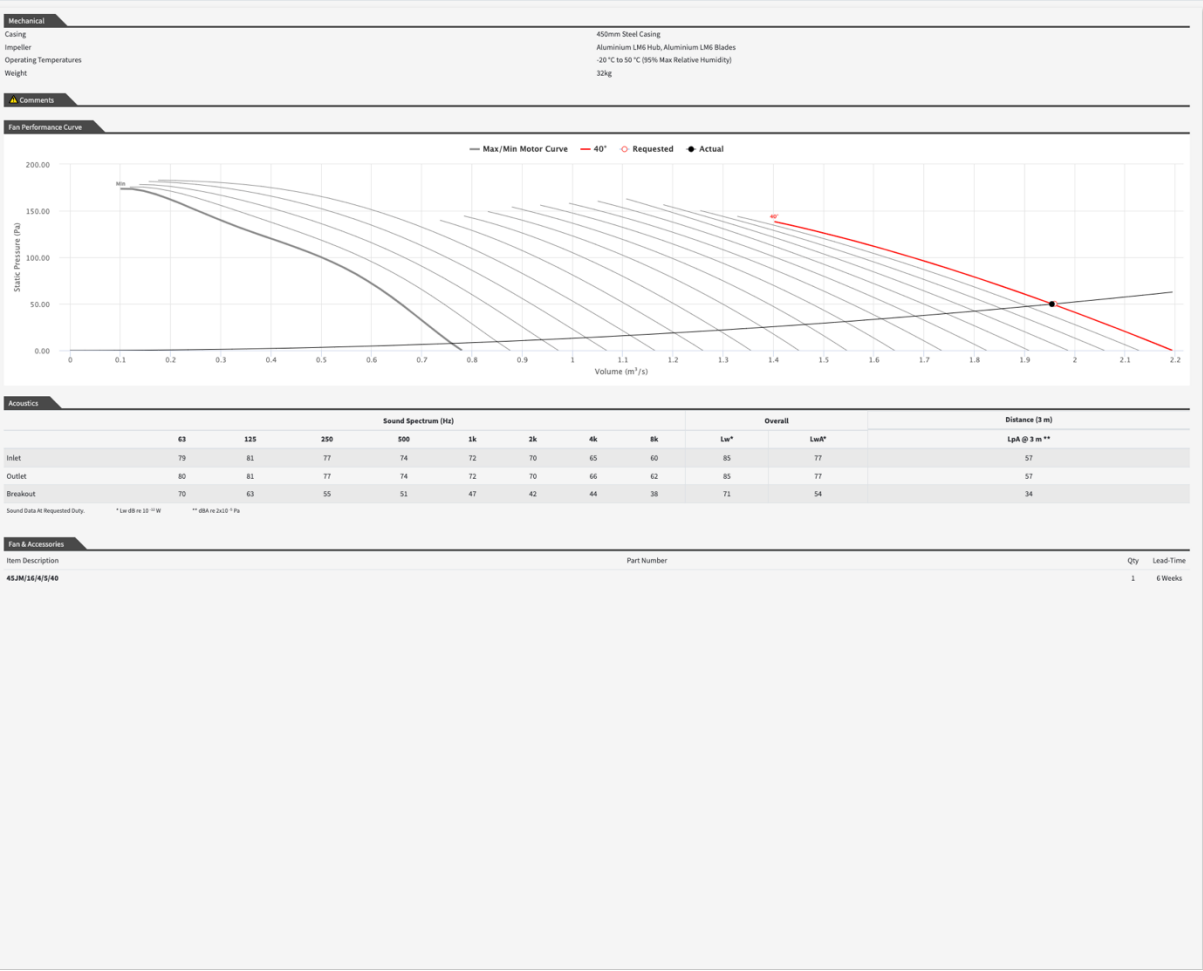
A detailed acoustic analysis of the proposed kitchen extract system has shown that the fan's casing radiated breakout noise level can be expected to be very low at the nearest residential receptor, such that it can be considered insignificant and hence does not require any noise control treatments. The fan's outlet noise level at the nearest dwelling is estimated to be 48dB(A) without the benefit of any noise control measures. It's demonstrated that the available duct silencers can be effective in bringing this level down to within the range 39dB(A) to 36dB(A) at the relevant receptor, equating to noise control attenuations of 9dB(A) to 12dB(A) range.

7. Noise Control Recommendations

In relation to BS4142, the typical day time residual noise levels (i.e. when the fan is inoperative) are likely to be of a similar order to the predicted sound level of the extract fan **without** any noise control equipment, at the nearest residential property. Nonetheless, the applicant's design includes silencers to be fitted on both the inlet and outlet sides of the fan. It is recommended that Type B or C silencers are installed, which will reduce the cumulative sound level of the fan to at least 39dB(A) at the nearest residential property, based upon a worst-case assessment. It's considered that this mitigation will result in receptor noise levels having low impact based upon BS4142's rating method. In terms of absolute noise levels, an attenuated fan noise level of 39dB(A) is well below the guidance levels provided in BS8223 & WHO for outdoor amenity areas. Equally, the associated noise ingress levels would equally be well within the relevant indoor guidance limits, allowing for open windows at the nearest affected dwelling.

Appendix A: Supplementary Fan Information

Summary - 45JM16/4/5/40 45JM16/4/5/40	
 JM Aerofoil 45JM16/4/5/40 45JM16/4/5/40 6 weeks - (Fan Only) Lead time may vary based on stock availability at time of order. Please refresh the lead time in the project or reslect the fan before placing an order.	
Product	
Model Code	45JM16/4/5/40
Fan Diameter	450 mm
Fan Speed	1420 rpm [Max 4382, Min 0]
Impeller	5 Blades, 40° Angle
Installation	Type D - Farm B
Fan Casing	Long Case - Horizontal
Performance	
Requested Duty	1.96 m³/s @ 50 Pa (Static)
Outlet Dynamic Pressure	91 Pa
Velocity	11.29 m/s
Absorbed Power	0.448 kW
Peak Power	0.480 kW [Used to size motor]
Efficiency (Total / Static)	61.3 % / 21.7 %
Motor	
Motor Rating	0.520 kW [CTS Frame - 4 Pole]
Full Load Current	3.9 A
Starting Current	7.8 A
Electrical Supply	220 - 240 Volts 50 Hz 1 Phase
Motor Winding	Standard
Motor Type	Pad - Class F Insulation
Efficiency Grades	
ErP (FMG) Rating	N 35 (Nee ErP Complaint) ❌
ErP (FMG)	Target N 40
FMG Blade Angle (Range)	32° [28° To 40°]
Measurement Category	C
VSD	No
Fan + Motor Efficiency	28.0% (1.11 m³/s @ 163 Pa)
Motor Input Power (ErP)	0.644 kW
Environment	
Air Density	1.2 kg/m³ / 20 °C / 0 m / 40% RH
Smoke Venting	No Smoke Venting
Operating Environment	Normal
Running Costs	
Power from mains	0.782 kW
Energy Consumption	1,563.17 kWh (2,000.00 h/Year)
Running Cost / Year	£390.79
CO2 per Year	549.55 kgCO2e
SFP value	0.40 W/s @ Actual Duty
Product Dimensions	
32 kg  Technical drawing of the 45JM16/4/5/40 fan showing front and side views with dimensions. The front view shows a circular fan with 5 blades, a diameter of 450 mm, and a height of 280 mm. The side view shows the fan's profile with a width of 375 mm, a height of 530 mm, and a base width of 289 mm. Other dimensions include a PCD of 500 mm, 8 x Ø12 mm mounting holes, and a total height of 586 mm. This drawing shows dimensions that should be used as a guide only and are subject to change. Certified drawings are available on request.	



Appendix B: Acoustic Calculations

Ref: 93224 - Kitchen Extract Noise Control Scheme, 4 Arnolds Crescent, Leicestershire - Acoustic Calculations

A-weighting	-26.2	-16.1	-8.6	-3.2	0	1.2	1	-1.1	
1/1 OBCFs	63	125	250	500	1k	2k	4k	8k	dB(LIN)
Inlet SWL	79.0	81.0	77.0	74.0	72.0	70.0	65.0	60.0	85
Outlet SWL	80.0	81.0	77.0	74.0	72.0	70.0	66.0	62.0	85
Breakout SWL	70.0	63.0	55.0	51.0	47.0	42.0	44.0	38.0	71
Attenuation 3m range	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	
Inlet SPL at 3m	61.5	63.5	59.5	56.5	54.5	52.5	47.5	42.5	67
Outlet SPL at 3m	62.5	63.5	59.5	56.5	54.5	52.5	48.5	44.5	68
Breakout SPL at 3m	52.5	45.5	37.5	33.5	29.5	24.5	26.5	20.5	53
1/1 OBCFs	63	125	250	500	1k	2k	4k	8k	dB(A)
Inlet SWL	52.8	64.9	68.4	70.8	72.0	71.2	66.0	58.9	77
Outlet SWL	53.8	64.9	68.4	70.8	72.0	71.2	67.0	60.9	78
Breakout SWL	43.8	46.9	46.4	47.8	47.0	43.2	45.0	36.9	55
Attenuation 3m range	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	
Inlet SPL at 3m	35.3	47.4	50.9	53.3	54.5	53.7	48.5	41.4	60
Outlet SPL at 3m	36.3	47.4	50.9	53.3	54.5	53.7	49.5	43.4	60
Breakout SPL at 3m	26.3	29.4	28.9	30.3	29.5	25.7	27.5	19.4	37
Insertion Loss 4501D Type B	2.0	3.0	6.0	12.0	13.0	11.0	10.0	6.0	
Insertion Loss 4501D Type C	2.0	4.0	7.0	13.0	20.0	23.0	22.0	17.0	
Inlet SWL Attenuated Type B	50.8	61.9	62.4	58.8	59.0	60.2	56.0	52.9	68
Outlet SWL Attenuated Type B	51.8	61.9	62.4	58.8	59.0	60.2	57.0	54.9	68
Inlet SPL at 3m Attenuated Type B	33.3	44.4	44.9	41.3	41.5	42.7	38.5	35.4	51
Outlet SPL at 3m Attenuated Type B	34.3	44.4	44.9	41.3	41.5	42.7	39.5	37.4	51
Inlet SWL Attenuated Type C	50.8	60.9	61.4	57.8	52.0	48.2	44.0	41.9	66
Outlet SWL Attenuated Type C	51.8	60.9	61.4	57.8	52.0	48.2	45.0	43.9	66
Inlet SPL at 3m Attenuated Type C	33.3	43.4	43.9	40.3	34.5	30.7	26.5	24.4	48
Outlet SPL at 3m Attenuated Type C	34.3	43.4	43.9	40.3	34.5	30.7	27.5	26.4	48
NSR (92 Main St) at 12m range	-29.6	-29.6	-29.6	-29.6	-29.6	-29.6	-29.6	-29.6	
Outlet SPL at 12m	24.2	35.3	38.8	41.2	42.4	41.6	37.4	31.3	48
Breakout SPL at 12m	14.2	17.3	16.8	18.2	17.4	13.6	15.4	7.3	25
Insertion Loss 4501D Type B	2.0	3.0	6.0	12.0	13.0	11.0	10.0	6.0	
Insertion Loss 4501D Type C	2.0	4.0	7.0	13.0	20.0	23.0	22.0	17.0	
Outlet SWL Attenuated Type B	51.8	61.9	62.4	58.8	59.0	60.2	57.0	54.9	68
Outlet SPL at 12m Attenuated Type B	22.2	32.3	32.8	29.2	29.4	30.6	27.4	25.3	39
Outlet SWL Attenuated Type C	51.8	60.9	61.4	57.8	52.0	48.2	45.0	43.9	66
Outlet SPL at 12m Attenuated Type C	22.2	31.3	31.8	28.2	22.4	18.6	15.4	14.3	36
Cumulative SPL at 12m Attenuated Type B	22.9	32.5	32.9	29.5	29.7	30.7	27.7	25.4	39
Cumulative SPL at 12m Attenuated Type C	22.9	31.5	32.0	28.6	23.6	19.8	18.4	15.1	36