Report Ref. **CLI0318/R1/Rev.A**

Noise Impact Assessment Report for Proposed Kitchen Extraction System and Air Conditioning Unit

329 West End Lane, London NW6 1RS

27 January 2022

Report prepared for:
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Document Information

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Summary

A new kitchen extraction & supply units and an air conditioning unit is proposed to be installed to serve the proposed commercial restaurant/ takeaway kitchen at 329 West End Lane, London NW6 1RS.

Climate Acoustics has been appointed to complete a noise survey and noise impact assessment to determine the noise impact on the neighbouring residents. Noise surveys were done on Thursday 16 December 2021 and Saturday 18 December 2021.

The kitchen extraction system operation is expected to run between 10 am to 11 pm, Monday to Sunday. *Note: typically, the plant would be more noticeable during the late evening when the background noise is lower.*

British Standard BS 4142 – Commercial Plant Noise Levels

As per London Borough of Camden Council's noise criteria, the noise level from the commercial kitchen plant should be at least 10 dB or greater below the minimum external background noise level at the nearest noise-sensitive properties.

The quietest 'minimum' background noise level during the daytime operating hours at Location A1 equals 44 dB $L_{A90,1\text{-hour(Day)}}$ during the proposed hours of operation, which is equivalent to the background noise level expected at the nearest residential window receptors R1-R3. Therefore, the cumulative maximum emission limit at 1 metre from the nearest noise-sensitive residential windows is equal to or below **34 dB $L_{Aeq,1\text{-hour(Day)}}$**.

Noise & Vibration Control Measures

To control noise levels, Section 4.2.1 of this report shows that the new kitchen extraction system ductwork should be fitted with one rectangular silencer, along with an acoustic jacket and acoustic duct lagging (Section 4.2.2). Section 4.2.3 of this report shows that the new air conditioning unit housed to the rear of the premises should have an acoustic enclosure fitted to control noise. Finally, anti-vibration mounts should be applied to the kitchen extraction system ductwork, as shown in Section 4.2.4 of this report.

With the noise & vibration control measures applied (as outlined in Section 4.2), the calculation tables in Appendix C shows the new proposed plant is predicted to achieve the required noise emission criteria/ limit **34 dB $L_{Aeq,1\text{-hour}}$** (Section 4.1.1) at 1-metre from the nearest noise sensitive residential windows Receptor R1-R3. This is 10 dB below the minimum daytime/ evening background noise level (44 dB $L_{A90,1\text{-hour}}$).

Therefore, predicted noise levels achieved the following at 1 metre from the nearest residential receptors windows:

- **Receptor R1: 34 dB $L_{Aeq,1\text{-hour}}$** at 1 metre from Receptor R1 window
- **Receptor R2: 28 dB $L_{Aeq,1\text{-hour}}$** at 1 metre from Receptor R2 window
- **Receptor R3: 25 dB $L_{Aeq,1\text{-hour}}$** at 1 metre from Receptor R3 window

These predicted noise levels achieve London Borough of Camden Council's noise criteria (i.e., 10 dB or greater below the minimum external background noise level), detailed in Section 2.1 of this report. As per British Standard BS 4142:2014+A1:2019 (Section 2.3 of this report), guidance, this gives ***"an indication of the specific sound source having a low impact"*** at the nearest noise-sensitive residential receptor window.

This meets London Borough of Camden Council's noise criteria for daytime/ evening (34 dB $L_{Aeq,1\text{-hour}}$). Full details of the noise criteria are provided in Sections 2.1 and 4.1.1 of this report.

British Standard BS 8233 – Predicted Internal Noise Levels

The nearest residents' windows with a partially open window for ventilation offers 10 decibels (dB) attenuation. The calculation tables in Appendix C shows the predicted internal noise levels with the x1 No. extraction fan unit and x1 No. A/C unit operating is expected to be:

- **Receptor R1: 24 dB $L_{Aeq,16\text{-}hour}$** inside Receptor R1 during the daytime/ evening.
- **Receptor R2: 18 dB $L_{Aeq,16\text{-}hour}$** inside Receptor R2 during the daytime/ evening.
- **Receptor R3: 15 dB $L_{Aeq,16\text{-}hour}$** inside Receptor R3 during the daytime/ evening.

These predicted levels with noise and vibration control measures implemented (detailed in Section 4.2 of this report) will comfortably meet the acceptable internal noise levels in bedrooms for resting during the daytime/ evening (35 dB $L_{Aeq,16\text{-}hour}$), as per British Standard BS 8233: 2014 (Section 2.3.3 of this report). Complaints are therefore unlikely.

Prevent Odour from Kitchen Extraction Unit

Appendix B1 & B2 shows the location of the odour control equipment, including one (x1 No.) odour control unit (OC Unit) system and two (x2 No.) Electrostatic Precipitator (ESP) systems to the kitchen extraction unit ductwork. Note: Appendix D9 shows the ESP system specification, and Appendix D10 details the OC unit specification.

In summary, the ESP systems will be used to separate the solid and liquid particles from the ventilation air whilst eliminating excessive quantities of smoke, therefore, providing a high percentage of clear air to the duct opening and an excellent odour control measure.

The 'Control of Odour and Noise from Commercial Kitchen Exhaust System (Section 2.3.1 of this report) recommends regular maintenance and cleaning of ESP systems:

"Recommendation for maintenance of odour control systems:

For a system employing ESP and other in line abatement systems:

- *Clean every 1-3 months"*

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1 Introduction

A new kitchen extraction & supply units and an air conditioning unit is proposed to be installed to serve the proposed commercial restaurant/ takeaway kitchen at 329 West End Lane, London NW6 1RS.

Climate Acoustics has been appointed to complete a noise survey and noise impact assessment to determine the noise impact on the neighbouring residents from the proposed commercial kitchen plant serving the proposed commercial premises.

London Borough of Camden Council has specified outline noise emission criteria based on our understanding and technical information from the kitchen extract system installer and client. Climate Acoustics will assess the likely increase in noise level due to the kitchen extraction & supply units and A/C unit new operation. If required, suggesting appropriate noise control measures to reduce noise emissions.

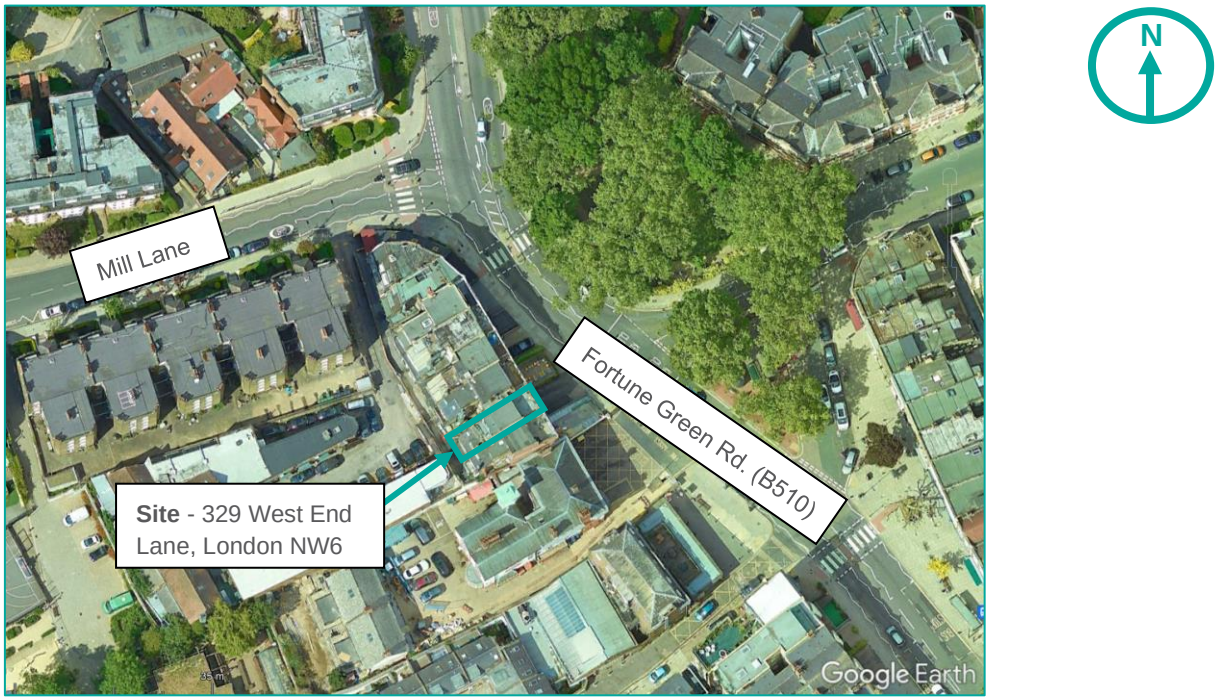
1.1. Site Description

Figure 1 shows the site boundary where the proposed commercial restaurant/ takeaway premises is located on the basement floor level and the kitchen is located on the ground floor level (highlighted in **green**).

Appendix B shows that the proposed kitchen extraction fan unit will be housed at first floor level towards the west elevation area at the rear of the restaurant/ takeaway premises at 329 West End Lane, London NW6 1RS. The proposed A/C unit will be housed at ground floor level towards the west elevation at the rear of the premises. These units must be assessed against the current noise climate to avoid noise disturbance to the nearby noise-sensitive residential receptors.

The sites dominant noise sources include existing commercial noise from a kitchen extraction unit serving Rozy Bar, and an air conditioning unit serving Gourmet Burger Kitchen. In addition, road traffic noise was audible from Mill Lane and the B510. *Note: the proposed restaurant/ takeaway at 329 West End Lane, London NW6 1RS has no existing plant in operation.*

Figure 1 –Google Earth™ image showing the site description.



2 Noise Criteria and Planning Policy

2.1. Local Planning Policy

2.1.1. London Borough of Camden Council – Camden Development Policies 2010-2025, Local Development Framework

Policy DP28: Noise and Vibration states:

"The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:

a. development likely to generate unacceptable noise pollution; or

b. development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.

Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.

The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds. The Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact."

Policy DP28 Table E sets out the following noise limits which are relevant for this development:

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dB$L_{Aeq'}$

2.1.2. London Borough of Camden Council's Noise Criteria

As detailed in Section 2.1.1 of this report, Policy DP28, Table E of the *'Camden Development Policies 2010-2025, Local Development Framework'* the proposed kitchen extractor unit (x1 No.) and air conditioning unit (x1 No.), Camden Council's has minimum noise criteria so that the plant noise is controlled to demonstrate that the plant won't cause noise disturbance and harm to the local residential environment. Typical guidance for fixed plant is given below:

"Noise levels at a point 1 metre external to sensitive facades shall be at least 5 dB(A) less than the existing background measurement (L_{A90}), expressed in dB(A) when all plant/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters,

thumps), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 10 dB(A) below the L_{A90}, expressed in dB(A).

Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policies A1 and A4 of the London Borough of Camden Local Plan 2017."

2.1.3. Camden Local Plan 2017

Policies A1 and A4 of the London Borough of Camden Local Plan 2017 are referred to here:

"Policy A1 Managing the impact of development

The Council will seek to protect the quality of life of occupiers and neighbours. We will grant permission for development unless this causes unacceptable harm to amenity.

We will:

a. seek to ensure that the amenity of communities, occupiers and neighbours is protected;

b. seek to ensure development contributes towards strong and successful communities by balancing the needs of development with the needs and characteristics of local areas and communities;

c. resist development that fails to adequately assess and address transport impacts affecting communities, occupiers, neighbours and the existing transport network; and

d. require mitigation measures where necessary.

The factors we will consider include:

e. visual privacy, outlook;

f. sunlight, daylight and overshadowing;

g. artificial lighting levels;

h. transport impacts, including the use of Transport Assessments, Travel Plans and Delivery and Servicing Management Plans;

i. impacts of the construction phase, including the use of Construction Management Plans;

j. noise and vibration levels;

k. odour, fumes and dust;

Policy A4 Noise and vibration

The Council will seek to ensure that noise and vibration is controlled and managed.

Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3). We will not grant planning permission for:

a. development likely to generate unacceptable noise and vibration impacts; or

b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development."

2.2. National Planning Policy

2.2.1. The National Planning Policy Framework (NPPF)

The latest revision of NPPF (July 2021) sets out the Government's vision for sustainable development through economic, environmental, and social planning policies for England.

Paragraph 174. *"Planning policies and decisions should contribute to and enhance the natural and local environment by:*

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of … noise pollution …"

Paragraph 185. "*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from this development. In doing so they should:*

a. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;"

NPPF also sets out that any planning policies and decisions should ensure that new development can be integrated effectively.

Paragraph 187. *"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."*

2.2.2. National Planning Practice Guidance (NPPG)

The Department for Communities and Local Government (DCLG) released a web-based resources at the time of the planning application relate to *'Planning Practice Guidance'*. The guidance advises the following:

"How can noise impact be determined?

Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved.*

In line with the Explanatory note of the noise policy statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy."

"What are the observed effect levels?

- *Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur.*

- *Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected.*
- *No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.*

Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs."

"How can it be established whether noise is likely to be a concern?

At the lowest extreme, when noise is not noticeable, there is by definition no effect. As the noise exposure increases, it will cross the no observed effect level as it becomes noticeable. However, the noise has no adverse effect so long as the exposure is such that it does not cause any change in behaviour or attitude. The noise can slightly affect the acoustic character of an area but not to the extent there is a perceived change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.

As the exposure increases further, it crosses the lowest observed adverse effect level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

Increasing noise exposure will at some point cause the significant observed adverse effect level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring.

This table summarises the noise exposure hierarchy, based on the likely average response."

Response	Examples of outcomes	Increasing effect level	Action
Not present	No Effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required

Response	Examples of outcomes	Increasing effect level	Action
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

"How can the risk of conflict between new development and existing businesses or facilities be addressed?

Development proposed in the vicinity of existing businesses, community facilities or other activities may need to put suitable mitigation measures in place to avoid those activities having a significant adverse effect on residents or users of the proposed scheme.

In these circumstances the applicant (or 'agent of change') will need to clearly identify the effects of existing businesses that may cause a nuisance (including noise, but also dust, odours, vibration and other sources of pollution) and the likelihood that they could have a significant adverse effect on new residents/users. In doing so, the agent of change will need to take into account not only the current activities that may cause a nuisance, but also those activities that businesses or other facilities are permitted to carry out, even if they are not occurring at the time of the application being made.

The agent of change will also need to define clearly the mitigation being proposed to address any potential significant adverse effects that are identified. Adopting this approach may not prevent all complaints from the new residents/users about noise or other effects, but can help to achieve a satisfactory living or working environment, and help to mitigate the risk of a statutory nuisance being found if the new development is used as designed (for example, keeping windows closed and using alternative ventilation systems when the noise or other effects are occurring).

It can be helpful for developers to provide information to prospective purchasers or occupants about mitigation measures that have been put in place, to raise awareness and reduce the risk of post-purchase/occupancy complaints."

2.3. British Standards & Guidance

2.3.1. Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2018)

Section 2.3.1 of this report refers to the *'Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2018)'*, which is an amendment of the original DEFRA document published in 2005. This state's minimum requirements for Noise Control:

"Minimum Requirements for Noise Control

For new premises or premises covered by planning conditions restricting the impact of noise the system shall be designed to prevent an acoustic impact on the external environment and therefore harm to the amenity….

The control system should meet the requirements laid down in BS4142: 2014 "Method for Rating and assessing industrial and commercial sound" or local standards where they exist (whichever is more appropriate).

Where in-line attenuators are used they shall be constructed so that there is no grease impregnation into the acoustic media. A protective membrane shall be specified for this purpose or this will reduce the design performance of the attenuator. This should be taken into account when selection is made.

It may be necessary to apply additional acoustic controls such as in line silencer or splitter attenuator after grease removal stages. Care should be taken to ensure that all such elements are capable of being accessed for cleansing purposes.".

"Recommendation for maintenance of odour control systems:

For a system employing ESP and other in line abatement systems:

- Clean every 1-3 months

2.3.2. British Standard BS 4142:2014+A1:2019 – Guidance on Assessing Industrial and Commercial Noise

British Standard BS 4142:2014+A1:2019 *"Methods for Rating and Assessing Industrial and Commercial Sound"* is used to assess the potential for adverse impact due to the agricultural noise sources at the relevant noise-sensitive property. The existing noise source levels are measured/calculated and compared to the existing background noise level (L_{A90}).

Depending on the noise source characteristics (tonal, intermittent, or impulsive), the noise source is given a rating noise level (penalty additions) and compared to the 'lowest' background noise level (during operating hours). The significance of the existing noise sources can then be given a likelihood of adverse impact, which follows British Standard BS 4142:2014+A1:2019 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 occurs.

- *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."*

2.3.3. British Standard BS 8233:2014 – Guidance on Internal Noise Criteria

Residential Internal Design Criteria

British Standard BS 8233:2014 *'Guidance on Sound Insulation and Noise Reduction for Buildings'* contains guidance for internal design criteria, as shown in the following table.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq, 16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq, 16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16hour}$	30 dB $L_{Aeq, 8hour}$

3 Existing Noise Climate

3.1. Survey Details

3.1.1. Personnel present

Alex Hancock (MIOA) – Climate Acoustics

3.1.2. Instrumentation and Calibration

Svantek 977 – Sound Level Meter (**calibration certificates available upon request.).*

Larson Davis CAL200 – Calibrator *(*calibration certificate available upon request.)*.

Climate Acoustics Calibrated Equipment	
Attended Noise Meter (Svantek 977)	
Class 1 Sound Level Meter	Svantek 977 – Serial Number 34186 (Date of Calibration: 05/07/2021*)
Microphone	MTG MK250 – Serial Number 10876 (Date of Calibration: 05/07/2021*)
Preamplifier	Svantek SV12L – Serial Number 33684 (Date of Calibration: 05/07/2021*)
Calibrator (Larson Davis CAL200)	
Calibrator	Larson Davis – CAL200 - Serial Number 6003 (Date of Calibration: 20/10/2021*)

3.1.3. Equipment operation, including the time and date

- 8 pm to 11 pm on Thursday 16 December 2021
- 8 pm to 11 pm on Saturday 18 December 2021

3.1.4. Weather conditions

The weather conditions during noise monitoring at the proposed site are as follows.

Date	Temperature (°C)	Weather Conditions	Wind
Thursday 16 December 2021	5°C - 7°C	Cold, dry with thick cloud with approx. 75%-100% cloud cover	Light winds (<5m/s)
Sunday 18 December 2021	6°C	Cold, dry with thick cloud with approx. 75%-100% cloud cover	Light winds (<5m/s)

3.2. Location of Noise Monitoring Equipment

Figures 2 shows the location of the attended sound level meter (position A1) to the ground floor level towards the rear of the premises (highlighted in **green**).

Full drawings of the kitchen extraction unit and A/C unit are detailed in Appendix B of this report.

Figure 2 – Noise Measurement Location (Source: Google Earth™)

3.3. Methodology

Attended Noise Monitoring:

Figure 2 shows the attended sound level meter location (position A1).

The sound level meter microphone at position A1 was set up on a tripod at a height of 1.5-metres at an equivalent location nearest the residential noise-sensitive premises. Position A1 is located 1.2 metres from the adjacent façade; this is 'near-field' but is deemed representative of the background noise level experienced at the nearest resident's windows.

Calibration Procedure:

The calibration procedure before and after the noise survey, the Svantek 977 sound level meter was calibrated using the Larson Davis CAL200 respectively, and no significant drift was measured (accuracy within ±0.3 dB).

3.4. Uncertainty

For accurate measurements, the noise monitoring equipment is calibrated by traceable lab calibration:

- a Class 1 sound level meter and microphone are calibrated once every two years
- a Class 1 calibrator is calibrated once every year

Note: any measurement taken was by a Class 1 sound level meter; a margin of uncertainty of +/- 1.1 decibels typically apply because of the equipment's tolerances.

The uncertainty with the noise prediction calculations is limited, as using our experience and factors including distance, direct line of sight and reflections have been considered. The manufacturer's octave band noise datasheets are assumed to be reliable and correct. In this instance, they have been included in the predicted noise level calculations.

3.5. Noise Climate

The sites dominant noise sources include existing commercial noise from a kitchen extraction unit serving Rozy Bar, and an air conditioning unit serving Gourmet Burger Kitchen. In addition, road traffic noise was audible from Mill Lane and the B510. *Note: the proposed restaurant/ takeaway at 329 West End Lane, London NW6 1RS has no existing plant in operation.*

Operating Hours of Proposed Restaurant/ Takeaway (329 West End Lane, London NW6 1RS) is as follows:

- **10 am to 1 am on Monday to Saturday*, and**
- **10 am to 11 pm, Sunday***

**** Note: plant will operate from 10 am until 11 pm, Monday to Sunday during the proposed operating hours.***

3.6. Noise Measurement Results

Attended Noise Monitoring Results (Location A1):

There was no secure location to leave the noise monitoring equipment unattended. Therefore, fully attended noise monitoring was conducted. The attended measured noise levels are summarised in the tables below for the evening noise levels.

Daytime/ Evening Noise Monitoring Results – Thursday 16th December 2021 and Saturday 18th December 2021 (Location A1):

Date	Position	Start Time (HH:MM)	Duration	$L_{Aeq,T}$	$L_{AF,max}$	$L_{A90,T}$
16/12/2021	A1	20:00	1 Hour	57	74	55
		21:00	1 Hour	56	69	55
		22:00	1 Hour	56	74	55
		23:00	15 mins	56	72	55
18/12/2021		20:00	1 Hour	57	75	55
		21:00	1 Hour	52	78	46
		22:00	1 Hour	54	76	**44**
		23:00	15 mins	54	66	50

Appendix A1 & A2 shows the weekend noise survey data presented in a tabulated format with comments on measurements.

The minimum background noise level measured during the day/ evening equals 44 dB $L_{A90,1\text{-}hour}$ at the nearest noise sensitive premises, measured during the quietest time of operation, i.e. between 22:00 to 23:00 in the evening on Saturday 18th December 2021.

4 Noise Impact Assessment

4.1. Noise Impact Assessment of Proposed Noise Sources to Nearest Residents

4.1.1. Noise Emission Criteria/ Limit as per London Borough of Camden Council's Noise Policy (Policy DP28, Table E of the Camden's *'Local Development Framework' External Background Noise Level'*)

The noise levels applicable to the noise-sensitive residential premises nearby has the following equivalent minimum background noise level measured (Location A1) during the day/ evening equals 44 dB $L_{A90,1\text{-hour}}$ at the nearest noise sensitive premises, measured during the quietest time of operation, i.e. between 22:00 to 23:00 in the evening on Saturday 18th December 2021.

Plant Noise Criteria/ Threshold

Camden Council's has put in place a planning policy for noise so that plant does not exceed the existing background noise level by at least 5 dB(A) less than the current background measurement. Or 10dB(A) less than the background if the noise has a distinguishable discrete-continuous note (whine, hiss, screech, hum) or if there are distinct impulses (bangs, clicks, clatters, thumps).

The noise level from the kitchen extraction and air conditioning plant is expected to have a distinguishable discrete-continuous note ***'hum'***. Therefore, the noise level from the kitchen extraction units will be required to meet a noise level at least 10 dB(A) below the typical background.

The quietest 'minimum' background noise level at daytime/ evening equals 44 dB $L_{A90,1\text{-hour}}$ at the nearest noise sensitive premises, the proposed kitchen extract unit fan unit and A/C unit will need to achieve a noise criteria level equal to or below **34 dB $L_{Aeq,1\text{-hour(Day)}}$**.

4.1.2. Proposed Kitchen Extraction Equipment

There is x1 No. proposed kitchen extractor fan unit to the rear elevation terminating at the eaves of the building, x1 No. proposed supply fan unit and x1 No. proposed air conditioning unit both located to the rear elevation at ground floor level. These items of plant will operate from 10 am until 11 pm, Monday to Sunday during the proposed operating hours provided below:

- **10 am to 1 am on Monday to Saturday*, and**
- **10 am to 11 pm, Sunday***

**** Note: plant will operate from 10 am until 11 pm, Monday to Sunday during the proposed operating hours.***

The client and the kitchen extract and supply system installer confirmed that:

New Rear Elevation Plant

- **Kitchen Extraction Fan Unit (x1 No.)** – x1 No. *'Flaktwoods, Kitchen Extractor Axial Flow Fan Model No. 50JM/20/4/6/32'* to be housed outside the commercial premises at first floor level to the rear elevation to the back of the premises (shown in Appendix B).
- **Air Conditioning/ A/C Unit (x1 No.)** – x1 No. *'Panasonic, Air Conditioning Unit Model No. U-71PZ2E5'* (Appendix D3) is housed outside the proposed commercial premises at basement floor level to the rear of the building, as shown in Appendix B2 and the photo below:

New Internal Plant (South Façade) - no noise output externally

- **Kitchen Supply Fan Unit (x1 No.)** – x1 No. *'Soler Palau (S&P), Kitchen Supply Plate Fan Model No. HCBB/4-400H'* to be housed inside the commercial premises venting system side at ground floor level to the rear elevation (shown in Appendix B).

Note: there is expected to be no noise output externally via the supply wall plate, as the supply unit is housed inside the proposed commercial premises (Appendix B2). Therefore, noise will only be produced internally.

The two tables below shows the spectral sound power level noise data for the above plant. Appendix D shows the manufacturers' specification and technical datasheets details, including octave band spectral data.

Octave Band Sound Power Levels from New Kitchen Extraction and Supply Fan Units

Plant Make	Model No.	Noise Source	Sound Power Level, L_w Frequency, Hz								L_{wA} dB
			L_{ZFeq} 63	L_{ZFeq} 125	L_{ZFeq} 250	L_{ZFeq} 500	L_{ZFeq} 1000	L_{ZFeq} 2000	L_{ZFeq} 4000	L_{ZFeq} 8000	
Flaktwoods	JM Aerofoil 50JM/20/4/6/32	Exhaust/ Outlet Extract Fan	80	82	78	76	74	70	68	62	**79**
		Case Breakout	70	64	56	53	49	42	46	38	**56**
Soler Palau (S&P)	Plate Fan HCBB/4-400H	Inlet/ Supply Fan	***No noise output externally via the supply wall plate.***								

Note 1: New proposed extraction fan provided is detailed in Appendix D1 technical datasheet.

Note 2: New proposed supply fan provided is detailed in Appendix D2 technical datasheet.

Octave Band Sound Pressure Levels from Air Conditioning Unit

Plant Make	Model No.	Noise Source	Sound Pressure Level Frequency, Hz								L_p dB
			L_{ZFeq} 63	L_{ZFeq} 125	L_{ZFeq} 250	L_{ZFeq} 500	L_{ZFeq} 1k	L_{ZFeq} 2k	L_{ZFeq} 4k	L_{ZFeq} 8k	
Panasonic	U-71PZ2E5	Cooling Mode (High)	53*	51*	50*	46*	45*	39*	33*	26*	**49**
		Heating Mode (High)	53*	51*	50*	46*	45*	39*	33*	26*	**49**

**** Indicative octave band noise levels based on overall sound pressure level (49dB L_p) provided in datasheet in Appendix D3.***

Figure 4 and Figure 5 also show the nearest noise-sensitive residential receptor windows R1-R3 and the proposed plant noise source (highlighted in **green, rear elevation plant shown in Appendix B1**) serving the commercial premises at 329 West End Lane, London NW6 1RS.

Full drawings are detailed in Appendix B, and distance between the proposed plant noise sources and the nearest receptors are detailed in Section 4.1.3 of this report (Noise Impact Assessment Parameters).

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Figure 4 – Google Earth Maps View - Location of the Noise Sources & Receptors R1-R3 (shown in Green)

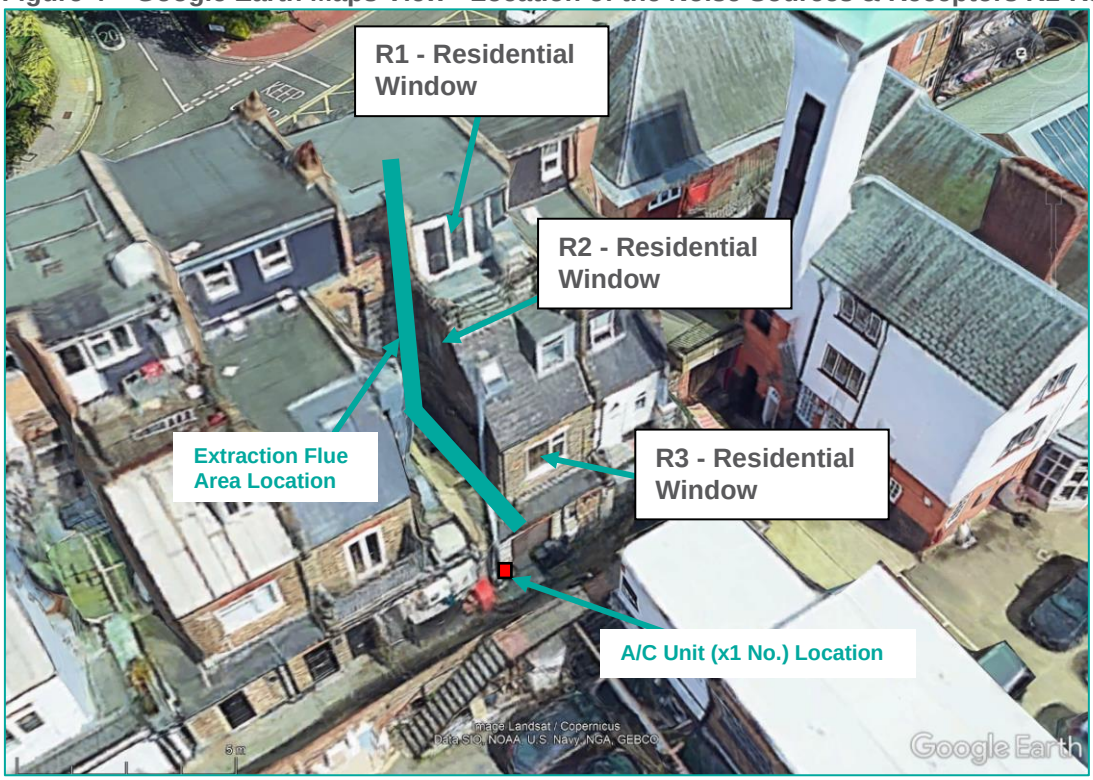
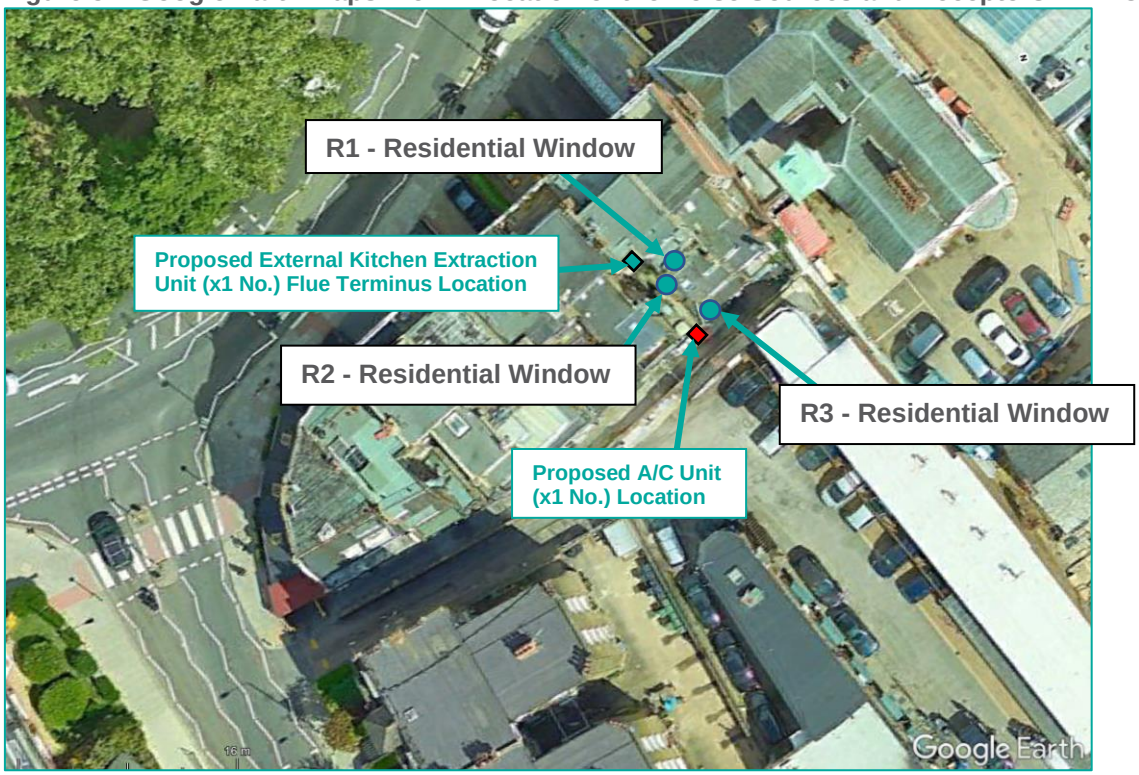


Figure 5 – Google Earth Maps View - Location of the Noise Sources and Receptors R1- R3



4.1.3. Noise Impact Assessment Parameters

Calculations predicted to the nearest noise-sensitive residential receptors consider the following:

- **Distance –** Figure 4 and Figure 5 above shows the location of the proposed plant and the nearest noise-sensitive residential windows at Receptors R1 to R3. The distances between the plant and the receptors, along with the line of sight shown in brackets are as follows:
  - **Kitchen Extraction Unit's Flue Terminus (Discharge Cowl) to Nearest Residential Receptors:** 2 metres distance to Receptor R1 (direct line of sight), 3 metres distance to Receptor R2 (direct line of sight) and 9 metres distance to Receptor R3 (no-direct line of sight).
  - **Kitchen Extraction Unit's Fan Casing to Nearest Residential Receptors:** 4 metres distance to Receptor R1 (partial line of sight), 2 metres distance to Receptor R2 (direct line of sight) and 7 metres distance to Receptor R3 (no-direct line of sight).
  - **Air Conditioning (A/C Unit) to Nearest Residential Receptors:** 10 metres distance to Receptor R1 (no direct line of sight), 7 metres distance to Receptor R2 (no-direct line of sight) and 3 metres distance to Receptor R3 (partial line of sight).
- **Line of Sight to Receptors Correction:**
  - **Receptor R1** – Figures 4 & 5 shows that no direct line of sight exists between the A/C Unit plant location to noise-sensitive receptor window R1, so a -10 dB correction was applied to fan noise impact calculations. Whilst a direct line of sight exists between the Kitchen Extraction Unit's Flue Terminus location to receptor R1, so no correction (0 dB) was applied. Whilst a partial line of sight exists between the Fan Casing location to receptor R1.
  - **Receptor R2** – Figures 4 & 5 shows that no direct line of sight exists between the A/C Unit plant location to noise-sensitive receptor window R2, so a -10 dB correction was applied to fan noise impact calculations. Whilst a direct line of sight exists between the Kitchen Extraction Unit's Flue Terminus and the Fan Casing to receptor R2, so no correction (0 dB) was applied.
  - **Receptor R3** – Figures 4 & 5 shows that a partial line of sight exists between the proposed A/C unit plant location to noise-sensitive receptor window R3, so a -5 dB correction was applied. Whilst a direct line of sight exists between the Kitchen Extraction Unit's Flue Terminus and the Fan Casing to receptor R3, so no correction (0 dB) was applied.
- **Reflections** – No addition has been applied for reflection to the air conditioning plant from two adjacent surfaces.
- **Directivity** – a 120-degree angle directivity for all Receptors R1, R2 & R3 has been included for the 500mm diameter flue discharge cowl terminus.
- **Calculation Format** – Calculated using technical datasheets noise data from Appendices D1, D2, D3, D4, D5 & D6, as per the summarised noise source Tables in Section 4.1.2, noise control measures detailed in Section 4.2, and the predicted noise impact detailed in Section 4.3 and Appendix C of this report.
- **British Standard BS 4142: 2014+A1:2019 and British Standard BS 8233: 2014** – British Standards BS 4142:2014+A1:2019 & British Standard BS 8233:2014 considered in calculations given in Section 4.2, 4.3 and Appendix C of this report.

4.2. Noise & Vibration Control Measures to Kitchen Noise Sources

The predicted noise impact calculations provided in Appendix C shows that noise control measures are necessary. The noise and vibration control measures to the x1 No. kitchen extraction unit and x1 No. A/C unit, as detailed in Section 4.2 of this report below.

4.2.1. Noise Control to Kitchen Extraction Fan

To achieve a cumulative noise criteria level equal to or below **34 dB $L_{Aeq,1\text{-}hour}$** (10 dB or greater below minimum external background noise level), mitigation is required to control noise emission levels from the proposed x1 No. kitchen extraction unit:

Appendix B1 shows one (x1 No.) rectangular silencer is needed to the atmosphere side of the kitchen extraction fan unit ductwork. The following calculations carried out in Appendix C of this report, the sound attenuation provided by the atmosphere side silencers are detailed in the table shown in Section 4.2.1 below.

- **Kitchen Extraction Fan Silencer (x1 No. Rectangular Silencer) – 'Fitted to Atmosphere Side of Fan':**
  Example of silencer products – 'Acoustica, Model No. R02 - 2 - 1500' Rectangular Silencer (1500mm length)'.

	L_{ZFeq} Frequency Spectral Data (dB) at 1m							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Silencer Minimum Attenuation from Kitchen Extraction Fan Silencer Acoustica, R02-2-1500 Rectangular Silencer	13	24	25	50	50	50	50	50

***Note*: Rectangular silencer attenuation provided is detailed in Appendix D4 technical datasheet**.

4.2.2. Noise Control to Fan Casing

As there is expected to be noise breakout from the fan casing and ductwork, the minimum sound attenuation required to the fan casing including an acoustic jacket and acoustic duct lagging are detailed below:

- **Acoustic Jacket. Example of product – CMS Acoustic Solutions, Acoustic Fan Jacket Type AFJ-1080.**
  We recommended the extract fan casing be wrapped with an acoustic fan jacket to enhance the acoustic performance.

  ***Note*: Example acoustic jacket provided is shown in Appendix D5 technical datasheet.**

- **Acoustic Duct Lagging. Example of product – CMS Danskin, Superlag Superflex Prime 10/25.**
  After the acoustic fan jacket is wrapped around the fan casing, it is recommended that the jacket be wrapped with an acoustic lagging to reduce the casing radiation and to weatherproof it. ***Important Note*: as there are one silencer to the atmosphere side of the extract fan ductwork, the acoustic duct lagging will only need to extend to cover all radiating surface areas up to the silencers.**

  ***Note*: Example acoustic duct lagging provided is shown in Appendix D6 technical datasheet.**

	L_{ZFeq} Frequency Spectral Data (dB) at 1m							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Minimum Expected Attenuation from Acoustic Jacket	7	17	24	28	33	39	44	50
Minimum Expected Attenuation from Acoustic Duct Lagging	16	18	21	25	34	41	49	47

***Note*: Acoustic Jacket and Acoustic Duct Lagging attenuation provided shown in Appendix D5 & D6 technical datasheets.**

4.2.3. Noise Control to Air Conditioning Unit

As there is expected to be excessive noise from the air conditioning unit at high setting (cooling/ heating), the minimum sound attenuation required to the full acoustic enclosure are detailed below:

- **Air Conditioning Unit Acoustic Enclosure (x1 No. Acoustic Enclosure):**

  Example of acoustic enclosure product – 'EEC (Environmental Equipment Corporation Ltd), LA1 Acoustic Enclosure'

	L_{ZFeq} Frequency Spectral Data (dB) at 1m							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Minimum Attenuation from Acoustic Enclosure	6	7	10	13	17	19	13	11

***Note*: Acoustic Enclosure attenuation provided is detailed in Appendix D7 technical datasheet**.

4.2.4. Vibration Control to Wall Mounted Ductwork.

We recommend anti-vibration mounts are fitted to the newly proposed extraction plant ductwork. The new system suppliers can advise a practical anti-vibration mount required to have no vibration impact through the external wall element structure.

- **Enclosed Spring Anti-Vibration Mounts. Example of anti-vibration mount product – *'Christie & Grey, Enclosed Spring Mounts (Model No. ES20 or ES25)'*.** We recommended contacting your supplier to confirm the best mounts for this type of equipment and applying them to the wall elements.

  ***Note*: Example anti-vibration mounts provided are shown in Appendix D8 technical datasheet.**

4.3. Predicted Daytime/ Evening Noise Impact to Nearest Noise Sensitive Residential Windows with Noise & Vibration Control Measures

British Standard BS 4142 – Plant Noise Levels

To control noise levels, Section 4.2.1 of this report shows that the new kitchen extraction system ductwork should be fitted with one rectangular silencer, along with an acoustic jacket and acoustic duct lagging (Section 4.2.2). Section 4.2.3 of this report shows that the new air conditioning unit housed to the rear of the premises should have an acoustic enclosure fitted to control noise. Finally, anti-vibration mounts should be applied to the kitchen extraction system ductwork, as shown in Section 4.2.4 of this report.

With the noise & vibration control measures applied (as outlined in Section 4.2), the calculation tables in Appendix C shows the new proposed plant is predicted to achieve the required noise emission criteria/ limit **34 dB $L_{Aeq,1\text{-}hour}$** (Section 4.1.1) at 1-metre from the nearest noise sensitive residential windows Receptor R1-R3. This is 10 dB below the minimum daytime/ evening background noise level (44 dB $L_{A90,1\text{-}hour}$).

Therefore, predicted noise levels achieved the following at 1 metre from the nearest residential receptors windows:

- **Receptor R1: 34 dB $L_{Aeq,1\text{-}hour}$** at 1 metre from Receptor R1 window
- **Receptor R2: 28 dB $L_{Aeq,1\text{-}hour}$** at 1 metre from Receptor R2 window
- **Receptor R3: 25 dB $L_{Aeq,1\text{-}hour}$** at 1 metre from Receptor R3 window

These predicted noise levels achieve London Borough of Camden Council's noise criteria (i.e. 10 dB or greater below the minimum external background noise level), detailed in Section 2.1 of this report. As per British Standard BS 4142:2014+A1:2019 (Section 2.3 of this report), guidance, this gives ***"an indication of the specific sound source having a low impact"*** at the nearest noise-sensitive residential receptor window.

This meets London Borough of Camden Council's noise criteria for daytime/ evening (34 dB $L_{Aeq,1\text{-}hour}$), full details of the noise criteria are provided in Section 2.1 and 4.1.1 of this report.

British Standard BS 8233 – Predicted Internal Noise Levels

The nearest residents' windows with a partially open window for ventilation offers 10 decibels (dB) attenuation. The calculation tables in Appendix C shows the predicted internal noise levels with the x1 No. extraction fan unit and x1 No. A/C unit operating is expected to be:

- **Receptor R1: 24 dB $L_{Aeq,16\text{-}hour}$** inside Receptor R1 during the daytime/ evening.
- **Receptor R2: 18 dB $L_{Aeq,16\text{-}hour}$** inside Receptor R2 during the daytime/ evening.
- **Receptor R3: 15 dB $L_{Aeq,16\text{-}hour}$** inside Receptor R3 during the daytime/ evening.

These predicted levels with noise and vibration control measures implemented (detailed in Section 4.2 of this report) will comfortably meet the acceptable internal noise levels in bedrooms for resting during the daytime/ evening (35 dB $L_{Aeq,16\text{-}hour}$), as per British Standard BS 8233: 2014 (Section 2.3.3 of this report), and complaints are therefore unlikely.

Vibration Control to Wall Mounted Fan Casing and External Ductwork for Kitchen Extract Unit

Anti-vibration mounts should be fitted to the proposed plant. The system suppliers can advise with an effective anti-vibration mount required so that there is no vibration impact through the structure of the wall elements. An example of anti-vibration mounts is provided in Section 4.2.4 of this report and Appendix D8 technical datasheet.

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Prevent Odour from Kitchen Extraction Unit

Appendix B1 & B2 shows the location of the odour control equipment, including one (x1 No.) odour control unit (OC Unit) system and two (x2 No.) Electrostatic Precipitator (ESP) systems to the kitchen extraction unit ductwork. Note: Appendix D9 shows the ESP system specification, and Appendix D10 details the OC unit specification.

In summary, the ESP systems will be used to separate the solid and liquid particles from the ventilation air whilst eliminating excessive quantities of smoke, therefore, providing a high percentage of clear air to the duct opening and an excellent odour control measure.

The 'Control of Odour and Noise from Commercial Kitchen Exhaust System (Section 2.3.1 of this report) recommends regular maintenance and cleaning of ESP systems:

"Recommendation for maintenance of odour control systems:

For a system employing ESP and other in line abatement systems:

- *Clean every 1-3 months"*

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Appendix A – Noise Measurement Tables

Appendix A1 - Thursday 16 December 2021 - Location A1 - Table of Evening Attended Noise Survey Data

Date	Position	Start Time (HH:MM)	Duration	$L_{Aeq,T}$	$L_{AF,max}$	$L_{A90,T}$	Comments
16/12/2021	A1	20:00	1 Hour	57	74	55	Road traffic noise from nearby road networks **Commercial Noise:** Extraction unit serving Rozy Bar (Dominant, L_{A90}) AC unit serving Gourmet Burget Kitchen Refrigeration unit serving Gourmet Burger Kitchen Rear door opening and closing (Rozy Bar & Gourmet Burger Kitchen) ($L_{AF,max}$)
		21:00	1 Hour	56	69	55	Road traffic noise from nearby road networks **Commercial Noise:** Extraction unit serving Rozy Bar (Dominant, L_{A90}) AC unit serving Gourmet Burget Kitchen Refrigeration unit serving Gourmet Burger Kitchen Rear door opening and closing (Rozy Bar & Gourmet Burger Kitchen) ($L_{AF,max}$)
		22:00	1 Hour	56	74	55	Road traffic noise from nearby road networks **Commercial Noise:** Extraction unit serving Rozy Bar (Dominant, L_{A90}) AC unit serving Gourmet Burget Kitchen Refrigeration unit serving Gourmet Burger Kitchen Rear door opening and closing (Rozy Bar & Gourmet Burger Kitchen) ($L_{AF,max}$)
		23:00	15 mins	56	72	55	Road traffic noise from nearby road networks ($L_{AF,max}$) **Commercial Noise:** Extraction unit serving Rozy Bar (Dominant, L_{A90}) AC unit serving Gourmet Burget Kitchen Refrigeration unit serving Gourmet Burger Kitchen

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Appendix A2 – Saturday 18 December 2021 - Location A1 - Table of Evening Attended Noise Survey Data

Date	Position	Start Time (HH:MM)	Duration	$L_{Aeq,T}$	$L_{AF,max}$	$L_{A90,T}$	Comments
18/12/2021	A1	20:00	1 Hour	57	75	55	Road traffic noise from nearby road networks **Commercial Noise:** Extraction unit serving Rozy Bar (Dominant, L_{A90}) AC unit serving Gourmet Burget Kitchen Refrigeration unit serving Gourmet Burger Kitchen Rear door opening and closing (Rozy Bar & Gourmet Burger Kitchen) ($L_{AF,max}$)
		21:00	1 Hour	52	78	46	Road traffic noise from nearby road networks (L_{A90}) **Commercial Noise:** Extraction unit serving Rozy Bar (Dominant) AC unit serving Gourmet Burget Kitchen Refrigeration unit serving Gourmet Burger Kitchen Rear door opening and closing (Rozy Bar & Gourmet Burger Kitchen) ($L_{AF,max}$)
		22:00	1 Hour	54	76	44	Road traffic noise from nearby road networks (L_{A90}) **Commercial Noise:** Extraction unit serving Rozy Bar (Dominant) AC unit serving Gourmet Burget Kitchen Refrigeration unit serving Gourmet Burger Kitchen Rear door opening and closing (Rozy Bar & Gourmet Burger Kitchen) ($L_{AF,max}$)
		23:00	15 mins	54	66	50	Road traffic noise from nearby road networks ($L_{AF,max}$) **Commercial Noise:** Extraction unit serving Rozy Bar (Dominant, L_{A90}) AC unit serving Gourmet Burget Kitchen Refrigeration unit serving Gourmet Burger Kitchen

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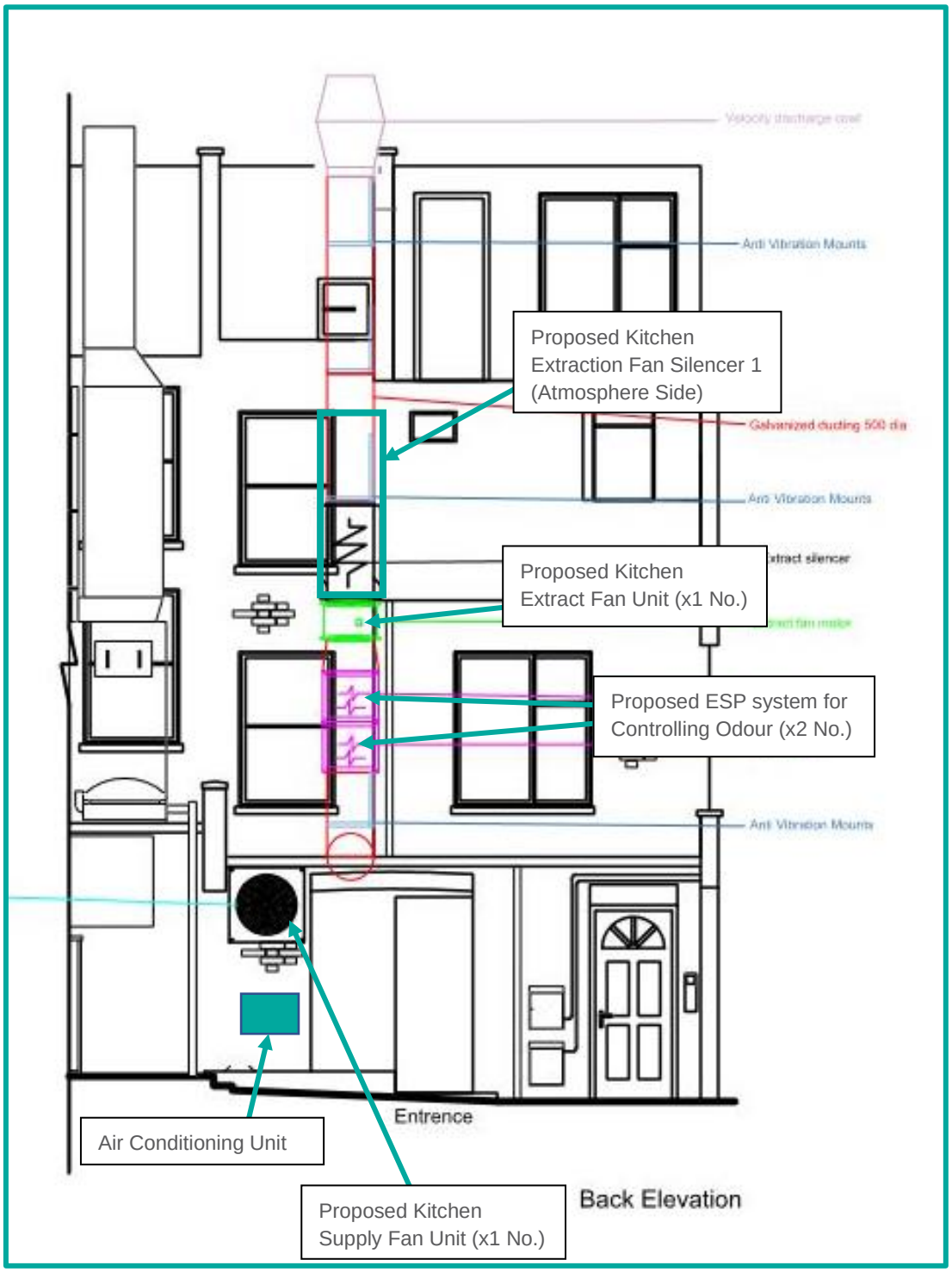
Appendix B – Drawings

Appendix B1 – Proposed Rear Elevation Drawing



Appendix B2 – Proposed Basement & Ground Floor Layout Drawings

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Appendix C – Calculations

Appendix C1 – Predicted Daytime/ Evening Noise Level Calculations from Proposed Kitchen Extractor Unit & A/C Unit to Noise Sensitive Residential Window R1 (Rear Elevation)

Source: Kitchen Extractor Unit Exhaust/ Outlet - Flaktwoods, Model No. JM Aerofoil 50JM/20/4/6/32

Predicted Noise Level at 1 metre from Bedroom Window 'R1'	Frequency Spectral Data (Hz)								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Kitchen 'Extract Fan' 'Exhaust/ Outlet' - Sound Power Level (L_w)	80	82	78	76	74	70	68	62	79
Conversion to Sound Pressure Level	-11	-11	-11	-11	-11	-11	-11	-11	
Kitchen 'Extract Fan' 'Outlet/ Extract' Unit - Sound Pressure Level (L_p)	69	71	67	65	63	59	57	51	68
Directivity (120 degrees, opening 500mm (D))	0	-2	-6	-10	-15	-20	-22	-22	
Distance attenuation to 1 metre from bedroom window R1 (2m - 1m = 1m)	0	0	0	0	0	0	0	0	
Direct Line of Sight (0 dB)	0	0	0	0	0	0	0	0	
Acoustica R02 - 2 - 1500 - Rectangular Attenuator (2 silencers, with face velocity of 2.5m/s) - Length: 1500mm	13	24	25	50	50	50	50	50	
Kitchen 'Extract Fan' 'Outlet/ Extract' Unit' - Noise level at 1m from Bedroom Window R1 ($L_{Aeq,T}$)	56	45	36	5	-2	-11	-15	-21	34

Source: Kitchen Extract Unit Case Breakout - Flaktwoods, Model No. JM Aerofoil 50JM/20/4/6/32

Predicted Noise Level at 1 metre from Bedroom Window 'R1'	Frequency Spectral Data (Hz)								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Kitchen 'Extract Fan' 'Case Breakout' - Sound Power Level (L_w)	70	64	56	53	49	42	46	38	56
Conversion to Sound Pressure Level	-11	-11	-11	-11	-11	-11	-11	-11	
Kitchen 'Extract Fan' 'Case Breakout' - Sound Pressure Level (L_p)	59	53	45	42	38	31	35	27	45
Distance attenuation to 1 metre from Bedroom window R1 (4m - 1m) = 3m	-10	-10	-10	-10	-10	-10	-10	-10	
Partial Line of Sight (-5 dB)	-5	-5	-5	-5	-5	-5	-5	-5	
CMS Acoustic Solutions AFJ-1080 - Cylindrical Axial Fan Jacket - Insulation Thickness: 50mm, Sound Barrier: 10 kg/m2	7	17	24	28	33	39	44	50	
CMS Danskin SuperLag Superflex Prime 10/25 - Acoustic Duct Lagging - Insulation Thickness: 25mm, Sound Barrier: 10 kg/m2	16	18	21	25	34	41	49	47	
Kitchen 'Extract Fan' 'Case Breakout' Noise level at 1m from Bedroom Window R1 ($L_{Aeq,T}$)	21	3	-15	-26	-44	-64	-73	-85	-3

Source: Air Conditioning Unit - Panasonic, Model No. U-71PZ2E5

Predicted Noise Level at 1 metre from Bedroom Window 'R1'	Frequency Spectral Data (Hz)								
	63	125	250	500	1k	2k	4k	8k	dB(A)
AC Unit 1 - Sound Pressure Level (L_p) - Cooling/ Heating Mode	53	51	50	46	45	39	33	26	49
Distance attenuation to 1 metre from bedroom window R1 (10m - 1m = 9m)	-19	-19	-19	-19	-19	-19	-19	-19	
No Direct Line of Sight (-10 dB)	-10	-10	-10	-10	-10	-10	-10	-10	
Reflection (Q = 1)	0	0	0	0	0	0	0	0	
EEC LA1 - Single Bank Louvre - Size: 150mm	6	7	10	13	17	19	13	11	
AC' Unit 1 - Noise level at 1m from Bedroom Window R1 ($L_{Aeq,T}$)	18	15	11	4	-1	-9	-9	-14	7

Predicted Noise Level at 1 metre from Bedroom Window 'R1'	Frequency Spectral Data (Hz)								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Kitchen 'Extract Fan' 'Outlet/ Extract' Unit' - Noise level at 1m from Bedroom Window R1 (LAeq,T)	56	45	36	5	-2	-11	-15	-21	34
Kitchen 'Extract Fan' 'Case Breakout' Noise level at 1m from Bedroom Window R1 (LAeq,T)	21	3	-15	-26	-44	-64	-73	-85	-3
AC' Unit 1 - Noise level at 1m from Bedroom Window R1 (LAeq,T)	18	15	11	4	-1	-9	-9	-14	7
Cumulative Noise Level at 1m from Noise Sensitive Bedroom Window R1 ($L_{Aeq,T}$)	56	45	36	8	1	-7	-8	-13	34
									34
External Noise Criteria ($L_{Aeq,1\text{-hour}}$)*									PASS

London Borough of Camden Council's Noise Criteria* 34 dB(A)

** should not exceed 10 dB below the measured background noise level $L_{A90,1\text{-hour}}$ = 44 dB(A)*

Predicted Noise Level Inside Bedroom R1	dB(A)
Noise level at 1m from Bedroom Window R1 ($L_{Aeq,T}$)	34
Sound Reduction provided by partially open window	-10
Noise level Inside Bedroom R1 ($L_{Aeq,T}$)	24

BS 8233: 2014 Internal Criteria (Bedroom, Daytime, $L_{Aeq,16\text{-hour}}$)	35 dB(A)
Internal Noise Criteria ($L_{Aeq,16\text{-hr}}$)*	PASS

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Appendix C2 – Predicted Daytime/ Evening Noise Level Calculations from Proposed Kitchen Extractor Unit & A/C Unit to Noise Sensitive Residential Window R2 (Rear Elevation)

Source: Kitchen Extractor Unit Exhaust/ Outlet - Flaktwoods, Model No. JM Aerofoil 50JM/20/4/6/32

Predicted Noise Level at 1 metre from Bedroom Window 'R2'	Frequency Spectral Data (Hz)								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Kitchen 'Extract Fan' 'Exhaust/ Outlet' - Sound Power Level (L_w)	80	82	78	76	74	70	68	62	79
Conversion to Sound Pressure Level	-11	-11	-11	-11	-11	-11	-11	-11	
Kitchen 'Extract Fan' 'Outlet/ Extract' Unit - Sound Pressure Level (L_p)	69	71	67	65	63	59	57	51	68
Directivity (120 degrees, opening 500mm (D))	0	-2	-6	-10	-15	-20	-22	-22	
Distance attenuation to 1 metre from bedroom window R2 (3m - 1m = 2m)	-6	-6	-6	-6	-6	-6	-6	-6	
Direct Line of Sight (0 dB)	0	0	0	0	0	0	0	0	
Acoustica R02 - 2 - 1500 - Rectangular Attenuator (2 silencers, with face velocity of 2.5m/s) - Length: 1500mm	13	24	25	50	50	50	50	50	
Kitchen 'Extract Fan' 'Outlet/ Extract' Unit' - Noise level at 1m from Bedroom Window R2 ($L_{Aeq,T}$)	50	39	30	-1	-8	-17	-21	-27	28

Source: Kitchen Extract Unit Case Breakout - Flaktwoods, Model No. JM Aerofoil 50JM/20/4/6/32

Predicted Noise Level at 1 metre from Bedroom Window 'R2'	Frequency Spectral Data (Hz)								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Kitchen 'Extract Fan' 'Case Breakout' - Sound Power Level (L_w)	70	64	56	53	49	42	46	38	56
Conversion to Sound Pressure Level	-11	-11	-11	-11	-11	-11	-11	-11	
Kitchen 'Extract Fan' 'Case Breakout' - Sound Pressure Level (L_p)	59	53	45	42	38	31	35	27	45
Distance attenuation to 1 metre from Bedroom window R2 (2m - 1m) = 1m	0	0	0	0	0	0	0	0	
Direct Line of Sight (0 dB)	0	0	0	0	0	0	0	0	
CMS Acoustic Solutions AFJ-1080 - Cylindrical Axial Fan Jacket - Insulation Thickness: 50mm, Sound Barrier: 10 kg/m2	7	17	24	28	33	39	44	50	
CMS Danskin SuperLag Superflex Prime 10/25 - Acoustic Duct Lagging - Insulation Thickness: 25mm, Sound Barrier: 10 kg/m2	16	18	21	25	34	41	49	47	
Kitchen 'Extract Fan' 'Case Breakout' Noise level at 1m from Bedroom Window R2 ($L_{Aeq,T}$)	36	18	0	-11	-29	-49	-58	-70	11

Source: Air Conditioning Unit - Panasonic, Model No. U-71PZ2E5

Predicted Noise Level at 1 metre from Bedroom Window 'R2'	Frequency Spectral Data (Hz)								
	63	125	250	500	1k	2k	4k	8k	dB(A)
AC Unit 1 - Sound Pressure Level (L_p) - Cooling/ Heating Mode	53	51	50	46	45	39	33	26	49
Distance attenuation to 1 metre from bedroom window R2 (7m - 1m = 6m)	-16	-16	-16	-16	-16	-16	-16	-16	
No Direct Line of Sight (-10 dB)	-10	-10	-10	-10	-10	-10	-10	-10	
Reflection (Q = 1)	0	0	0	0	0	0	0	0	
EEC LA1 - Single Bank Louvre - Size: 150mm	6	7	10	13	17	19	13	11	
AC' Unit 1 - Noise level at 1m from Bedroom Window R2 ($L_{Aeq,T}$)	21	18	14	7	2	-6	-6	-11	11

Predicted Noise Level at 1 metre from Bedroom Window 'R2'	Frequency Spectral Data (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Kitchen 'Extract Fan' 'Outlet/ Extract' Unit' - Noise level at 1m from Bedroom Window R2 (LAeq,T)	50	39	30	-1	-8	-17	-21	-27	28
Kitchen 'Extract Fan' 'Case Breakout' Noise level at 1m from Bedroom Window R2 (LAeq,T)	36	18	0	-11	-29	-49	-58	-70	11
AC' Unit 1 - Noise level at 1m from Bedroom Window R2 (LAeq,T)	21	18	14	7	2	-6	-6	-11	11
Cumulative Noise Level at 1m from Noise Sensitive Bedroom Window R2 ($L_{Aeq,T}$)	50	39	30	8	3	-5	-5	-10	28
									28
External Noise Criteria ($L_{Aeq,1\text{-}hour}$)*									PASS

London Borough of Camden Council's Noise Criteria* 34 dB(A)

** should not exceed 10 dB below the measured background noise level $L_{A90,1\text{-}hour}$ = 44 dB(A)*

Predicted Noise Level Inside Bedroom R2	dB(A)
Noise level at 1m from Bedroom Window R2 ($L_{Aeq,T}$)	28
Sound Reduction provided by partially open window	-10
Noise level Inside Bedroom R2 ($L_{Aeq,T}$)	18

BS 8233: 2014 Internal Criteria (Bedroom, Daytime, $L_{Aeq,16\text{-}hour}$)	35 dB(A)
Internal Noise Criteria ($L_{Aeq,16\text{-}hr}$)*	PASS

CLIMATE ACOUSTICS

Telephone: 01245 800105
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Website: www.climateacoustics.com

Appendix C3 – Predicted Daytime/ Evening Noise Level Calculations from Proposed Kitchen Extractor Unit & A/C Unit to Noise Sensitive Residential Window R3 (Rear Elevation)

Source: Kitchen Extractor Unit Exhaust/ Outlet - Flaktwoods, Model No. JM Aerofoil 50JM/20/4/6/32

Predicted Noise Level at 1 metre from Bedroom Window 'R3'	Frequency Spectral Data (Hz)								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Kitchen 'Extract Fan' 'Exhaust/ Outlet' - Sound Power Level (L_w)	80	82	78	76	74	70	68	62	79
Conversion to Sound Pressure Level	-11	-11	-11	-11	-11	-11	-11	-11	
Kitchen 'Extract Fan' 'Outlet/ Extract' Unit - Sound Pressure Level (L_p)	69	71	67	65	63	59	57	51	68
Directivity (120 degrees, opening 500mm (D))	0	-2	-6	-10	-15	-20	-22	-22	
Distance attenuation to 1 metre from bedroom window R3 (9m - 1m = 8m)	-18	-18	-18	-18	-18	-18	-18	-18	
No-Direct Line of Sight (-10 dB)	-10	-10	-10	-10	-10	-10	-10	-10	
Acoustica R02 - 2 - 1500 - Rectangular Attenuator (2 silencers, with face velocity of 2.5m/s) - Length: 1500mm	13	24	25	50	50	50	50	50	
Kitchen 'Extract Fan' 'Outlet/ Extract' Unit' - Noise level at 1m from Bedroom Window R3 ($L_{Aeq,T}$)	28	17	8	-23	-30	-39	-43	-49	6

Source: Kitchen Extract Unit Case Breakout - Flaktwoods, Model No. JM Aerofoil 50JM/20/4/6/32

Predicted Noise Level at 1 metre from Bedroom Window 'R3'	Frequency Spectral Data (Hz)								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Kitchen 'Extract Fan' 'Case Breakout' - Sound Power Level (L_w)	70	64	56	53	49	42	46	38	56
Conversion to Sound Pressure Level	-11	-11	-11	-11	-11	-11	-11	-11	
Kitchen 'Extract Fan' 'Case Breakout' - Sound Pressure Level (L_p)	59	53	45	42	38	31	35	27	45
Distance attenuation to 1 metre from Bedroom window R3 (7m - 1m) = 6m	-16	-16	-16	-16	-16	-16	-16	-16	
No-Direct Line of Sight (-10 dB)	-10	-10	-10	-10	-10	-10	-10	-10	
CMS Acoustic Solutions AFJ-1080 - Cylindrical Axial Fan Jacket - Insulation Thickness: 50mm, Sound Barrier: 10 kg/m2	7	17	24	28	33	39	44	50	
CMS Danskin SuperLag Superflex Prime 10/25 - Acoustic Duct Lagging - Insulation Thickness: 25mm, Sound Barrier: 10 kg/m2	16	18	21	25	34	41	49	47	
Kitchen 'Extract Fan' 'Case Breakout' Noise level at 1m from Bedroom Window R3 ($L_{Aeq,T}$)	10	-8	-26	-37	-55	-75	-84	-96	-14

Source: Air Conditioning Unit - Panasonic, Model No. U-71PZ2E5

Predicted Noise Level at 1 metre from Bedroom Window 'R3'	Frequency Spectral Data (Hz)								
	63	125	250	500	1k	2k	4k	8k	dB(A)
AC Unit 1 - Sound Pressure Level (L_p) - Cooling/ Heating Mode	53	51	50	46	45	39	33	26	49
Distance attenuation to 1 metre from bedroom window R3 (3m - 1m = 2m)	-6	-6	-6	-6	-6	-6	-6	-6	
Partial Line of Sight (-5 dB)	-5	-5	-5	-5	-5	-5	-5	-5	
Reflection (Q = 1)	0	0	0	0	0	0	0	0	
EEC LA1 - Single Bank Louvre - Size: 150mm	6	7	10	13	17	19	13	11	
AC' Unit 1 - Noise level at 1m from Bedroom Window R3 ($L_{Aeq,T}$)	36	33	29	22	17	9	9	4	25

Predicted Noise Level at 1 metre from Bedroom Window 'R3'	Frequency Spectral Data (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Kitchen 'Extract Fan' 'Outlet/ Extract' Unit' - Noise level at 1m from Bedroom Window R3 (LAeq,T)	28	17	8	-23	-30	-39	-43	-49	6
Kitchen 'Extract Fan' 'Case Breakout' Noise level at 1m from Bedroom Window R3 (LAeq,T)	10	-8	-26	-37	-55	-75	-84	-96	-14
AC' Unit 1 - Noise level at 1m from Bedroom Window R3 (LAeq,T)	36	33	29	22	17	9	9	4	25
Cumulative Noise Level at 1m from Noise Sensitive Bedroom Window R3 ($L_{Aeq,T}$)	37	33	29	22	17	9	9	4	25
									25
External Noise Criteria ($L_{Aeq,1\text{-}hour}$)*									PASS

London Borough of Camden Council's Noise Criteria* 34 dB(A)

** should not exceed 10 dB below the measured background noise level $L_{A90,1\text{-}hour}$ = 44 dB(A)*

Predicted Noise Level Inside Bedroom R3	dB(A)
Noise level at 1m from Bedroom Window R3 ($L_{Aeq,T}$)	25
Sound Reduction provided by partially open window	-10
Noise level Inside Bedroom R3 ($L_{Aeq,T}$)	15

BS 8233: 2014 Internal Criteria (Bedroom, Daytime, $L_{Aeq,16\text{-}hour}$)	35 dB(A)
Internal Noise Criteria ($L_{Aeq,16\text{-}hr}$)*	PASS

Appendix D – Technical Datasheets

Appendix D1 – Extractor Fan (x1 No.) - Axial Flow Fan Datasheets, *'Flaktwoods, Model No. 50JM/20/4/6/32'*

FlaktWoods Limited
Fan Selector - Technical Datasheet

FläktGroup

Project	:	**Order Code**	:
Quotation	:	**Date**	: 24 October 2020

JM
50JM/20/4/6/32

PRODUCT

Model Code	50JM/20/4/6/32
Fan Diameter	500 mm
Fan Speed	1420 rpm [Max 1410, Min 300]
Impeller	6 Blades, 32° Angle
Installation	Type D - Form B
Fan Casing	Long

PERFORMANCE

Requested Duty	2.50 m³/s @ 1.80 Pa (Static)
Actual Duty	2.60 m³/s @ 1.95 Pa (Static)
Outlet Dynamic Pressure	106 Pa
Velocity	13.26 m/s
Duty Shaft Power	0.482 kW
Max Shaft Power	0.627 kW [Used to size motor]
Efficiency (Total / Static)	58 % / 11 %

MOTOR

Motor Rating	0.660 kW [80M Frame - 4 Pole]
Full Load Current	1.62 A
Starting Current	9.3 A
Electrical Supply	380 - 415 Volts 50 Hz 3 Phase
Motor Winding	Standard
Motor Type	TEAR - Pad - IE2 - Class F Insulation

EFFICIENCY GRADES

ErP [FMEG] Rating	N 63 (ErP Compliance 2015) ✓
ErP [FMEG]	Target N 58
FMEG Blade Angle [Range]	28° [18° to 32°]
Measurement Category	D
VSD	No
Fan + Motor Efficiency	55.8% [1.84 m³/s @ 186 Pa]
Motor Input Power (ErP)	0.612 kW
SFP value	0.23 W/l/s @ Actual Duty

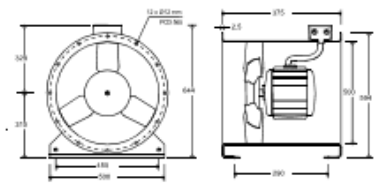
ENVIRONMENT

Air Density	1.2 kg/m³ / 20 °C / 0 m / 40% RH
Smoke Venting	No Smoke Venting
Operating Environment	Standard

RUNNING COSTS

Power from mains	0.606 KWh
Energy Consumption	1,211.75 (2,000.00 hr/year)
Running Cost / Year	£1,369.27
Co2 per Year	426.00 kgCO2e

DIMENSIONS

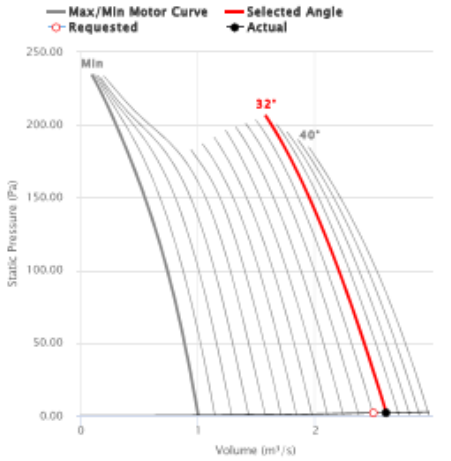


MECHANICAL

Impeller	200mm Aluminium Hub, 6 Aluminium Blades
Operating Temperatures	-40 °C to 50 °C
Maximum Running Speed	1410 rpm [50 Hz]
Minimum Running Speed	300 rpm [11 Hz]

COMMENTS

FAN PERFORMANCE CURVE



ACOUSTICS

	Sound Spectrum (Hz)								Overall		
	63	125	250	500	1k	2k	4k	8k	Lw*	LwA*	LpA @ 3 m **
Inlet Spectrum	78	80	77	76	74	70	67	61	85	79	58
Outlet Spectrum	80	82	78	76	74	70	68	62	86	79	59
Breakout	70	64	56	53	49	42	46	38	71	56	35

Sound data at requested duty. * Lw dB re 10 ⁻¹² W ** dBA re 2x10 ⁻⁵ Pa

FAN & ACCESSORIES

Item Description	Qty
50JM/20/4/6/32	1

Axial Way
Colchester, Essex, CO4 5DZ
01206 222634

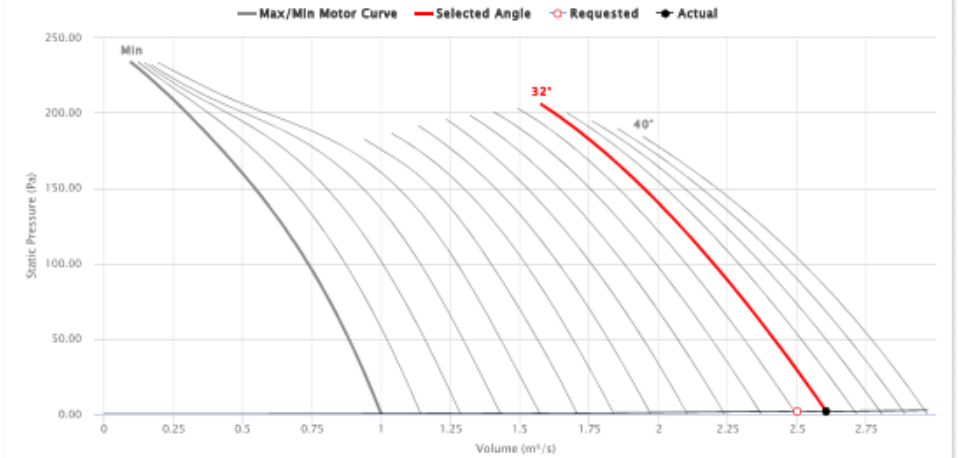
(1) UK [Third Party) Page 1 / 3 Version 10/9/2020 Rev.18226 (10/9/2020 Rev.1 PRODUCTION)

FlaktWoods Limited
Fan Selector - Technical Datasheet

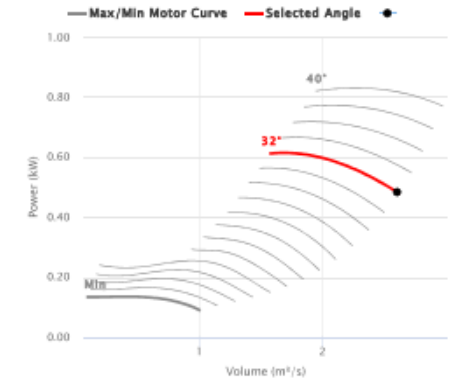
FläktGroup

Project	:	**Order Code**	:
Quotation	:	**Date**	: 24 October 2020

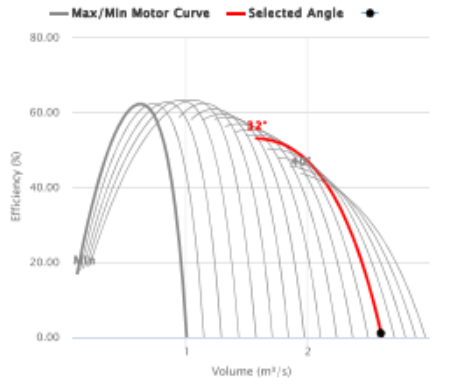
FAN PERFORMANCE CURVE



POWER CURVE



EFFICIENCY CURVE



ACOUSTICS

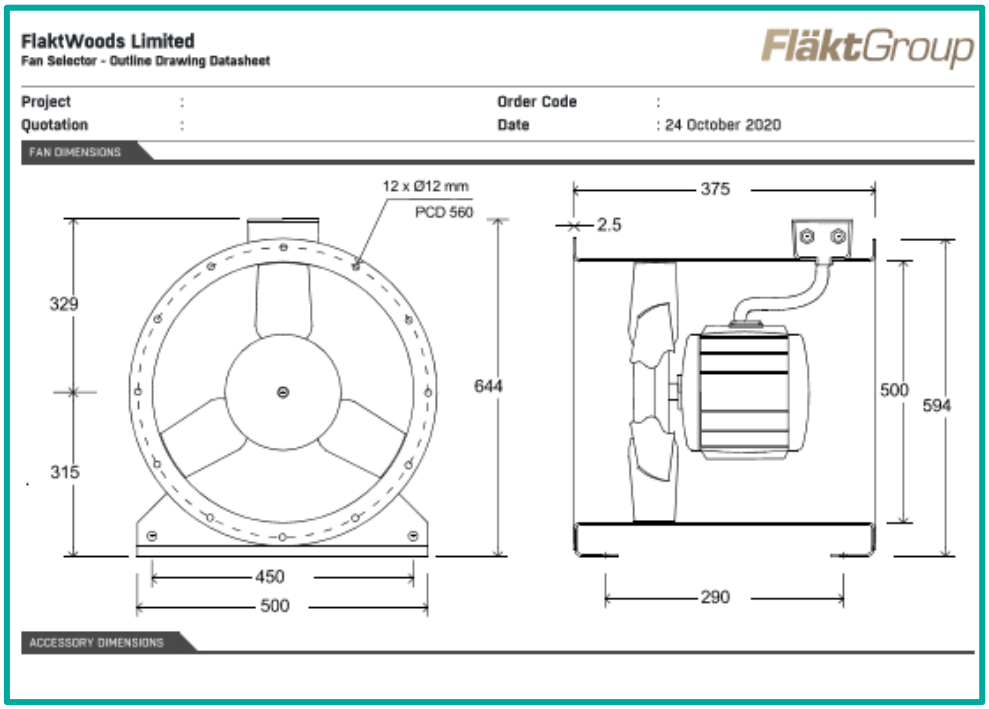
	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3 m **
Inlet Spectrum	78	80	77	76	74	70	67	61	85	58
Outlet Spectrum	80	82	78	76	74	70	68	62	86	59
Breakout	70	64	56	53	49	42	46	38	71	35

Sound data at requested duty. * Lw dB re 10⁻¹² W ** dBA re 2x10⁻⁵ Pa

Axial Way
Colchester, Essex, CO4 5DZ
01206 222634

(1) UK (Third Party)

Version 10/9/2020 Rev.18226 (10/9/2020 Rev.1 PRODUCTION)



Sound Power Level of Kitchen Extraction Fan Unit

Plant Make	Model No.	Noise Source	Sound Power Level, L_w Frequency, Hz								L_{wA}* dB(A)
			L_{ZFeq} 63	L_{ZFeq} 125	L_{ZFeq} 250	L_{ZFeq} 500	L_{ZFeq} 1000	L_{ZFeq} 2000	L_{ZFeq} 4000	L_{ZFeq} 8000	
Flaktwoods	JM Aerofoil 50JM/20/ 4/6/32	Exhaust/ Outlet Extract Fan	80	82	78	76	74	70	78	62	**79***
		Case Breakout	70	64	56	53	49	42	46	38	**56**

** A-Weighted Sound Power Level dBA re 2x10 Pa*

Appendix D2 – Supply Fan (x1 No.) - Plate Fan Datasheet, *'Soler & Palau (S&P), Model No.HCBB/4-400H'*

PLATE MOUNTED AXIAL FLOW FANS
COMPACT HCFB / HCFT Series - PLASTIC IMPELLERS

Range of low profile plate mounted axial fans fitted with plastic impellers with fiberglass, single phase motor (HCFB) or three phase motor (HCFT), IP65 (1), Class F insulation (2), equipped with thermal protection (3).
(1) Ø 800, 900 and 1000 models are IP55.
(2) Working temperatures from -40°C up to +70°C. Except models 4-710 suitable up to +55°C and models Ø 800 to 1000 suitable for usage in environments from -20°C to +40°C.
(3) Except models 800 to 1000.

Motors
Available, depending upon the model, with single or three phase motors in 2, 4 or 6 poles.
All motors are speed controllable by autotransformer except 2 pole and /4-630, 710, T/800, T/900 and T/1000.
Three phase models are speed controllable by inverter.
Electrical supplies:
Single phase 220-240V-50Hz. (Capacitor located inside the wiring terminal box).
Three phase 220-240/380-415V-50Hz or 380-415V-50Hz. (See characteristic chart).

Compact design
Compact design created by the combination of the motor with the factory matched direct drive wrap around impeller hub.

Corrosion resistance
Mounting plate, motor support and finger proof guard protected by cataforesis primer and black polyester paint finish. Stainless steel screws.

Terminal box
Wiring terminal box with cable gland PG-11.

Additional information
Standard air direction: form (A) configuration.
(Motor over Impeller).

On request
Inlet finger proof guard for models Ø 800 to 1000.

ErP OK
IP65(1)
PROTECTION

Impeller dynamically balanced
Impellers are dynamically balanced, according to ISO 1940 standard, giving vibration free operation.

Manufacturing variations
Multiple manufacturing variations, depending on the type of installation and use conditions.

Configuration for models Ø 800 to 1000
Special design of motor over impeller, which provides compactness and tightness IP55.

310 Plate mounted axial flow fans COMPACT HCFB / HCFT www.solerpalau.com

PLATE MOUNTED AXIAL FLOW FANS
COMPACT HCFB / HCFT - HCBB / HCBT Series

TECHNICAL CHARACTERISTICS WITH ALUMINIUM IMPELLERS

Before making any electrical connection ensure that the voltage and frequency of the mains electrical supply matches that of the fan data plate label.

Model	Speed (r.p.m.)	Diameter (mm)	Maximum absorbed power (W)	Maximum current (A)		Sound pressure level* (dB(A))	Maximum airflow (m³/h)	Weight (kg)	Speed controller		Inverter control	
				230 V	400 V				REB	RMB/T**	VFTM**	VFKB**
SINGLE PHASE 4 POLE												
HCBB/4-250/H	1325	250	84	0,4	–	49	1.130	5	REB-1	RMB-1,5	–	–
HCBB/4-315/H	1235	315	124	0,7	–	55	2.220	7	REB-1	RMB-1,5	–	–
HCBB/4-400/H	1360	400	315	1,5	–	62	4.830	9	REB-2,5	RMB-3,5	–	–
HCBB/4-500/H	1370	500	762	3,3	–	68	8.850	16	REB-5	RMB-3,5	–	–
HCBB/4-560/H	1390	560	1433	6,5	–	70	13.400	22	REB-10	RMB-8	–	–
HCBB/4-630/H	1360	630	1879	8,3	–	71	16.720	25	–	–	–	–
SINGLE PHASE 6 POLE												
HCBB/6-355/H	900	355	84	0,4	–	48	2.230	8	REB-1	RMB-1,5	–	–
HCBB/6-400/H	845	400	112	0,5	–	51	3.010	9	REB-1	RMB-1,5	–	–
HCBB/6-450/H	935	450	191	0,8	–	54	4.400	13	REB-2,5	RMB-1,5	–	–
HCBB/6-500/H	915	500	244	1,1	–	57	5.620	16	REB-2,5	RMB-3,5	–	–
HCBB/6-560/H	930	560	449	1,9	–	59	8.950	22	REB-2,5	RMB-3,5	–	–
HCBB/6-630/H	915	630	588	2,9	–	62	10.950	25	REB-5	RMB-3,5	–	–
THREE PHASE 4 POLE												
HCBT/4-250/H	1330	250	81	0,3	0,2	49	1.120	5	–	RMT-1,5	VFTM-Tri 0,37	VFKB-45
HCBT/4-315/H	1330	315	125	0,5	0,3	55	2.380	7	–	RMT-1,5	VFTM-Tri 0,37	VFKB-45
HCBT/4-355/H	1380	355	181	0,8	0,5	59	3.530	8	–	RMT-1,5	VFTM-Tri 0,37	VFKB-45
HCBT/4-400/H	1340	400	283	1,2	0,7	62	5.020	9	–	RMT-1,5	VFTM-Tri 0,37	VFKB-45
HCBT/4-450/H	1350	450	547	1,7	1,0	65	6.800	13	–	RMT-1,5	VFTM-Tri 0,37	VFKB-45
HCBT/4-500/H	1390	500	809	2,7	1,6	68	9.140	16	–	RMT-2,5	VFTM-Tri 0,55	VFKB-45
HCBT/4-560/H	1390	560	1287	4,0	2,3	70	12.950	22	–	RMT-2,5	VFTM-Tri 0,75	VFKB-45
HCBT/4-630/H	1385	630	1736	5,4	3,1	73	16.840	25	–	–	VFTM-Tri 1,1	VFKB-45
HCBT/4-710/H	1350	710	2554	7,6	4,4	74	22.400	27	–	–	VFTM-Tri 2,2	VFKB-45
HCBT/4-800/L-X-1,5	1410	800	2632	7,3	4,2	78	23.290	37	–	–	VFTM-Tri 1,5	VFKB-45
HCBT/4-800/H-X-3	1440	800	4595	12,8	7,4	84	33.100	52	–	–	VFTM-Tri 4	VFKB-48
HCBT/4-900/L-X-3	1450	900	3909	12,0	6,9	82	34.270	62	–	–	VFTM-Tri 3	VFKB-48
HCBT/4-900/H-X-5,5	1455	900	7893		13,4	87	46.270	96	–	–	VFTM-Tri 5,5	–
HCBT/4-1000/L-X-3	1415	1000	5048	14,2	8,2	86	39.910	67	–	–	VFTM-Tri 4	VFKB-48
HCBT/4-1000/H-X-7,5	1470	1000	8675		14,6	93	53.700	101	–	–	VFTM-Tri 7,5	–
THREE PHASE 6 POLE												
HCBT/6-355/H	900	355	91	0,3	0,2	48	2.270	8	–	RMT-1,5	VFTM-Tri 0,37	VFKB-45
HCBT/6-400/H	840	400	120	0,5	0,3	51	3.050	9	–	RMT-1,5	VFTM-Tri 0,37	VFKB-45
HCBT/6-450/H	925	450	198	0,9	0,5	54	4.620	13	–	RMT-1,5	VFTM-Tri 0,37	VFKB-45
HCBT/6-500/H	905	500	282	1,1	0,6	57	6.190	16	–	RMT-1,5	VFTM-Tri 0,37	VFKB-45
HCBT/6-560/H	895	560	401	1,4	0,8	59	8.650	22	–	RMT-1,5	VFTM-Tri 0,37	VFKB-45
HCBT/6-630/H	910	630	596	2,3	1,3	62	10.950	25	–	RMT-1,5	VFTM-Tri 0,37	VFKB-45
HCBT/6-710/H	950	710	953	4,7	2,7	65	15.350	27	–	RMT-5	VFTM-Tri 1,5	VFKB-45
HCBT/6-800/L-X-0,55	940	800	1025	3,3	1,9	73	17.600	31	–	–	VFTM-Tri 0,75	VFKB-45
HCBT/6-800/H-X-0,75	935	800	1309	4,2	2,4	75	20.630	36	–	–	VFTM-Tri 1,1	VFKB-45
HCBT/6-900/L-X-1,1	960	900	1341	4,8	2,8	74	23.700	54	–	–	VFTM-Tri 1,5	VFKB-45
HCBT/6-900/H-X-1,5	955	900	2289	7,3	4,2	78	32.300	57	–	–	VFTM-Tri 1,5	VFKB-45
HCBT/6-1000/L-X-1,1	940	1000	1855	5,9	3,4	79	28.810	56	–	–	VFTM-Tri 1,5	VFKB-45
HCBT/6-1000/H-X-1,5	940	1000	2392	7,7	4,4	83	34.300	60	–	–	VFTM-Tri 2,2	VFKB-45

* Sound pressure level measured in free field conditions at a distance equivalent to three times the diameter of the impeller with a minimum of 1,5 meters.
** Three phase speed controllers (RMT) or inverter control (VFKB/VFTM): three phase 400V.

Telephone: 01245 800105
Email: info@climateacoustics.com
Website: www.climateacoustics.com

Sound Power Level of Kitchen Supply Plate Fan Unit

Plant Make	Model No.	Noise Source	Sound Power Level, L_w Frequency, Hz								L_w dB
			L_{ZFeq} 63	L_{ZFeq} 125	L_{ZFeq} 250	L_{ZFeq} 500	L_{ZFeq} 1000	L_{ZFeq} 2000	L_{ZFeq} 4000	L_{ZFeq} 8000	
Soler & Palau	HCBB/ 4-400H	Inlet/ Supply Fan	***Limited noise output externally via the supply wall plate.***								

Appendix D3 – Air Conditioning Units (x1 No.) Datasheet, *'Panasonic, Model No. U-71PZ2E5'*

Panasonic

heating & cooling solutions

PACi Standard Ceiling • R32

This range of ceiling mounted units feature a DC fan motor for increased efficiency and reduced operating sound levels.
All the units are the same height and depth for a uniform appearance in mixed installations. A knock out is provided to allow for supplementary fresh air for improved air quality.

- Wide air distribution for large rooms
- Horizontal air flow reaches maximum 9,5 m
- Fresh air connection available on the unit
- Slim design with 235 m height fits narrow space
- Silent operation
- Datanavi simple support tool App with remote controller (CZ-RTC5B)
- Twin, Triple and Double-twin split options
- Easy connection and control of external fan or ERV using the connector PAW-FDC on the indoor unit PCB. The external device can be controlled by the remote control of the Panasonic indoor unit

Outdoor unit		U-71PZ2E5
Outdoor power source	V	220 - 230 - 240
Current in cooling (1p 220V / 3p 380)	A	9,70
Current in cooling (1p 230V / 3p 400)	A	9,30
Current in cooling (1p 240V / 3p 415)	A	8,90
Current in heating (1p 220V / 3p 380)	A	7,85
Current in heating (1p 230V / 3p 400)	A	7,50
Current in heating (1p 240V / 3p 415)	A	7,20
Outdoor air flow (Cool)	m³/min	50
Outdoor air flow (Heat)	m³/min	45
Outdoor sound pressure (Cool -Hi)	dB(A)	49
Outdoor sound pressure (Heat -Hi)	dB(A)	49
Outdoor sound power (Cool -Hi)	dB(A)	69
Outdoor sound power (Heat -Hi)	dB(A)	69
Outdoor dimension (Height)	mm	695
Outdoor dimension (Width)	mm	875
Outdoor dimension (Depth)	mm	320
Outdoor net weight	kg	44
Pipe diameter (Liquid)	Inch (mm)	3/8 (9,52)
Pipe diameter (Gas)	Inch (mm)	5/8 (15,88)
Pipe length range	m	3 ~ 40
Elevation difference (in/out) (5)	m	30
Pipe length for additional gas	m	30
Additional gas amount	g/m	35
Refrigerant (R32) / CO2 Eq.	kg / T	1,45 / 0,979
Operating range (Cool - Min)	°C	-10
Operating range (Cool - Max)	°C	43
Operating range (Heat - Min)	°C	-15
Operating range (Heat - Max)	°C	24

(1) EER and COP calculation is based in accordance to EN14511.
(2) Energy Label Scale from A+++ to D. For models below 12 kW, the SEER and SCOP is calculated based on values of EU/626/2011. For models above 12 kW, the SEER and SCOP is calculated based on values of EU/2281/2016.
(3) The annual energy consumption is calculated in accordance to EU/626/2011.
(4) The sound pressure of the units shows the value measured of the position 1 m in front of the main body and 1 m below the unit. The sound pressure is measured in accordance with Eurovent 6/C/006-97 specification.
(5) When installing the outdoor unit at a higher position than the indoor unit.
* Recommended fuse for the indoor 3 A.

Complementary products

www.aircon.panasonic.eu - Panasonic Marketing Europe GmbH - Panasonic Air Conditioning - Hagenauer Strasse 43, 65203 Wiesbaden, Germany

Telephone: 01245 800105
Email: info@climateacoustics.com
Website: www.climateacoustics.com

Octave Band Sound Pressure Levels from Air Conditioning Unit

Plant Make	Model No.	Noise Source (Fan Speed)	Sound Pressure Level at 1 metre, L_p (Fan Speed - High) Frequency, Hz								L_p dB
			L_{ZFeq} 63	L_{ZFeq} 125	L_{ZFeq} 250	L_{ZFeq} 500	L_{ZFeq} 1k	L_{ZFeq} 2k	L_{ZFeq} 4k	L_{ZFeq} 8k	
Panasonic	U-71PZ2E5	Cooling Mode (High)	53*	51*	50*	46*	45*	39*	33*	26*	**49**
		Heating Mode (High)	53*	51*	50*	46*	45*	39*	33*	26*	**49**

**** Indicative octave band noise levels based on overall sound pressure level (49dB L_p) provided in datasheet in Appendix D3.***

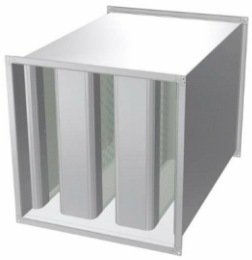
Appendix D4 – Rectangular Silencer Datasheet, *'Acoustica, Model No. R02-2-1500'*

R02
Rectangular Silencers

ACOUSTICA

R02 - 2 - Attenuator

Available in seven standard lengths R02 2 Rectangular Duct Mounted Silencers have excellent attenuation properties, achieved with sound absorbing infill splitters, retained in the attenuator casing by a perforated liner. The resistance to airflow is a function of the face velocity and length. It is not recommended to select the R02 2 Silencers with a face velocity above 2.5 metres per second without asking advice regarding re-generated self noise. We can advise on the selections and can perform system analysis to ensure the correct unit is specified.



- High performance rectangular duct silencer
- Seven standard lengths
- Many connection options
- Cross section dimensions in 1mm increments
- System pressure within ducted systems to 1500 Pa
- Special lengths on request

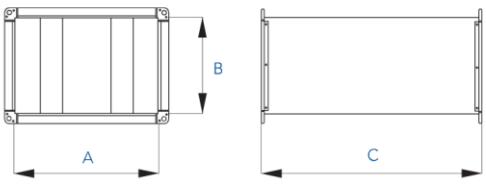
Insertion Loss (dB) - Centre Band Frequency

Product Code	Length (mm)	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
R02 - 2 - 600	600	7	12	20	31	39	40	38	27
R02 - 2 - 900	900	9	16	25	42	50	50	50	41
R02 - 2 - 1200	1200	11	20	20	50	50	50	50	48
R02 - 2 - 1500	1500	13	24	25	50	50	50	50	50
R02 - 2 - 1800	1800	15	30	20	50	50	50	50	50
R02 - 2 - 2100	2100	16	33	25	50	50	50	50	50
R02 - 2 - 2400	2400	7	38	20	50	50	50	50	50

Insertion loss data is derived from continual testing to BS4718 and other standards in independent UKAS certified laboratories, which includes where appropriate, re-generated or self noise testing in both forward and reverse flow conditions. If you request system analysis from our technicians all predictions will be assessed using the relevant certified insertion loss data together with relevant dynamic corrections.

Dimensional Data

Code	A Min	A Max	B Min	B Max	C Min	C Max
R01 - 2	100	1200	100	1200	400	2400



Resitance to Airflow (Pa)

Product Code	1.0m/s	1.5m/s	2.0m/s	2.5m/s	3.0m/s
R02 - 2 - 600	9	29	52	80	108
R02 - 2 - 900	9	30	54	82	111
R02 - 2 - 1200	10	31	55	84	114
R02 - 2 - 1500	10	31	56	85	116
R02 - 2 - 1800	11	32	57	88	119
R02 - 2 - 2100	11	34	57	90	123
R02 - 2 - 2400	12	36	60	95	133

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2 Conder Way, Whitehall Industrial Estate, Colchester, Essex CO2 8JN

A MEMBER OF eg ELTA GROUP

Telephone: 01245 800105
Email: info@climateacoustics.com
Website: www.climateacoustics.com

Sound Reduction Level of Rectangular Silencers

	Octave Band Insertion Loss (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Minimum Attenuation from Kitchen Extraction Fan Silencer Acoustica, R02-2-1500 Rectangular Silencer	13	24	25	50	50	50	50	50

Appendix D5 – Acoustic Jacket Technical Datasheet, CMS Acoustic Solutions, Acoustic Fan Jacket, Model Type: *'AFJ-1080'*

CMS acoustic SOLUTIONS

Acoustic Fan Jackets Type AFJ

Advantages

- ***Flexible and easy to handle and install.***
- ***Available in two product formats.***
- ***Provides a cost effective sound barrier solution.***
- ***Durable and wear resistant.***

Applications

CMS AFJ acoustic fan jackets are employed to efficiently reduce the noise breakout from axial flow fan casings.

Description

CMS AFJ acoustic fan jackets are manufactured from a lead free polymeric barrier material supported by a 25mm or 50mm acoustic foam spacer providing excellent acoustic insulation properties. The polymeric barrier is backed with a hessian substrate for strength and dimensional stability. There are two product options available:

AFJ-1060 is our standard format acoustic fan jacket, manufactured from 5 kg/m² polymeric barrier and is available in two options:

AFJ-1060-A supported by CMS FR25 fire retardant acoustic foam.

AFJ-1060-B supported by CMS Class 'O' acoustic foam.

AFJ-1080 is our high performance acoustic fan jacket, manufactured from 10 kg/m2 polymeric barrier and is available in two options:

AFJ-1080-A supported by CMS FR25 fire retardant acoustic foam.

AFJ-1080-B supported by CMS Class 'O' acoustic foam.

Technical Information

CMS AFJ acoustic fan jackets conform to the following specifications:

AFJ-1060

Barrier material surface density	5kg/m²
Barrier material flammability	FMVSS 302: self extinguishing
Operating temperature	-30 to +65°C
Acoustic foam technical data	see data sheets 1003 (type A) and 1001 (type B).

AFJ-1080

Barrier material surface density	10kg/m²
Barrier material flammability	FMVSS 302: self extinguishing
Operating temperature	-30 to +65°C
Acoustic foam technical data	see data sheets 1003 (type A) and 1001 (type B).

Physical Information

Dimensions
Made to measure to suit requirements.

Acoustic Performance

CMS AFJ acoustic fan jackets have the following acoustic performance data.

Transmission Loss Data

Material \ Frequency	125	250	500	1k	2k	4k	8k
AFJ-1060	12	18	22	27	32	38	44
AFJ-1080	17	24	28	33	39	44	50

See graph overleaf

Sound Reduction Level from Acoustic Jacket

	L_{ZFeq} Frequency Spectral Data (dB) at 1m							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Minimum Expected Attenuation from Acoustic Jacket	**7**	**17**	**24**	**28**	**33**	**39**	**44**	**50**

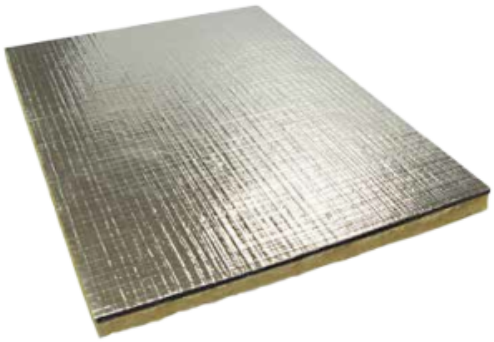
Appendix D6 – Acoustic Lagging Technical Datasheet, *'CMS Danskin, Acoustic Lagging (Model No. Superlag Superflex Prime 10/25)'*

TECHNICAL DATA SHEET

SUPERLAG SUPERFLEX PRIME

PRODUCT DESCRIPTION

CMS Danskin Acoustics SuperLag Superflex Prime is a highly flexible material consisting of a three part laminate, incorporating a spacer or isolating layer, a very flexible heavy mass layer and an outer flame / vapour barrier meeting Class '0' of the UK Building Regulations. Being of a laminated construction it overcomes the need for a separate isolation layer normally required beneath most forms of acoustic lagging.



BENEFITS

- Easy and quick to apply
- Excellent acoustic performance
- Applied as a single layer treatment
- Excellent fire resistance & temperature stability
- Highly durable
- Low thermal conductivity
- Low toxicity
- Highly flexible suitable for installation on smaller pipes

APPLICATIONS

CMS Danskin Acoustics SuperLag Superflex Prime is a highly efficient acoustic insulation lagging for ductwork, pipes, enclosures and similar applications where a considerable reduction in the passage of noise is required, combined with ease of application.

TECHNICAL INFORMATION

CMS Danskin Acoustics SuperLag Superflex Prime conforms to the following specifications:

Glass fibre spacer density	16-24 kg/m³ nominal
Operating temperature	-30 to 100°C
Chemical resistance	Oils, water, most solvents
Fire resistance	Class '0' foil facing Appendix A. Foil Faced
Thermal Conductivity	0.037 W/m°K to BS 4745
R Value	25mm= 0.65m2/Kw 50mm= 1.35m2/Kw

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CMSDANSKIN ACOUSTICS

PHYSICAL INFORMATION

Dimensions

Standard sheet size: 2m x 1.2m

Other sizes are available upon request.

Grades

CMS Danskin Acoustics SuperLag Superflex Prime is available in four grades to suit different performance requirements:

Grade	Barrier Mass (kg/m²)	Thickness (mm)
SuperLag Superflex Prime 5/25	5	20
SuperLag Superflex Prime 5/50	5	37
SuperLag Superflex Prime 10/25	10	25
SuperLag Superflex Prime 10/50	10	40

ACOUSTIC PERFORMANCE

CMS Danskin Acoustics SuperLag Superflex Prime is a high performance material that has been acoustically tested at certified independent test laboratories.

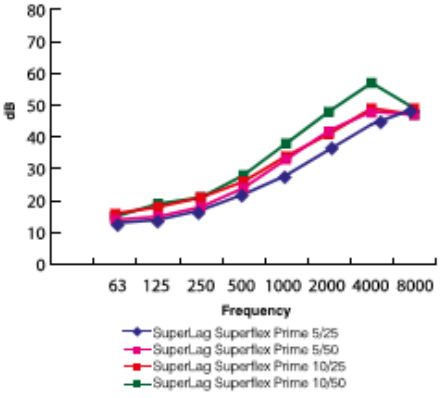
Tested and Rated according to:

BS EN ISO 717-1

BS EN ISO 10140:1

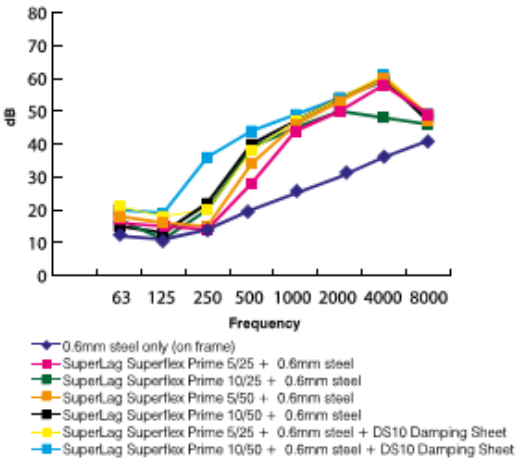
Sound Reduction Index (SuperLag Superflex Prime only, no supporting materials)

Material \ Frequency	63	125	250	500	1k	2k	4k	8k
SuperLag Superflex Prime 5/25	13	14	17	22	28	36	44	49
SuperLag Superflex Prime 5/50	14	15	18	24	33	42	48	47
SuperLag Superflex Prime 10/25	16	18	21	25	34	41	49	47
SuperLag Superflex Prime 10/50	15	19	21	28	38	48	57	49



Sound Reduction Index (SuperLag Superflex Prime only, with supporting materials)

Material \ Frequency	63	125	250	500	1k	2k	4k	8k
0.6mm steel only (on frame)	12	11	14	20	25	30	36	41
SuperLag Superflex Prime 5/25 + 0.6mm steel	16	15	14	28	44	50	58	49
SuperLag Superflex Prime 10/25 + 0.6mm steel	18	16	15	34	46	53	60	49
SuperLag Superflex Prime 5/50 + 0.6mm steel	17	11	20	38	47	54	61	49
SuperLag Superflex Prime 10/50 + 0.6mm steel	15	13	22	40	47	54	60	47
SuperLag Superflex Prime 5/25 + 0.6mm steel + DS10 Damping Sheet	21	18	20	39	45	50	48	46
SuperLag Superflex Prime 10/50 + 0.6mm steel + DS10 Damping Sheet	20	19	36	44	49	54	59	48



Acoustic duct lagging is a complex subject with the size, shape, thickness and configuration of the ductwork all having a significant effect on the system performance. The data shown above is based on flat panel tests used for SuperLag Superflex Prime products.

Similar tests carried out on ducting will generally produce similar or slightly lower levels of performance.

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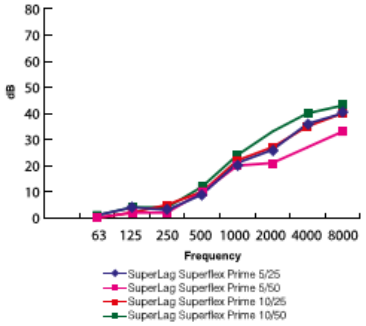
SELECTION GUIDELINES

CMS Danskin Acoustics have recognised the complex problems associated with noise breakout from ductwork and have developed performance data from laboratory test results. This performance data predicts, as closely as possible, the minimum likely improvement achievable by lagging a duct with SuperLag Superflex Prime insulating materials.

The data below is based on 1mm thick ductwork of 3.5m length and 200mm diameter cross section, and indicates the actual improvement of the SuperLag Superflex Prime, with the noise reduction of the original untreated ductwork being removed from this performance data.

Material \ Frequency	63	125	250	500	1k	2k	4k	8k
SuperLag Superflex Prime 5/25	1	4	3	9	21	26	36	40
SuperLag Superflex Prime 5/50	0	2	2	10	20	21	27	33
SuperLag Superflex Prime 10/25	0	2	5	10	22	27	35	40
SuperLag Superflex Prime 10/50	1	4	4	12	24	33	40	43



The acoustic performance of CMS Danskin Acoustics SuperLag Superflex Prime can further enhanced by applying on top of a layer of glass fibre slab up to 300mm thick where very high performance levels are required.

To boost the performance and reduce low frequency noise breakout, CMS Danskin Acoustics DS type damping sheet should be applied to the ductwork before installing the SuperLag Superflex Prime.

INSTALLATION GUIDELINESS

The method required in the fitting of SuperLag Superflex Prime insulation is dependent on several factors.

1) The size and circumference of the duct.
2) The shape of the duct -rectangular or round.
3) The ambient temperature and temperature within the duct normal and maximum.
4) The location of the duct inside or outside

Circular ductwork

Round ducts where one sheet of SuperLag Superflex Prime will completely lap the circumference can be insulated without the need for adhesives or extra mechanical fixings. Mating edges should be sealed with Class '0' foil faced adhesive tape to match the finish required.

The SuperLag Superflex Prime insulation can be secured to large round ducts using proprietary banding systems, in conjunction with a Class '0' edge tape.

Rectangular ductwork

Rectangular ducts normally require additional support for the SuperLag Superflex Prime in the form of contact adhesive and/ or proprietary insulation fixings, particularly on the underside where the SuperLag Superflex Prime will tend to hang away from the duct surface.

It is recommended that large intricate ducts be further supported and reinforced with 25mm wire mesh (i.e. chicken wire) and wire ties.

Banding rectangular ductwork is not recommended as insufficient support is given across the sides of the duct and the SuperLag Superflex Prime will be compressed at the corners, thus affecting performance.

CMS Danskin Acoustics recommends the following products to assist installation:

Aerosol Adhesive

SPRAYTACK

A specially formulated nonflammable synthetic rubber adhesive. Available in 500ml aerosol cans, which provides approximately 5m² coverage. SPRAYTACK is a contact adhesive that requires application to both surfaces before bonding.

STA-PUT

A simple, strong adhesive spray for bonding materials to concrete, brick, wood, plaster or metal walls and ceilings. Available in 500ml aerosol cans, which provide approximately 3.4m² coverage. Offers immediate bond strength.

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CMSDANSKIN ACOUSTICS

Sound Reduction Level from Acoustic Duct Lagging

	L_{ZFeq} Frequency Spectral Data (dB) at 1m							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Minimum Expected Attenuation from Acoustic Duct Lagging	16	18	21	25	34	41	49	47

Appendix D7 – Acoustic Enclosure Technical Datasheet, *'EEC, Model No. EEC LA1'*

EEC Acoustic Louvres

eec
Environmental Equipment Corporation Ltd

APPEARANCE

EEC Acoustic Louvres can be manufactured to accommodate the various dimensional and appearance requirements a building project may demand.

The louvres can be designed and constructed to be installed in the exterior fabric of buildings or as complete acoustic enclosures to house noise emitting plant. Also supplied are acoustic louvred fully openable single and double doors.

Special materials and finishes available include stainless steel, anodised aluminium and painted to the complete BS colour range.

Louvres are supplied, in single bank modules (LA1) or back-to-back "chevron" modules (LA2) ranging from 150mm to 600mm deep.

CONSTRUCTION

Built to the highest quality and specification, all EEC acoustic weather louvres will have outer casings of not less than 1.2mm galvanised mild steel sheet.

The louvre blades and outer faces of the top and bottom support sections will not be less than 0.7mm galvanised mild steel sheet. The inner absorptive faces will not be less than 0.7mm galvanised perforated mild steel sheet.

The acoustic infill will be in-organic, non-hydroscopic, flame, moisture and vermin proof mineral wool with a minimum density of 48Kg/m 3 and packed under compression to prevent voids due to settlement.

PERFORMANCE

The overall acoustic performance for single and double bank acoustic louvres varies depending on the free area, louvre blade design and the noise spectrum from the attenuated plant item.

Typical SRI figures for standard Acoustic Louvre configurations are presented below

Frequency - Hz	63	125	250	500	1K	2K	4K	8K
LA1 SRI - dB	6	7	10	13	17	19	13	11
LA2 SRI - dB	9	10	14	20	30	33	32	30

AERODYNAMICS

It is generally recommended to avoid excessive regenerative noise from the louvres that air flow pressure losses across the louvres be kept below 20 Pa. This again varies on the final specification of each louvres, however no acoustic louvre should be run faster than 2.5 m/s.

NOISE AND VIBRATION CONTROL SPECIALISTS

EEC Limited, Richmond House, Churchfield Road, Walton-on-Thames, Surrey KT12 2TP
t: 01932 230940 f: 01932 230941 e: info@eecnoisecontrol.co.uk www.eecnoisecontrol.co.uk

quietly moving forward

Sound Reduction Level of Acoustic Enclosure

	L_{ZFeq} Frequency Spectral Data (dB) at 1m							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Minimum Attenuation from Acoustic Enclosure	6	7	10	13	17	19	13	11

Appendix D8 – Anti-Vibration Mount - Enclosed Spring Mounts Technical Datasheet, *'Christie & Grey, Model No. ES20 or ES25'*

Enclosed Spring Mountings

Type ES - Enclosed Spring and ECS - Enclosed Captive Spring Mounting

A unique range of mountings designed primarily for building services applications where the control of low frequency vibration and noise emanating from mechanical plant is of paramount importance.

The benefits of a combined rubber and steel housing for the spring have helped establish the ES and ECS mountings as industry standards accepted by specifiers, equipment manufacturers and mechanical services installers alike.

DESIGN FEATURES

- Nitrile rubber (oil resistant) lower spring housing eliminates the possibility of metallic continuity and ensures excellent acoustic performance. Steel reinforced on ECS range.
- Full enclosed captive assembly protects the spring and controls transient motion.
- All steel components are zinc plated.
- Nominal 15, 20, 25 & 50 mm deflection colour coded helical steel springs to BS1726 Class B, laterally stable with 50% overload capacity.
- Simple single screw height adjustment.
- 6 mm thick ribbed rubber seating pads available for ES25 and ECS ranges.
- Colour coded labels for easy identification.
- Stainless Steel variants available.

TYPICAL APPLICATIONS

- Axial and Centrifugal Fans.
- Air Handling Units.
- Chillers and Cooling Towers.
- Rotary and Multi Cylinder Compressors.
- Diesel Generating Sets (ECS only).
- Mechanical Test Rigs.
- Isolation of Sensitive Equipment.

CHRISTIE & GREY Vibration & Shock Control

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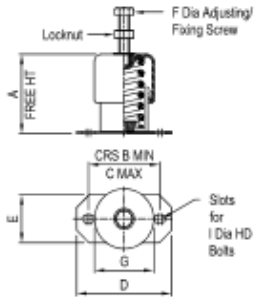
TYPE ES, ESB, ES25, ECS25 & ECS50 MOUNTINGS

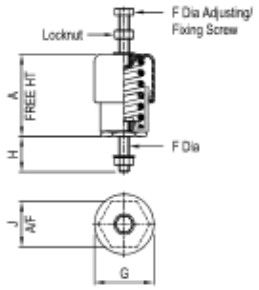
PART No.	COLOUR CODE	RATED LOAD (kg)	DEFLECTION AT RATED LOAD (mm)	DIMENSIONS (mm) A	B	C	D	E	F	G	H	I	J	WT (kg) MAX
ES20/10	PURPLE	10	20											
ES20/15	YELLOW	15	20											
ES20/20	GREY	20	20											
ES20/40	GREEN	40	20	63	54	60	76	38	M8	48	-	M6	-	0.25
ES20/70	RED	70	20											
ES15/100	BLUE	100	15											
ESB20/10	PURPLE	10	20											
ESB20/15	YELLOW	15	20											
ESB20/20	GREY	20	20											
ESB20/40	GREEN	40	20	65	-	-	-	-	M8	48	26	-	36	0.25
ESB20/70	RED	70	20											
ESB15/100	BLUE	100	15											
ES25/30	YELLOW	30	25											
ES25/60	GREEN	60	30											
ES25/100	BLUE	100	25	88	85	90	110	70	M10	78	-	M8	-	1.0
ES25/160	WHITE	160	25											
ES25/250	RED	250	25											
ECS25/100	WHITE/YELLOW	100	25											
ECS25/200	WHITE/RED	200	25											
ECS25/300	WHITE/PURPLE	300	25											
ECS25/400	WHITE/GREY	400	25											
ECS25/500	WHITE/ORANGE	500	25											
ECS25/600	WHITE/BROWN	600	25	127	130	150	180	95	M16	111	-	M12	-	3.0
ECS25/700	WHITE/BLACK*	700	25											
ECS25/800	WHITE/GOLD	800	25											
ECS25/1000	WHITE/1000	1000	25											
ECS25/1200	WHITE/1200*	1200	25											
ECS25/1400	WHITE/1400*	1400	25											
ECS50/100	BLACK/YELLOW	100	50											
ECS50/200	BLACK/GREEN	200	50											
ECS50/300	BLACK/BLUE	300	50	155	130	150	180	95	M16	111	-	M12	-	2.8
ECS50/400	BLACK/WHITE	400	50											
ECS50/500	BLACK/RED	500	50											

* Internal nested spring.

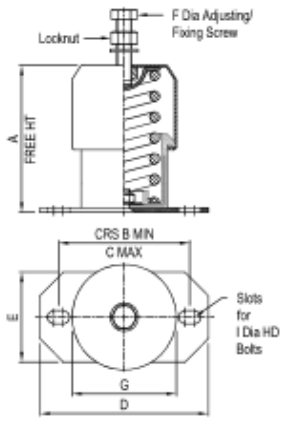
TYPE ES



TYPE ESB



TYPE ECS



Seating Pads

Ribbed rubber seating pads can now be fitted as standard, suffix Pt. No. /B e.g. ES25/100/B.

Stainless Steel.

This option is available across the entire range for external and other hostile environments.

When ordering the Pt. No. should be suffixed with /S for Stainless Steel or if fitted with a seating pad /SB e.g. ECS25/500/S or ECS25/500/SB.

ISOLATION EFFICIENCY AT TYPICAL MACHINE SPEEDS

MACHINE SPEEDS (rpm)	EFFICIENCY % 15 mm DEFL.	25 mm DEFL.	50 mm DEFL.
300	DO NOT USE	34.0	75.2
500	68.7	83.3	92.3
750	88.1	93.2	96.7
1000	93.7	96.3	98.2
1200	95.7	97.4	98.7
1500	97.3	98.4	99.2
1750	98.0	98.8	99.4
2000	98.5	99.1	99.5

The above figures are theoretical values only based on the vertical natural frequency of the sprung system assuming infinitely stiff structural supports.
The effects of high frequency spring coil resonances on low frequency performance are also ignored.

Spring Deflection

Spring stiffness is linear over its working range therefore the actual deflection for a given load can be calculated as follows:-

$$\text{Actual Deflection (mm)} = \frac{\text{Actual Load (kg)} \times \text{Rated Deflection (mm)}}{\text{Rated Load (kg)}}$$

For full installation instructions please refer to our data sheet DS026.
For more detailed information and technical assistance please contact our Technical Department.

In the interests of continual development, the Company reserves the right to make modifications to these details without notice.

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Appendix D9 – ESP System (x2 No.) - Electrostatic Precipitator Technical Datasheet, *'Ideal Catering Solutions, Model No. RY2500'*

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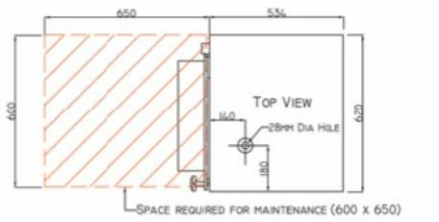
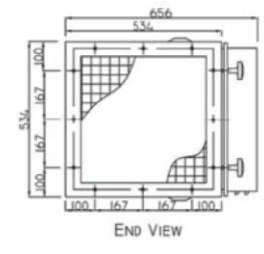
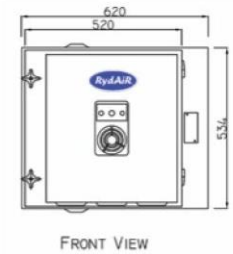
Electrostatic Precipitators

RY2500

Industrial grade electrostatic air cleaner for collection of dry and wet particulates like dust, oil mist, cooking fumes etc. Typical application include Commercial kitchen exhaust, factories, workshops, CNC machine shops etc







CE
ISO 9001

Spec sheet overleaf >

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Electrostatic Precipitators

OC Innovations – RY2500 (SPECIFICATIONS)

Unit:	H: 534mm / W: 656mm / L: 620mm
Cabinet	1.2mm Electro Galvanized Steel Powder Coated
Finishing	Dark Blue
Weight	40 Kg
Air Volume	Upto 2500m3/hr or 0.69m3/s
Air Flow	Left to Right, Right to Left
Static Pressure Reqd	100 Pascal
Operating Voltage	220 Vac+/-10%, 50 Hz (Single phase)
Features	Short circuit, arc protection and auto power restore for Power Pack
Efficiency	Up to 95%, meets NIOSH 5026 Oil Mist Test (National Institute for Occupational Safety and Health)
Particle Size	Collects particles as small as 0.01 microns
Controls	Auto cut-off switch when door is opened. Indicator lights for fault, normal or wash function
Cell	H :480mm / W: 340mm / L : 530mm / Weight: 15Kg each Ionizing voltage: 12 KVdc Collector voltage: 6 KVdc Uses 2 cells, each cell comprising of 9 ionizing wires & 29 collection plates. Total face Area is 0.264 sqm. Effective collection area is 5.8 sqm
Power consumption	50 Watts (1 cell)
Pre-filter Installation	Aluminum mesh, washable Ceiling suspended, wall or frame mounted
Options	Dry contact for Building Management System (BMS)

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Appendix D10 – OC Unit (x1 No.) - Odour Control Unit Technical Datasheet, *'Ideal Catering Solutions, Model No. OC2'*

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ODOUR CONTROL

OC2

Process Information

Oxidation using ozone and activated oxygen ions is used to treat odour emissions from commercial and industrial kitchen processes (DEFRA, 2005: Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems).

The OC2 has been specifically designed for use in commercial kitchens. The system injects ozone into the kitchen extraction canopy or associated duct work where it reacts with odours, which are oxidized in a chemical reaction, which results in the production of carbon dioxide and water vapour. The ozone itself is consumed during the process and is converted back into oxygen.

The benefits of purchasing an OC2 unit over traditional UV/Ozone systems are as follows:

- Compact, lightweight and quiet operation so is less obtrusive
- Quick and easy low cost installation
- Low capital and running costs – up to 50% less than traditional UVC systems
- Injection into ductwork – adding negligible back pressure to the system so requiring less energy to push air through the air handling system. This means less ductwork modifications
- The OC2 maintains efficiency as they remain outside of the air stream, they also require less maintenance and require less cleaning.
- Tested to EN13725:2003, CE Approved

Spec sheet overleaf >

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ODOUR CONTROL

OC2 (SPECIFICATIONS)

Technical Information

Ozone Output	24g/hr ozone output
Housing dimensions	300mm wide x 300mm length x 150mm height
Housing material	Stainless Steel powder coated white/grey
Duct work connection	100mm circular
Volume flow rate in ductwork	Up to 2m3/s per unit, subject to cooking odours.
Air residence time inside chamber	>0.1 seconds
Pressure drop	N/A
Weight of unit	5Kg approx.
Two individual Light Indicators	Green Power On / Green Ozone On
Electrical requirements	240V / 1 ph / 50/60Hz
Power requirements	168W
Safety	Built in Air pressure switch

Installation

It is recommended to locate the units with an injection point located closest to the source of odours (i.e. Canopy plenum or nearest accessible point on ductwork, in order to maximize dwell time. In any case the dwell time must be no less than 1 second.

The units in built air pressure switch is activated by the installation of the black three pined connector to the unit to the sensor lock connector.

Maintenance

An optional service contract is available which entails a yearly inspection of the unit.
Please contact us for further information and pricing.

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