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REPORT No: FR230724NW52HR-4 **Date:** 23/07/2024

CLIENT PROJECT REFERENCE

153 Fortess Rd London, NW5 2HR

ENVIRONMENTAL NOISE SURVEY -4 (UPDATED)

PREPARED FOR:

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1. Summary

An environmental noise impact assessment was carried out at the premises at 153 Fortess Rd London, NW5 2HR, on Tuesday 23rd July 2024. ***The aim of this report is to determine the impact of the proposed extractor fan system upon noise sensitive receptors in accordance with BS4142:2014+A1:2019 guidance, and to determine interior noise levels in the flat above the shop in accordance with BS8233:2014 guidance.***

The results of the environmental noise survey are reasonable considering the location of the measurement position and the existing noise sources in the local neighbourhood. Noise calculations of the sound source were undertaken using available details and plans provided by the client. The data and information form the basis of the assessment. BS4142:2014+A1:2019 and BS8233: 2014 noise assessment were conducted at the site.

The summary of the difference between the Rating Level and Background Noise Level of noise sensitive receptors, and external noise levels is given in table below.

Noise sensitive receptor	**Difference between The Rating Level and Background Level**
	Day
153 Fortess Road (First floor window)	– 31.6dB(A)
153 Fortess Road (Second floor window)	– 35.9dB(A)
	External Noise levels
153 Fortess Road First Floor Rear Terrace	34dB(A)

In accordance with BS4142:2014+A1:2019 guidance, the day Rating Level at nearest noise sensitive receptors does not exceed the background sound level as shown in Table above. Therefore, the operation of the proposed extractor fan indicates the specific sound source having a low adverse impact during daytime.

The predicted daytime Rating Level $\boldsymbol{L_{Aeq,Tr}}$ at the external amenity space, rear terrace, of First Floor of 153 Fortess Road is 34dB(A). The Rating Level $\boldsymbol{L_{Aeq,Tr}}$ 34dB(A) at the external amenity space does not exceed 50dB(A) $L_{Aeq,16hr}$ of desirable category of BS8233:2014.

It can be confirmed that the Rating Levels of the proposed extractor fan is expected to comply with BS4142:2014+A1:2019 guidance.

A rigorous calculation method that is given in BS8233: 2014 was applied to determine interior noise levels of the flat above the shop by using predicted internal noise level 85dB(A) in the shop, measured environmental noise levels, and suggested multi-layer ceiling. Calculations show the ceiling scheme reduces sound transmission by 60dB(A), which achieves minimum airborne sound insulation value of 43dB(A) (D_{nTw} +C_{tr}).

In accordance with BS8233:2014 guidance; the predicted daytime internal noise level in the flat above the shop is 25dB(A**)** $L_{Aeq,16hr}$ and it is within the desirable category of 35dB(A) for living rooms and 30dB(A) for bedrooms.

2. Introduction

Environmental noise assessment was carried out at the premises at 153 Fortess Rd, London, NW5 2HR, on Tuesday 23rd July 2024. Environmental Noise Survey was undertaken in accordance with BS4142:2014+A1:2019. The site is located on a busy road with high background noise level.

3. Site Description

The site (153 Fortess Rd, London, NW5 2HR) is seeking planning permission for proposed extractor fan system that will be installed at the premises as shown in **Appendix F**. The building has four floors. The premises is located in a mixed commercial and residential area, and it will be open for business between 07:00 and 23:00.

4. Environmental Noise Survey Methodology

Environmental noise survey was undertaken at the rear of the site to determine day noise levels in accordance with the methodology contained within BS4142:2014 +A1:2019. Noise survey at given time covers the most sensitive period of the time in which the noise units may be operational.

4.1. Sound source under investigation

During the measurements carried out at the site, the primary noise source identified was road traffic noise from Fortess Road. Secondary noise sources are mechanical noise from neighbour shops (151 Fortess Road). An extractor fan system with the attenuator for the kitchen of the premises will be installed on the rear ground floor wall of premises as shown in **Appendix F**. The details of the extractor fan unit are as follow: **Helios GigaBox centrifugal fan 560mm (GBW 560/4)**. The details of the fan and attenuator are given in **Appendix B**.

Anti-vibration mounts will be used to provide isolation from vibration and noise via high resilience rubber. These isolation products provide high levels of reduction in vibration.

4.2. Measurement equipment

A description of the equipment used for the noise survey are given in the Table 1.

Table 1: Description of the equipment used for measurements

Equipment	Description	Quantity	Serial No
Norsonic SLM	Type 1 sound level meter, NOR140	1	1402815
Norsonic	½ inch microphone	1	1225
Norsonic	Preamplifier	1	1209
Norsonic Calibrator	Class 1 Calibrator (114 dB)	1	Nor-1251-32462

4.3.Parameters measured

BS4142:2014+A1:2019 gives a method for assessing the impact of specific sounds based upon the amount, in dB, that a specific sound level exceeds the background sound level, taking into account the context of the situation. The standard requires measurement of the **specific sound level**, in $L_{Aeq,T}$ over a period of 1 hour (daytime) and 15 minutes (night time), and the **background sound level**, L_{AF90}, when the specific sound is not in operation, the **residual sound level**, L_{Aeq}, when the specific sound is not in operation, and the background and residual sound should be measured at times which are **representative of and similar to** those at which the specific sound is in operation. Noise parameters were measured using a calibrated system over a period of the time that is representative of the worst-case condition. Ambient, background, and maximum noise levels were measured in 1/3 octave bands throughout the noise survey.

Weather conditions were noted to be 18 degrees Celsius with partly-cloudy skies at the beginning of the measurements with a light wind, which was less than 3 m/s, and 19 degrees Celsius at the end of the measurements with a cloudy sky and a wind, which was less than 4 m/s. These weather conditions were checked against and confirmed using the Meteorology Office mobile application available on smart phone technology.

The noise monitoring equipment was calibrated before and after the measurements. No significant drift was recorded during calibration as shown in Table 2.

Table 2: Calibration details

Measurement	Calibrator Ref Level (dB)	Level Before (dB)	Deviation Before (dB)	Level After (dB)	Deviation After (dB)
Day	114.0	114.1	0.10	114	0.00

4.4.Measurements

To undertake a BS4142:2014+A1:2019 assessment, it is necessary to measure the noise levels at the site to determine day noise levels. Day residual noise levels and background noise levels were measured at the rear of the site. The sound level meter was positioned at minimum 3.5 metres away from nearby walls/fences. The sound level meter was mounted onto a tripod at 1.4 metre above the rear terrace of the site as shown in **Appendix D**.

5. Noise survey results and observations

5.1 Results

A noise survey was carried out at the rear of the site. Detailed day noise level results are given below.

5.1.1 Day noise levels

Measured residual ($L_{Aeq,1h}$), and background ($L_{AF90,1h}$) levels are 51.9dB, and 49.2dB respectively. Highest L_{AMax}, was 76dB that was observed at 16:25 during measuring background noise levels. A comparison of L_{Aeq}, L_{AMax}, L_{A10} and L_{A90} results for day is given numerically in Table 3, and they are given graphically for day levels in Figure 1.

Table 3: Day Residual and Background Noise Levels measured at the rear of the site.

Recorded time	L_{Aeq}	L_{AFmax}	$L_{AF,10}$	$L_{AF,90}$
07:15	47.5	69.6	47.8	42.8
07:30	46	60.1	47.1	41.5
07:45	46.8	56.3	48.9	42.1
08:00	46.1	63.4	47.5	43.5
08:15	45.1	56.3	46.9	43.3
08:30	45.3	56.4	49.6	42.4
08:45	44.2	54.2	45.5	41.9
09:00	44.9	59.3	44.1	42.3
09:15	52.1	73.4	55	45
09:30	49.2	65.5	51.5	47.3
09:45	45	57.3	46.9	43.3
10:00	50	70.8	51.1	45.1
10:15	48.6	69.3	51.1	45.5
10:30	46.7	60.4	50.2	45.4
10:45	45.8	60.3	49.5	44.1
11:00	48.3	64.3	50.5	45.4
11:15	52.7	70.5	50.9	49.1

11:30	53.7	67.3	56.1	51
11:45	54.5	69.2	57	51.5
12:00	54.3	68.6	56.6	51.3
12:15	53	62.7	54.6	51.2
12:30	53.2	65.7	56	50.1
12:45	52.4	63.8	53.6	51
13:00	52	63.9	53	50.6
13:15	52.5	65.1	53.2	51.3
13:30	51.2	60.9	51.8	50.4
13:45	52.1	63.3	53.3	50.2
14:00	52.5	64.1	53.7	51
14:15	54.3	66	56.3	50.9
14:00	52	58.5	53.4	50.7
14:45	52	63	53.1	50.7
15:00	52.2	65.1	53.6	50.6
15:15	51.5	57.5	52.8	50.3
15:30	52.3	57.4	53.4	51.2
15:45	52.5	63.9	53	51
16:00	53.4	73.4	54.9	50.4
16:25	53.4	**76**	53.2	51.2
16:40	53	70	53.7	51
16:55	52.6	63.6	54.3	50.5
17:10	53.3	62.8	55	51.4
17:25	54.3	68.4	55.6	51.3
17:40	55.4	70.5	59	47.2
17:55	56.3	67.3	60.1	47.3
18:10	53.5	67	56.9	48.1
18:25	53.2	66.7	55	48.7
18:40	53.8	64.9	55.6	51.7
18:55	55.4	69.2	58.1	51.4
19:10	54.5	67.9	56	50.8
19:25	52.8	65.9	53.8	51.4
19:40	52.5	65.1	53.2	51.1
19:55	52.3	62.7	53.8	49.5
20:10	49	69.3	50.5	44.6
20:25	48.6	57.3	50	46.4
20:40	52.6	65	54	48.6
20:55	52.6	65.3	53.7	51
21:10	52.5	62.5	53.7	50.7
21:25	51.3	65.6	53.6	47.7
21:40	50.9	65.5	52.4	48
21:55	50.7	63.1	52	47.9
22:10	51.7	72.3	52.7	47.5
22:25	48.4	58.6	49.2	47.4
22:40	50.6	60.9	52.1	47.6
22:55	49.2	54.3	50.4	48
23:10	47.1	58.5	49.2	48.3
Average	**51.9**	**67**	**53.8**	**49.2**

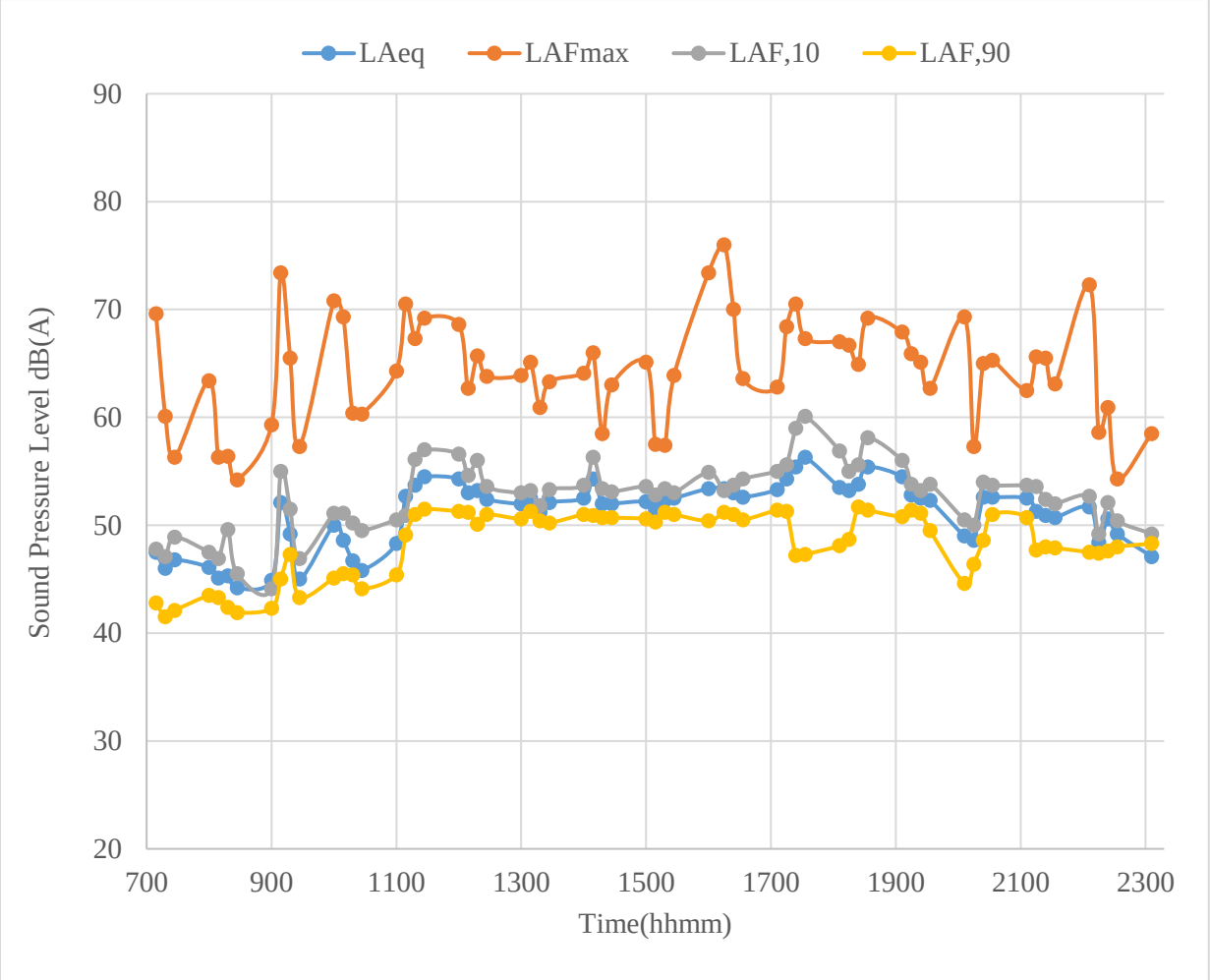


Figure 1: Day Sound Pressure Levels measured at the rear of the site.

5.1.1.1 Objective method to determine noticeable characteristics

Section B.2.1.1 of BS4142:2014+A1:2019 states "Establish whether standing waves/interference patterns are present by considering the nature of the source and the influence of any nearby sound reflecting surfaces. This can be carried out subjectively by listening in several places around the measurement location, or by measuring any change in sound pressure levels with a sound level meter at different locations in the immediate locality when traversing the measurement location".

Section 9.3 of BS 4142:2014+A1:2019 states that if the subjective method is not sufficient for assessing the audibility of tones in sound or the prominence of impulsive sounds, use the one-third octave method in 9.3.2.

Annex C of BS 4142:2014+A1:2019 states that the test for the presence of a prominent, discrete-frequency spectral component (tone) typically compares the $L_{Zeq,T}$ sound pressure level averaged over the time when the tone is present in a one-third-octave band with the time-average linear sound pressure levels in the adjacent one-third-octave bands. For a prominent, discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by some constant level difference.

The level differences between adjacent one-third-octave bands that identify a tone is:

- ***15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);***
- ***8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz); and***
- ***5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz).***

The proposed extractor fan system is a brand-new system. Therefore, no acoustic features (tonality, impulsivity, and intermittency) are expected from the new extractor fan system.

5.2 Observations

Attended environmental noise measurements were carried out at the site. Observations and detailed notes were made of the significant noise sources, which contribute to each of the measured levels.

Road traffic noise: Road traffic noise from Fortess Road was audible at the monitoring locations but it was not subjectively loud during the measurements.

People noise*:* The noise from people shopping and walking by was not audible at measurement location.

Site sound sources: The noise from sound sources of the site was not audible at measurement location.

Neighbourhood s*ound sources*: The noise from mechanical units of neighbour shops (extractor fan from 151 Fortess Road) was audible at measurement locations and it was subjectively loud during the measurements.

5.3 Uncertainty

The levels of uncertainty in the data and calculations are low given the robust measurements undertaken in noise monitoring and the confidence in the data statistical analysis.

6 Noise Impact Assessment

6.1 BS4142:2014+A1:2019

BS4142:2014+A1:2019 provides guidance on the assessment of the likelihood of complaints relating to noise from industrial sources. The key aspects of the BS4142:2014+A1:2019 are summarised below. The standard presents a method of assessing potential noise impact by comparing the noise level due to industrial sources (the Rating Level) with that of the existing background noise level at the nearest noise sensitive receiver in the absence of the source (the Background Sound Level). The Specific Noise Level - the noise level produced by the source in question at the assessment location - is determined and a correction applied for certain undesirable acoustic features such as tonality, impulsivity or intermittency. The corrected *Specific Noise Level* is referred to as the *Rating Level*.

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) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
b) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
c) 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.
d) 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.

BS4142:2014+A1:2019 criteria are given below.

Difference between the rating level and the background level	Assessment (All dependant on the context)
Around 10 dBA or more	*Indicates a significant adverse impact*
Around 5 dBA	*Indicates an adverse impact*
Below 5 dBA	*Lower the adverse impact*
Below 0 dBA	*Low adverse impact likely*

6.2 BS8233: 2014 Noise Assessment Criteria

For desirable internal and external noise levels to be maintained, given in BS8233:2014 as:

- 35dB $L_{Aeq,16hr}$ within living rooms (07:00 – 23:00).
- 30dB $L_{Aeq,8hr}$ within bedrooms (23:00 – 07:00).
- 45dB L_{Amax} should not be regularly exceeded within bedrooms (23:00 – 07:00).
- <55dB $L_{Aeq,16hr}$ within external amenity spaces.

6.3 Assessment

6.3.1 Day noise impact

Specific noise level from the proposed extractor fan that will be installed on the rear wall of the site is 44dB(A) as calculated in **Appendix B**. No tonality and impulsivity are expected from brand new extractor fan. The rating level $L_{Aeq\ Tr,1h}$ is equal to the specific noise level.

Day rating level $L_{Aeq\ Tr,1h}$ = 44 dB(A)

6.4 Distance attenuation

The noise sensitive receptors to noise sources were noted to be window of first floor flat of 153 Fortess Road first floor flat above the site) and window of second floor flat of 153 Fortess Road (second floor flat above the site). The noise levels at window of the noise sensitive receptors can be predicted using outdoor sound propagation equation given below.

$$L_{\mathrm{Aeq,Tr}} - L_{\mathrm{Receptor}} = 20\log\left(\frac{r_2}{r_1}\right)$$

- Distance attenuation at 4.7 metres (window of first floor flat of 153 Fortess Road) from discharge of noise sources is 13.4dB(A) using a 1 metre distance from the noise source.
- Distance attenuation at 7.7 metres (window of second floor of 155 Fortess Road) from discharge of noise sources is 17.7dB(A) using a 1 metre measurement distance from the noise source.

6.5 Barrier attenuation

Screening of the noise units to prevent line of sight to the sound source would reduce noise levels at the receivers. *Theory of outdoor sound propagation suggest that if the line-of-sight is significantly cut by a barrier/wall then a 10 dB(A) reduction can be expected.*
If the line-of-sight is just cut by a barrier/wall, then a 5 dB(A) reduction might be expected.
The line of sight of windows of first and second floor flats at 53 Fortess Road is significantly cut by the rear wall then a 10dB(A) reduction can be expected.

6.6 Sound Insulation

6.6.1 Sound Insulation Assessment

The floor above the site is used for residential purpose. A visual inspection of the building and shop was conducted. Sound insulation performance of the proposed ceiling scheme is given in Appendix E.

The Approved Document E states that "**The scheme shall achieve a minimum airborne sound insulation value of 43 dB(A) (D_{nTw} + C_{tr} dB) for all floors. Following approval and implementation of the scheme, a test shall be undertaken to demonstrate that the attenuation measures carried out as part of the approved scheme are effective and achieve the specified criteria. All works, which form part of the approved scheme, shall be completed before the use commences**". $D_{nT,w}$ is the standardised level difference measured on-site.

With the regard to noise emanating from the shop to noise sensitive flat above the site, BS 8233:2014 states "Airborne sound insulation is mainly considered for intermediate floors between spaces containing either noise sources or noise-sensitive occupants. For a ground floor where there is neither an appreciable noise source nor a noise-sensitive occupant below the floor, the floor is only of interest if it could contribute to flanking transmission".

It is predicted that the highest internal ambient noise level generated inside seating area of proposed shop will be 85dB(A) during busiest times of operation. This specific internal ambient noise level is considered for worst-case noise level in the shop.

The assessment based on the predictions, using the properties of proposed multi-layer ceiling as showing in Figure 2, has demonstrated that the sound insulation value of multi-layer ceiling scheme is significant. Proposed multi-layer ceiling scheme will reduce noise level by 60 dB(A) that is higher than required minimum sound insulation value of 43 dB(A) which is set by Approved Document E. This will contain noise from the private dining areas and non-dining areas within the premises. See the details of the prediction method given in Appendix E.

To control the transfer of noise from the shop to the flat above the site, a multi-layer ceiling build up shown in Figure 2 has been suggested. Existing air cavity, timber batten, and plasterboard should be covered using 30 mm acoustic dense plasterboard. Multi-layer ceiling should be finished with 20mm fire rated dense plasterboard separated from acoustic panel by 50mm air cavity as shown in Figure 2.

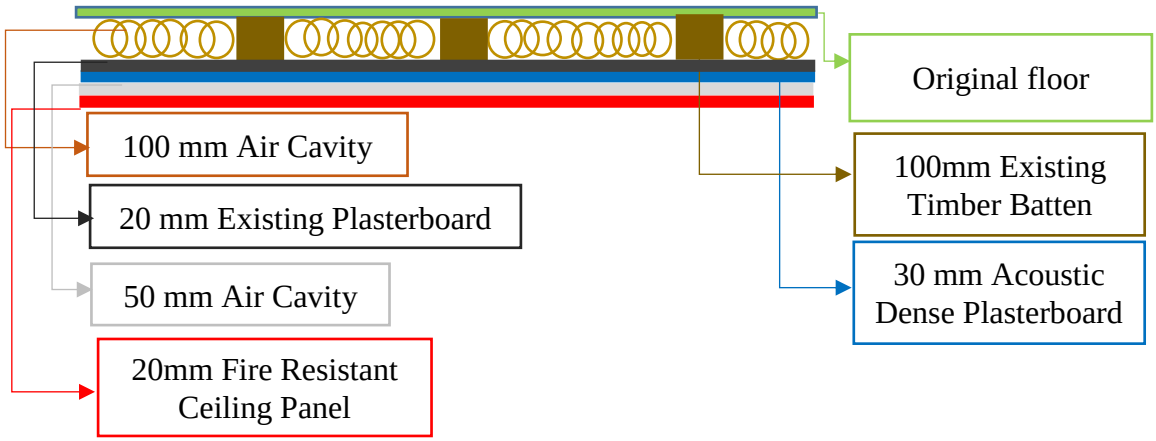


Figure 2: Suggested multi-layer ceiling scheme for additional sound insulation.

6.6.2 Sound Insulation Assessment Outcome

It is determined that by applying the mitigation as specified above for the building ground floor (shop) ceiling, the outcome summarised in the following Table 4 is achieved.

Table 4: Noise Assessment Outcome

Internal Space	Noise Parameter	Internal Noise Level	BS8233 Limit	Within Desirable Limit (BS8233)
Flat above the shop (Living Room)	Daytime $L_{Aeq,16hr}$ (dB)	25	35	**Yes**
Flat above the shop (Bedroom)	Daytime $L_{Aeq,16hr}$ (dB)	25	30	**Yes**

6.7 BS 4142:2014+A1:2019 Assessment for nearest noise sensitive receptors

6.7.1 153 Fortess Road (First floor flat window)

The predicted Rating Level $\boldsymbol{L_{Aeq,Tr}}$at the receptor is 31.6dB(A) below background noise level at the top-floor window level of noise sensitive receptor for day as calculated in table below. In accordance with BS4142:2014+A1:2019 guidance and criteria, ***the rating level does not exceed the background sound level. This is an indication of the specific sound source having a low adverse impact (low adverse impact likely)***.

BS4142:2014+A1:2019 Assessment- Daytime	**dB(A)**
Specific Sound Level	**44**
Characteristic penalty	0
Façade correction	-3
Distance attenuation at 4.7	-13.4
Line-of-site cut significantly (wall/barrier attenuation)	-10
Rating Level at receptor point	17.6
Daytime background level, L_{A90}	**49.2**
Difference between rating level and background level	**-31.6**

6.7.2 153 Fortess Road (second floor flat window)

The predicted Rating Level $\boldsymbol{L_{Aeq,Tr}}$at the receptor is 35.9dB(A) below background noise level at the top-floor window level of noise sensitive receptor for day as calculated in table below. In accordance with BS 4142:2014+A1:2019 guidance and criteria, ***the rating level does not exceed the background sound level. This is an indication of the specific sound source having a low adverse impact (low adverse impact likely)***.

BS4142:2014+A1:2019 Assessment- Daytime	**dB(A)**
Specific Sound Level	**44**
Characteristic penalty	0
Façade correction	-3
Distance attenuation at 7.7	-17.7
Line-of-site cut significantly (wall/barrier attenuation)	-10
Rating Level at receptor point	13.3
Daytime background level, L_{A90}	**49.2**
Difference between rating level and background level	**-35.9**

6.7.3 External Noise levels (153 Fortess Road, first floor flat rear terrace)

BS8233:2014 provides a desirable guideline of 50dB $L_{Aeq,16hr}$ for external amenity spaces and an acceptable guideline of 55dB $L_{Aeq,16hr}$ for noisier environments. Nearest external amenity

space is rear terrace of first floor of 153 Fortess Road, which is approximately 1meter from the discharge of the extractor fan unit. The predicted daytime Rating Level $L_{Aeq,Tr}$ at the external amenity space of 153 High Street, first floor flat is 34 dBA. Therefore, Rating Level $L_{Aeq,Tr}$ at the external amenity space is in the desirable category of BS8233:2014.

BS8233:2014 Assessment- Daytime	**dB(A)**
Specific Sound Level	**44**
Characteristic penalty	0
Façade correction	0
Distance attenuation at metre	0
Line-of-site cut significantly (wall/barrier attenuation)	-10
Rating Level at receptor point	**34**

7. Vibration

In addition to the control of airborne noise transfer, it is important to consider the transfer of noise as vibration to adjacent properties as well as any sensitive areas of the same building. The proposed extractor fan at the site will be installed with proper vibration dampening connections and with rubber anti-vibration mounts with extractor fan mounting feet and flanges on the rear wall of the site. Vibration isolation products provide high levels of reduction in vibration.

8. Control of odour from commercial kitchen exhaust system

The café is proposing the installation of an extraction system and flue. Surrounding properties include residential and commercial properties. The kitchen extract flue discharges at a height of approximately 1.1 metre above the edge of the roof. The design given in Figure 3 currently show the flue terminating with extract duct curved at the outlet grill.

The first stage of odour control is to use an Electrostatic Precipitator model ESP 1500E unit for oil, grease and smoke removal. More detail for ECP could be found in **Appendix C**.

The second stage of odour control is to use Carbon Filters 605 x 750 x 1200 from Purified Air Ltd. Carbon filters use panels of activated carbon to remove the malodourous gases within the commercial kitchen extract duct through the process of chemical adsorption.

By installing ESP units before carbon filters, the carbon life span is greatly increased, allowing it to nullify malodours at optimum efficiency for much longer.

It is advised that a service maintenance contract should be taken out to enable engineers to carry out the necessary services. Internals of the maintenance depend on how aggressive the cooking is. We would probably advise every 12 weeks to start with, it could be increased or decreased depending on engineer's recommendation. In addition, we would advise the carbon filters could be replaced with a new filter every 26 weeks, based on engineer's recommendation.

The proposed kitchen ventilation system Helios GBW 560/4 fan through ductwork discharging vertically at least 1 metre above the edge of the roof that has ESP followed by carbon filtration will be able to control odour from commercial kitchen exhaust systems.

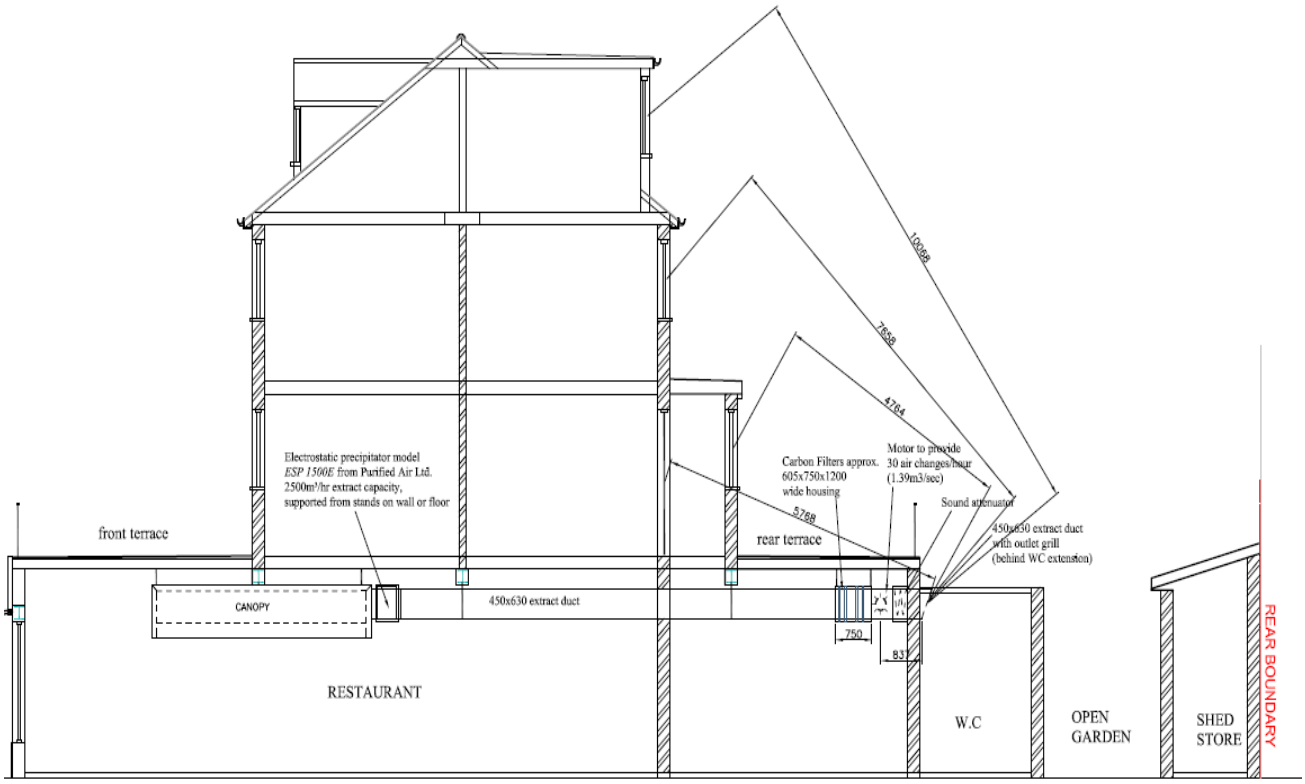


Figure 3: The design of proposed ventilation system for the kitchen (**see Appendix-F for more details**).

9. Conclusion

An environmental noise survey was undertaken at the site in order to determine prevailing day noise levels that are representative of the nearest noise sensitive neighbouring residential receivers. A BS4142:2014+A1:2019 noise assessment was carried out at the site. All worst-case situations were considered for the assessment.

The summary of the difference between the Rating Level and Background Noise Level of noise sensitive receptors, and also external noise levels is given in table below.

Noise sensitive receptor	**Difference between The Rating Level and Background Level**
	Day
153 Fortess Road (First floor window)	– 31.6dB(A)
153 Fortess Road (Second floor window)	– 35.9dB(A)
	External Noise levels
153 Fortess Road First Floor Rear Terrace	34dB(A)

In accordance with BS4142:2014+A1:2019 guidance, the day Rating Level at nearest noise sensitive receptors does not exceed the background sound level as shown in Table above. Therefore, the operation of the proposed extractor fan indicates the specific sound source having a low adverse impact during daytime.

The predicted daytime Rating Level $\boldsymbol{L_{Aeq,Tr}}$ at the external amenity space, rear terrace, of First Floor of 153 Fortess Road is 34dB(A). The Rating Level $\boldsymbol{L_{Aeq,Tr}}$ 34dB(A) at the external amenity space does not exceed 50dB(A) $L_{Aeq,16hr}$ of desirable category of BS8233:2014.

It can be confirmed that the Rating Levels of the proposed extractor fan is expected to comply with BS4142:2014+A1:2019 guidance.

A rigorous calculation method that is given in BS8233: 2014 was applied to determine interior noise levels of the flat above the shop by using predicted internal noise level 85dB(A) in the shop, measured environmental noise levels, and suggested multi-layer ceiling. Calculations show the ceiling scheme reduces sound transmission by 60dB(A), which achieves minimum airborne sound insulation value of 43dB(A) ($D_{nTw} + C_{tr}$).

In accordance with BS8233:2014 guidance; the predicted daytime internal noise level in the flat above the shop is 25dB(A**)** $L_{Aeq,16hr}$ and it is within the desirable category of 35dB(A) for living rooms and 30dB(A) for bedrooms.

10. References

- BS4142:2014+A1:2019 “Methods for rating and assessing industrial and commercial sound”.
- BS8233:2014 “*Guidance on sound insulation and noise reduction for buildings*”.

11. Appendix A: Acoustic Terminology

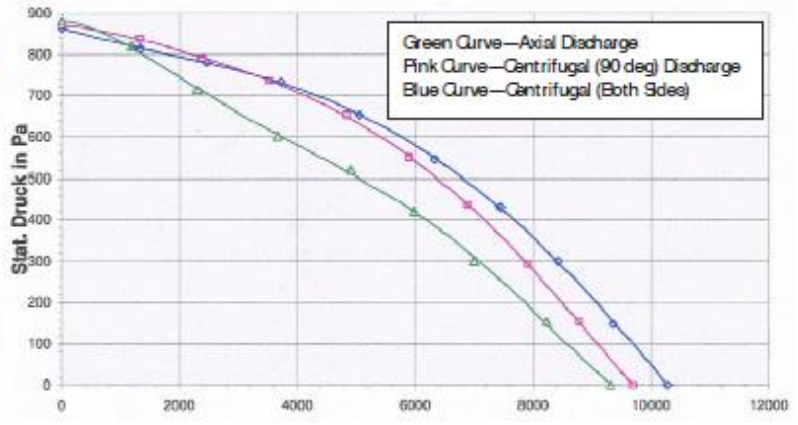
Parameter	**Description**
Decibel (dB)	A logarithmic scale representing the sound pressure or power level relative to the threshold of hearing ($20x10^{-6}$ Pascals).
Ambient noise level	The totally encompassing sound in a given $L_{Aeq,T}$ situation at a given time, usually composed of sound from many sources near and far.
Background noise level	The A-weighted sound pressure level of the $L_{A90,T}$ residual noise at the assessment position exceeded for 90% of a given time interval T, measured using the fast response and reported to the nearest whole dB.
Rating level $L_{Ar,T}$	The specific noise level plus any adjustment for the characteristic features of the noise.
Residual noise level	The ambient noise level at the assessment $L_{Aeq,T}$ position in the absence of the noise source under investigation.
Specific noise level	The equivalent continuous A-weighted noise $L_{Aeq,T}$ level produced by the source over a given reference time interval.
$L_{Aeq,T}$	The A-weighted equivalent continuous noise level over the time period T (typically T= 16 hours for daytime periods, T = 8 hours for night-time periods). This is the sound level that is equivalent to the average energy of noise recorded over a given period.
$L_{n,T}$	The noise level exceeded for n% of the time over a given period T. e.g., L90, the noise level exceeded for 90% of the time (background noise) level.
L_{Max}	The maximum noise level measured.

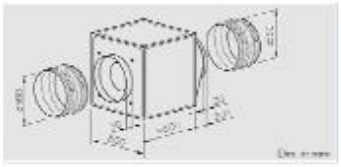
12. APPENDIX B: Details of extractor fan system, its sound power level and attenuator.

GigaBox centrifugal fan 560 mm ø

Helios

GBW 560/4





$\Delta p_{stat.}$ Pa

Frequency		Hz	Total	125	250	500	1k	2k	4k	8k
L_{WA}	Case breakout	dB(A)	64	64	64	48	50	46	43	37
L_{WA}	Intake	dB(A)	77	57	66	69	74	70	64	55
L_{WA}	Extract	dB(A)	81	62	74	75	75	74	70	61

Self supporting frame construction from aluminium hollow profiles. Double-walled side panels from galvanised sheet steel. Intake cone for ideal airflow, spigot and flexible connector for duct connection. With discharge adapter (square to circular) on the pressure side for low-loss discharge and flexible sleeve to reduce vibration transmission. Simple positioning by standard crane hooks. Installation must be carried out with condensation discharge showing downward. Flexible assembly by three possible centrifugal discharge directions via discharge adapter. Outdoor installation is possible using outdoor cover hood and external weather louvres (accessories).

Impeller:
Smooth running backward curved aluminium centrifugal impeller highly efficient and direct driven. Energy efficient with a low noise development. Dynamically balanced together with the motor to DIN ISO 1940 Pt.1 - class 6.3

Motor:
Maintenance free external rotor motor or IEC standard motor protected to IP44 and 54. With ball bearings and radio suppressed as standard.

Electrical Connection:
Standard terminal box (IP54) fitted on the motor support plate.

Motor Protection:
Motors have thermal contacts wired to the terminal block and must be connected to a motor protection unit.

Speed Control:
Speed controllable by voltage reduction using transformer controller.

Type	Ref. No.	R.P.M.	Sound Level	Motor power (nominal)	Current Full Load	Maximum air flow temp.	Nom. weight (net)	5 step trans. controller	
		min^{-1}	dB(A) at 1 m	kW	Amps	+°C	kg	Type	Ref.
GBW 560/4	5508	1370	44	2.0	8.7	60	90	TSW 10	1498

Volume Flow m3/s against static pressure

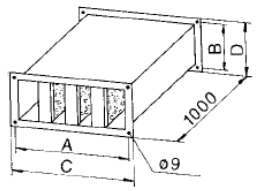
0	50	100	150	200	250	300	400	500	600	700	800
2.77	2.72	2.55	2.48	2.41	2.31	2.22	2.0	1.72	1.44	1.00	0.36

Type Ref.

Helios

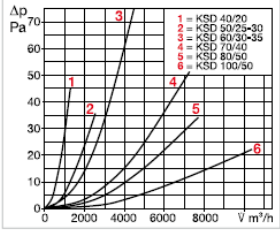
KSD

Dimensions KSD



Dim. in mm see table

Pressure loss KSD



Rectangular duct silencer KSD

Design – Installation
Casing made of galvanised steel sheet, with connection flanges, dimensionally matched to the rectangular duct fans, for insertion on the inlet and outlet side of the rectangular duct system. The silencers upstream or downstream of the fan must be provided with a flexible connector (VS or VS Ex) to the further duct system to prevent structure-borne noise transmission.

Pressure loss
Rectangular duct silencers cause flow resistances (adjacent diagram) which must be taken into account for the design. These values apply for uniform flows. In case of non-uniform flows (e.g. for the outflow from rectangular duct fans), a straight duct piece at least 1 m in length must be used or allow for higher resistances.

Reference	Page
Selection - noise calculation	494

Type	Ref. no.	Nom. duct size in cm	No. links	Dimensions in mm A	B	C	D	Weight approx. kg	Insertion loss D_e dB at Hz 125	250	500	1000	2000	4000	8000	Average loss
KSD 40/20	08728	40/20	3	420	220	443	240	13	8	11	23	31	31	26	18	17
KSD 50/25-30	08729	50/25-30	3	520	270/320	540	340	16.5	6	9	19	25	25	20	15	14
KSD 60/30-35	08730	60/30-35	4	620	320/370	640	390	20	7	10	21	28	28	23	16	12
KSD 70/40	08731	70/40	4	720	420	740	440	25	6	8	18	24	24	20	14	12
KSD 80/50	08732	80/50	5	820	520	840	540	31	7	9	19	26	26	21	15	14
KSD 100/50	08733	100/50	5	1020	520	1040	540	35	5	7	16	21	21	17	12	11

Sound pressure level of the fan extractor system at façade level.

$$L_P = L_W - 20\log(r) - 11 - L_{Attenuator}$$

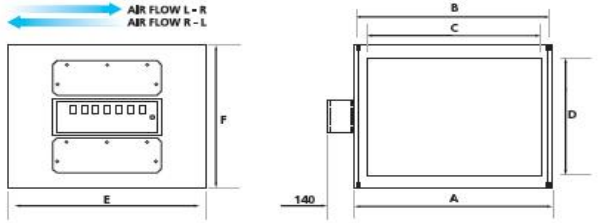
Fan noise	**125**	**250**	**500**	**1000**	**2000**	**Overall (dB)**
Exhaust L_W dB(A)	62	74	75	75	74	
2x Attenuator dB(A)	14	20	42	56	56	
L_P dB(A) 1m from the façade using the equation given above	37	43	22	8	7	**44**

13. APPENDIX C – Electrostatic Precipitation (ESP) Filter Unit & UV-C Odour Control Technology

Technical Specifications

Six ESP and Three UV-C modules installed as an integrated system.

The Purified Air system modular is designed to be able to incorporate up to three racks of six lamps. The unit can be stacked as with our ESP range to accommodate higher airflows.



UVC 3000				UVC 4500			
A - Width	950mm	D - Height	530mm	A - Width	1400mm	D - Height	530mm
B - Width	900mm	E - Depth	810mm	B - Width	1350mm	E - Depth	660mm
C - Width	800mm	F - Height	630mm	C - Width	1250mm	F - Height	630mm

Electrical Supply	220/240v 50Hz 1ph	Weight Per Rack	16 Kg.
Power Consumption	500w (Per rack of Six lamps)	Min/Max Working Temperature	4/56°C
Weight Unit	105 Kg.	Maximum Relative Humidity	75%

The design of cooking exhaust control systems varies. Different types of cooking and location have separate requirements and may require additional equipment. The equipment in this brochure is designed to be used in conjunction with other items of our manufacture. Purified Air Limited offer a free consultation service and will assist you with design, please discuss your project with us before selecting equipment.

Installation of grease smoke and odour equipment must be made on the negative side of the fan and the systems must be switched via an interlock to ensure they are only operational when the extract fan is operational. If there is ductwork inside the premises on the positive side of the fan please ensure that it is completely sealed so as not to let fumes or odour control compounds back into the premises. In certain instances some equipment can be installed on the positive side of the fan but please discuss this with our technical department and ask them to provide a design statement to confirm that it can be done.

purified air®
providing a better environment

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JULY 2009

UV-C Odour Control Technology

purified air®
providing a better environment

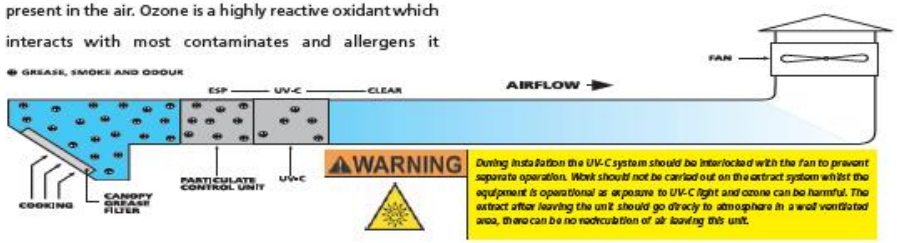
Purified Air Systems...

...market leaders in odour control for the food service industry

The emission of cooking odours from commercial kitchens is becoming an increasingly important environmental issue, as well as having a significant influence on the granting of planning permission for new restaurants. UVC Technology from Purified Air uses UV-C (ultra-violet light) to eliminate cooking odours and alter the make up of grease to a better-managed compound.

How UV-C Technology Works

UV-C technology is based on the synergy, which occurs when ozone and ultra-violet light are combined and the Purified Air modular system features six to eighteen high output UV-C lamps. These lamps act to oxidise odours and grease permanently destroying and altering the compounds. Some of the lamps are designed to produce UV light at 185nm, which converts ozone from the oxygen present in the air. Ozone is a highly reactive oxidant which interacts with most contaminates and allergens it encounters rendering them harmless, and at the same time removes odours. The remaining lamps in the system combine to produce UV light at 254nm, the most efficient UV-C wave length, which converts the ozone to hydroxyl free radicals. Purified Air's UV-C odour control system also features a photo catalytic liner, which enhances the production of hydroxyl free radicals. Free radicals are natural air cleansing agents and are strong oxidants. They are significantly more powerful than plain ozone.



Safety

Band C ultra-violet light is the most powerful of the three bands, so to ensure the safety of customer's employees the UV-C technology is secured behind locked panels. The system has also been engineered to shut down automatically when the panel is unlocked. However, since the lamps typically have a life of twelve months and with the system able to operate even if one lamp fails at optimum efficiency it is unlikely that, apart from routine servicing by experienced engineers, the system will ever need to be opened. As an option Purified Air's UV-C system can also be fitted with a self-diagnostic module, which constantly monitors the unit to ensure no installation or component failure

Electrostatic Precipitator (ESP)

UV-C technology cannot remove smoke, for instance where there is a lot of smoke produced due to the cooking style, for example char-grilling. Then Purified Air recommends that the UV-C system be used in conjunction with a filtration system such as their Electrostatic Precipitator (ESP).

Purified Air's highly efficient ESP range cleans the kitchen extract emissions of both smoke and grease and can remove particulate down to sub-micron (0.01 micro) size. Filter efficiency of 98% is attained during a single pass through the ESP, based on the charging of particles. These particles are then trapped on the earthed plates in the collector cell with larger particulate in the air stream removed by the pre-filter. Lastly the air stream passes through an after-filter to prevent re-entrainment and provide good air distribution.

Main Features

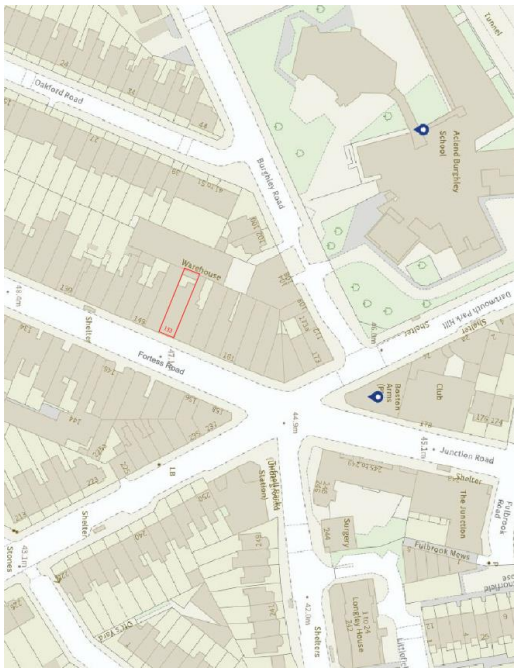
- **High efficiency UV-C technology**
- ***Cooking odour's reduced by up to 95%**
- **Grease altered to better managed compound**
- **Robust, compact construction**
- **Twelve month lamp life**
- **Minimum maintenance**
- **High security - UV-C lamps locked behind panels**
- **Optional self-diagnostic system**

This unit's tried and tested UV-C technology allows for the siting of commercial kitchens in locations such as residential areas and shopping centres, where previously planning permission would not have been granted.

After extensive research and development Purified Air devised the best combination of lamps at different wave lengths, which when combined with the photo catalytic liner provides the most effective odour control.

*Odour reduction is dependant on type and volume of cooking

14. Appendix D: Measurement set-up and images of equipment used for environmental noise survey

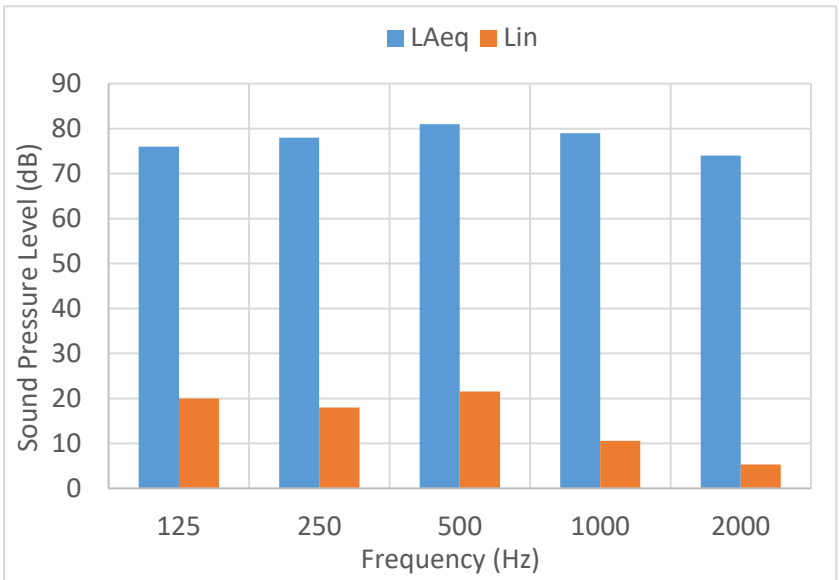


15. APPENDIX E - BS8233:2014 Specification Calculations / Construction Details

BS8233: 2014 Specification Calculation Summary;

Flat above the proposed shop, FLOOR/CEILING

		Sound Insulation Properties					
Room Width (m)	5.4	Frequency, Hz	125	250	500	1k	2k
Room Depth (m)	13	Wall, Rw,Ctr (dB)	48	53	53	62	62
Room Height (m)	2.8	Shop Ceiling , Rw,Ctr (dB)	48	53	53	62	62
Glazed Area (m2)	4.5	Glazing, Rw,Ctr (dB)	27	29	36	41	52
Is dwelling on top floor?	Yes	Vents, Dnew,Ctr (dB)	42	43	43	49	64



External Level (Inside flat above the shop)	25 dB L_{Aeq}
Internal Level (shop)	85 dB L_{Aeq}
Insertion Loss	60 dB L_{Aeq}

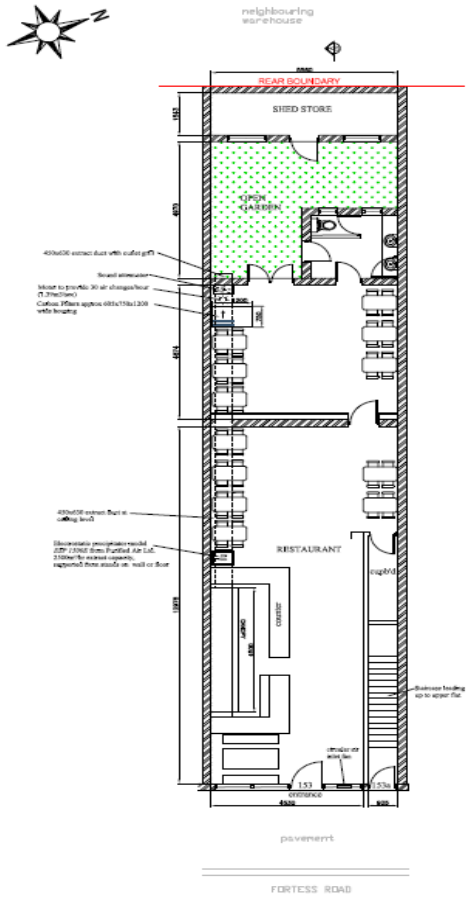
Sound Insulation Requirement			
Minimum Sound Insulation Requirement Approved Document E			Suitable Systems
Ceiling/Floor	**43**	dB ($D_{nTw} + C_{tr}$)	Original floor of the flat, 100 mm Mineral Wool Quilt, 30mm Acoustic Dense Plasterboard, 50mm Air Cavity, 20mm Fire Resistant Floating Panel.

	Transmission coefficients				
Frequency, Hz	**125**	**250**	**500**	**1k**	**2k**
Vents	0	0	0	0	0
Glazing	0	0	0	0	0
Wall	0	0	0	0	0
Ceiling (Shop)	1.58489E-05	5.01E-06	5.01E-06	6.31E-07	6.31E-07
Internal/Shop, L_{Aeq} (dB) A	76	78	81	79	74
External (inside flat), L_{Aeq} (dB)A,	20	18	21.5	10.5	5

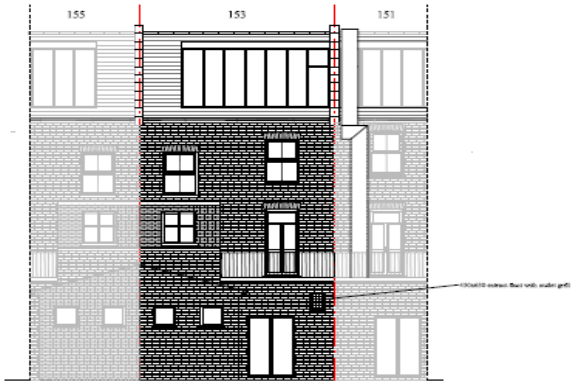
Calculations are conducted in accordance with BS8233: 2014 rigorous calculation method:

$$L_{eq,2}=L_{eq,ff}+10\log\left(\frac{A_0}{S}10^{\frac{-D}{10}}+\frac{S_{wi}}{S}10^{\frac{-R_{wi}}{10}}+\frac{S_{ew}}{S}10^{\frac{-R_{ew}}{10}}+\frac{S_{rr}}{S}10^{\frac{-R_{rr}}{10}}\right)+10\log\left(\frac{S}{A}\right)+3$$

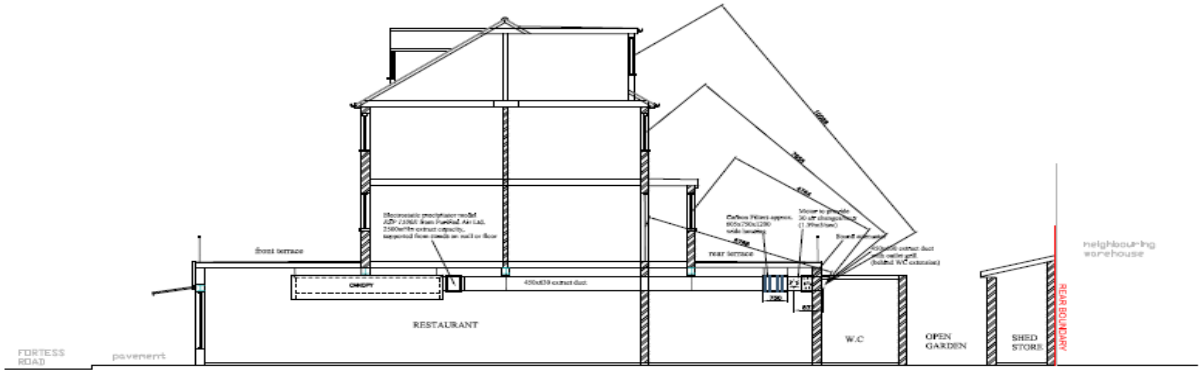
16. Appendix F: Ventilation extractor system



PROPOSED GROUND FLOOR PLAN



PROPOSED REAR ELEVATION



PROPOSED CROSS SECTION A-A

SIZE—A2

1:100

Location	Project	Drawing Title	PLANNING	Scale : 1:100@A2	Date : OCT 2024
153 FORTESS ROAD LONDON NW5 2HR	INSTALLATION OF ESP VENTILATION EXTRACT SYSTEM IN GROUND FLOOR RESTAURANT	PROPOSED GROUND FLOOR PLAN & CROSS SECTION & REAR ELEVATION		Drawing number SE/153FR/02	Rev —