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Environmental Noise Assessment

2nd March 2021

Proposal Number:	21403-1
Client:	Sugarland Associates Ltd
Site Address:	166 High Street Ruislip

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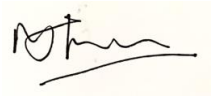
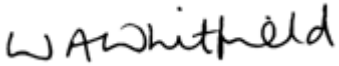
https://www.ukas.com/wp-content/uploads/schedule_uploads/00002/2694Testing%20Multiple.pdf

1. Quality Management

Report Number	21403 - 1
Issue	Issue 1
Prepared	2nd March 2021
Prepared By	 Matt Torjussen CEng, MIOA
Authorised By	 Bill Whitfield PhD, MSc, MIOA

2. Executive Summary

An environmental noise assessment has been carried out for proposed new and relocated fixed plant at a refurbished and extended restaurant at 166 High Street, Ruislip.

2.1. Measurement, Assessment and Evaluation

The survey was carried out to BS7445-1:2003[1] and BS7445-2:1991[2] which are covered under our UKAS Accreditation.

The interpretation of the data and the specification of suitable mitigation or treatment are outside the scope of our UKAS accreditation but is covered in our 17025 Quality Management System and reporting procedure.

2.2. Scope

This report covers all aspects of the noise assessment, including:

- the identification of acoustic design criteria;
- an objective sound pressure level survey of the existing site;
- analysis of the data,
- construction of a noise model,
- specification of required mitigation.

2.3. Consultant's Qualifications

The person responsible for this report is Bill Whitfield. They hold a Masters degree in Environmental Engineering and a PhD in Acoustics from the University of Liverpool. They have more than 30 years of experience in acoustics and are a full corporate member of the Institute of Acoustics.

The survey technician who carried out the survey was Matt Torjussen. They hold a Masters degree in Sound and Vibration Studies from the University of Southampton, have 15 years of experience in acoustics, are a Chartered Engineer and a corporate member of the Institute of Acoustics.

2.4. Conclusion

Treatment has been specified to mitigate and minimise the impact of the specific sound on the nearest residential receivers. This includes: relocating the supply fan inlet, extractor hood exhaust and the air-conditioning condenser unit, as well as providing an additional 10dB attenuation to the supply fan inlet.

With the proposed treatment, the rating level is not expected to exceed the existing typical background sound level, which is likely to result in a ''low impact'' on the nearest residential receivers.

Taking into account the context of the situation, it is likely that the BS4142 numerical assessment outcomes are robust and that the proposals would be a significant improvement, in noise terms, compared to the existing situation.

[1] BS7445-1:2003 ''Description and measurement of environmental noise – Part 1: Description of quantities and procedures''

[2] BS7445-2:1991 ''Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use''

3. Limitations

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The methodology adopted and the sources of information used by Noise in providing its services are outlined in this report. The work described in this report was undertaken between the 23rd February 2021 and the 2nd March 2021 and is based on the conditions encountered and the information available up to the said date. The scope of this report and the services are accordingly factually limited by these circumstances.

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4. Contents

5. Background

5.1. Noise Policy Statement for England

The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise policy is to *''promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development''.*

This long-term vision is supported by the following aims; through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life;
- Where possible, contribute to the improvement of health and quality of life.

The intention is that the NPSE should apply to all types of noise apart from noise in the workplace (occupational noise).

5.2. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published on 19th June 2019 and sets out the Government's planning policies for England and how these are expected to be applied. The framework states that the planning system should contribute to and enhance the natural and local environment by:

''preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability''.

The NPPF requires that new developments be appropriate to their locations such that the effects of pollution on health have been taken into account. Planning policies and decisions should aim to:

- avoid noise giving rise to significant adverse impacts on health and the quality of life;
- mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development; and,
- identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value.

Existing businesses near to proposed development 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.

5.3. National Planning Practice Guidance

The National Planning Practice Guidance (PPG) is a web-based resource, launched by the Department for Communities and Local Government (DCLG), which was updated on the 22nd July 2019 to reflect the changes made to the NPPF and make it more accessible.[3]

There are a number of factors that determine whether a noise could be a concern to a receptor. These include: the absolute level of the noise and when it occurs, whether it is existing or new to the area, temporal characteristics, spectral content and the acoustic absorption in the area.

[3] http://planningguidance.communities.gov.uk/

Perception	Examples of outcomes	Effect level	Action
Not noticeable	No effect	No observed effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect (NOAEL)	No specific measures required
	Lowest Observed Adverse Effect Level (LOAEL)		
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
	Significant Observed Adverse Effect Level (SOAEL)		
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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
Noticeable and very intrusive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 – Noise exposure hierarchy

It is emphasised in the PPG that the planning process should be used to mitigate and minimise the impact of noise. This could include: engineering the noise sources to be quiet, minimising the impact of noise through layout, using conditions/obligations to restrict activities, mitigating the impact in places where noise is likely to be experienced (e.g. using facade sound insulation).

6. Introduction

noise.co.uk Ltd has been appointed by Sugarland Associates Ltd to carry out an environmental noise assessment of proposed new and relocated fixed plant serving a restaurant at 166 High Street, Ruislip. The changes are a result of a refurbishment and extension of an existing restaurant. The location of the restaurant has been illustrated in red Figure 1.

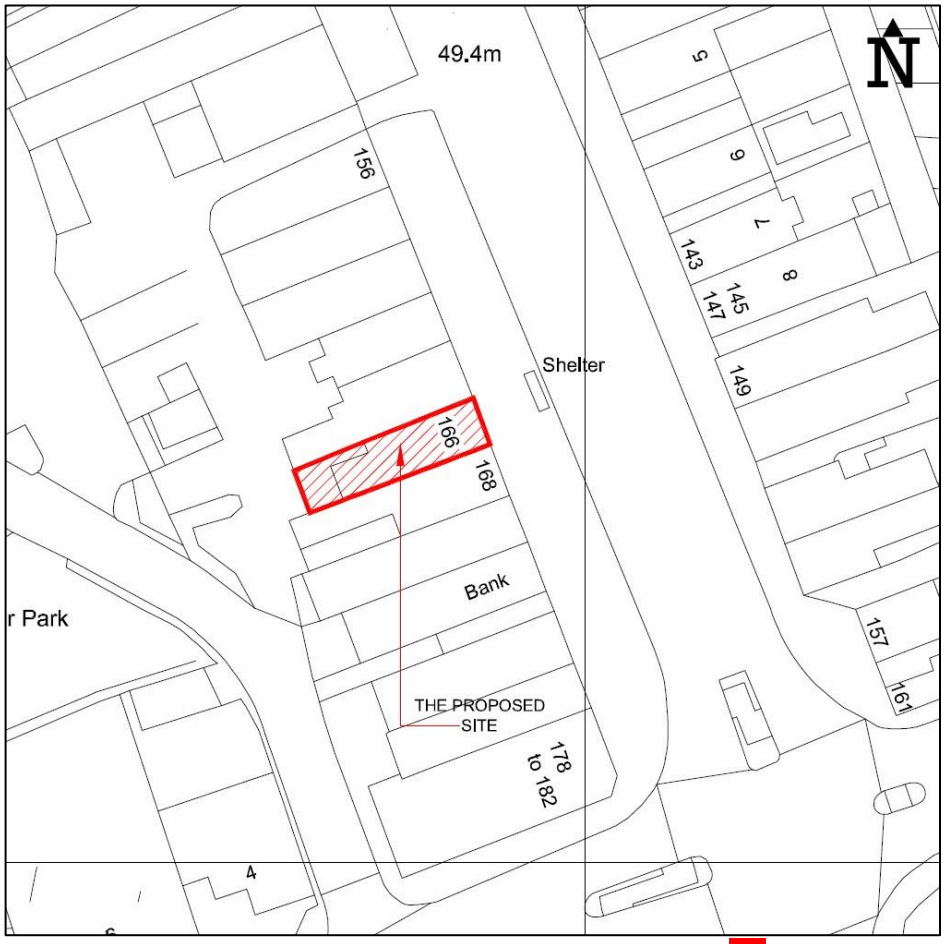


Figure 1 – Plan showing the location of the restaurant red

6.1. Nearby Residential Receivers

The nearest residential receivers to the new and relocated fixed plant would be the first floor flat immediately above the restaurant.

6.2. Noise Climate

The attending survey technician reported that, at the time of the survey visits, the noise climate was dominated by distant continuous road traffic noise from the surrounding road network. Transient noise was clearly audible from the car park at the rear of 166 High Street, Ruislip, which included deliveries from refrigerated articulated lorries.

⚠

The survey was carried out during a period where the UK Government had imposed restrictions to control the Covid-19 pandemic. This is likely to result in lower levels of road traffic noise and sound from the fixed plant of closed businesses. In the context of this assessment this is likely to result in lower than normal background sound levels, which would result in a more conservative assessment.

6.3. Existing Fixed Plant

The existing restaurant is served by the following items of fixed plant:

- Refrigerator condensers (2 off)
- Double air-conditioning condenser unit
- Cooker hood extractor

At the time of the survey these items had been electrically disconnected and could not be measured to determine their contribution to the existing background sound level; however, the context that there is existing plant should be considered as part of the assessment.

6.4. New/Relocated Specific Sound Sources

The proposed new items of fixed plant are new sources of specific sound. The type of fixed plant has been described in Table 3 and its location is shown in Figure 2.

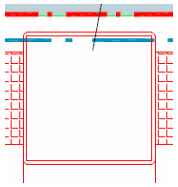
Plant Item	Illustration	Description
Mitsubishi Double Condenser Unit (Existing, to be relocated)		The label stating the model and serial number for this unit had been removed. Therefore, it has been assumed that it is **Mitsubishi PUHZ – ZRP125/140VKA,** which is widely used in takeaway restaurants. Assumed to operate 100% of the reference period. Assumed to operate in its loudest mode L_p = 52dB(A) re 20µPa @1m
Extract Fan Helios GBD 560/4		Assumed to operate for 100% of the time. Specific product sound power level data provided with octave band spectrum. L_W = 81dB(A) re 1pW Note: An exhaust silencer has already been specified
Supply Fan CBM-9/9 245W 6P T RE VR		Assumed to operate 100% of the reference period. L_p = 67dB(A) re 20µPa @1.5m

Table 2 - Summary of proposed new fixed plant equipment

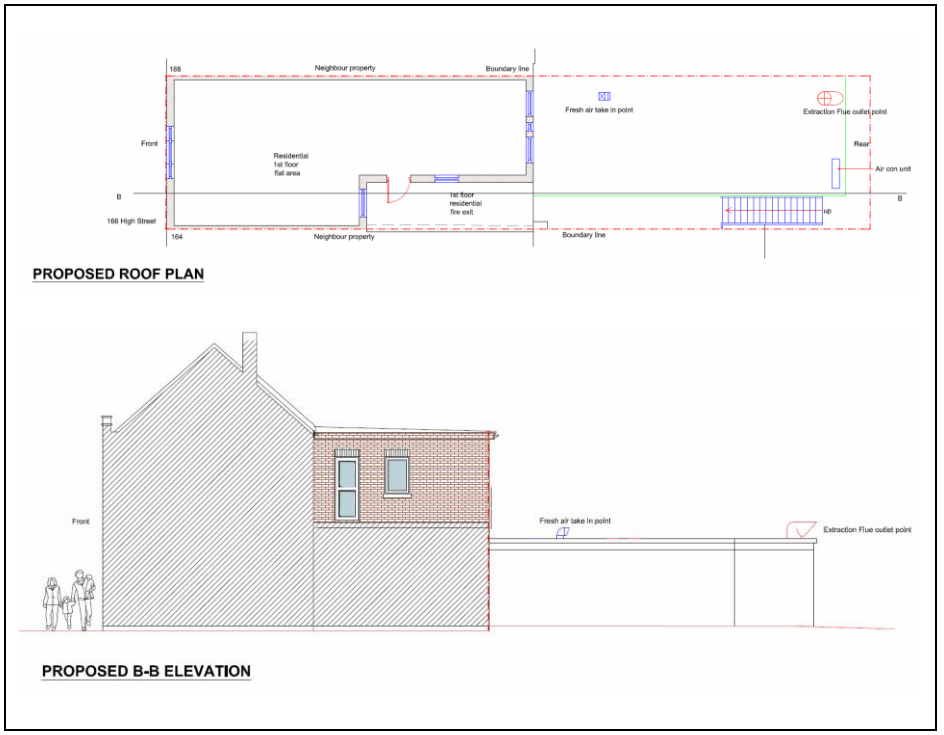


Figure 2 – Plans and elevations showing the location of the proposed new fixed plant (larger images can be found in the Appendix)

The manufacturer's data for the items of fixed plant has been reproduced in the appendix for reference.

It is possible that the restaurant could be open into the early hours of the morning; therefore, the background sound levels have been considered during both the daytime and the night-time.

7. Assessment Criteria

7.1. BS4142:2014

BS4142 provides methods for rating and assessing **specific sound sources** of an industrial and/or commercial nature, which includes: industrial and manufacturing processes, fixed services plant, sound generated by the loading/unloading of goods and sound from mobile plant/vehicles associated with industrial/commercial premises (e.g. fork-lift trucks). The **assessment location** is outside a residential receptor.

The standard is specifically precluded from being used to assess the likely impact inside a building or from the assessment of various sound sources for which other (more relevant) guidance exists, including: music/entertainment noise, noise from people and construction noise.

The foundation of the assessment is to establish the following quantities, either by measurement or prediction:

- **Ambient sound**: The overall sound at the assessment location
- **Residual sound**: The ambient sound without the specific sound source operating
- **Specific sound**: The ambient sound with the specific sound source operating, corrected for residual sound
- **Background sound**: Residual sound present for 90% of the time

Once the specific sound level has been determined, this must be corrected for the presence of acoustic features that are audible at the assessment location to determine the **rating level**:

Rating Level = Specific Sound Level + Character Corrections

Normally it is possible to carry out a subjective assessment of characteristics, based on the following correction guidelines:

- Tonality: +2dB for a 'just perceptible' tone, +4dB for 'clearly perceptible', and rising to +6dB for 'highly perceptible' tones.
- Impulsivity (rapidity of change and overall chance in level): +3 dB for 'just perceptible' impulsivity, +6dB for 'clearly perceptible', rising to +9 dB for 'highly perceptible' impulsivity.
- Intermittency: if the on/off-time of the specific sound is readily distinctive at the noise- sensitive receivers, +3dB.

It should be noted that. where one feature is clearly perceived as dominant, it may be appropriate to apply a single correction. Where both tonal and impulsive features are likely to affect perception and response, each should be added arithmetically.

An estimate of the magnitude of the impact is evaluated by subtracting the measured background sound level at the assessment location from the rating level

Assessment Level = Rating Level – Background Sound Level

Typically, the greater the difference between the background and rating level, the greater the magnitude of impact, although BS 4142 emphasises that this is highly context-specific. As an initial estimate, BS4142 states that:

- A difference (between the background and rating level) of around +10 dB or more is likely to be indicative of significant adverse impact, depending on context
- A difference (between the background and rating level) of around +5 dB or more is likely to be indicative of adverse impact, depending on context
- Where the rating level does not exceed the background level, this is an indication that the specific sound will have a low impact, depending on context

Where the initial estimate of the impact needs to be modified due to the context, other factor should be considered, including: absolute sound levels, the character and level of the residual sound and the sensitivity of the receiver.

8. Survey

8.1. General

Unattended measurements were made to characterise the background sound levels close to the nearest residential receivers.

8.2. Measurement Instrumentation

The measurement instrumentation used during the survey is detailed in the appendix. The acoustic equipment was calibrated to comply with Section 4.2 of BS7445-1:2003 before and after the surveys. The calibration details can also be found in the appendix.

8.3. Measurement and Timescale

Unattended noise monitoring took place on a typical weekday period between Tuesday 23rd February 2021 and Wednesday 24th February 2021 to determine typical background sound levels when the new fixed plant was not operating. The following quantities were measured:

$L_{A90,15\text{-}min}$

The acoustic measurements and their interpretation have been in accordance with BS 7445: Parts 1, and 2. All sound pressure levels are in dB (re 20μPa).

8.4. Meteorology

During the survey the weather information was noted. This is shown in Table 3.

	Tuesday 23rd February 2021	Wednesday 24th February 2021
Roads(Wet/Dry)	Dry	Dry
Wind Speed (ms^{-1}) / Direction	7 SW	5 SW

Table 3 - Meteorological data noted during the survey

8.5. Monitoring Locations

The monitoring equipment was located on the façade of the first floor flat of 164 High Street Ruislip. This location is considered to provide representative sound level data for the background sound levels at the worst-affected residential receivers. The monitoring location has been illustrated in Figure 5.

8.6. Typical Background Sound Levels

The background sound level time-series has been presented in Figure 3 and the distribution in the day and the night has been presented in Figure 4.

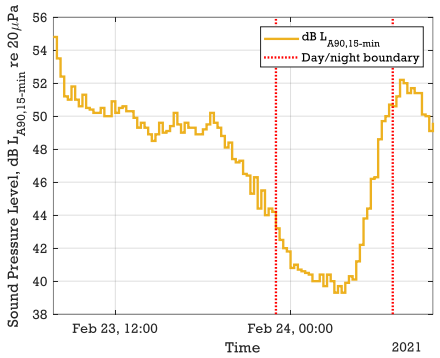


Figure 3 – Background sound level time-series

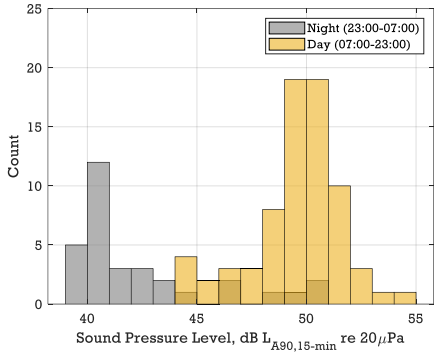


Figure 4 – Distribution of background sound levels

The background sound levels reduced after 21:00 and the typical background sound level has been taken to be 41dB $L_{A90,15\text{-}min}$ because it was the most common value during the night. It should be noted that this is likely to be a conservative estimate because the UK Government's response to the Covid-19 pandemic is likely to have resulted in lower levels of noise from road traffic and existing fixed plant than would otherwise be the case

Figure 5 – Aerial view showing the location of the monitoring equipment. © Google 2021

9. 3D Noise Model

A noise model has been constructed in SoundPLAN™ to calculate the specific sound level 1m from the facades of the nearby residential receivers. The model uses the calculation method from ISO9613-1:1996[4] to account for the distance between the source and receiver and any screening or reflections provided by the surrounding buildings.

The terrain has been assumed to be flat for the purposes of the modelling because the nearest residential receiver and the restaurant are part of the same building. The locations of the buildings surrounding the restaurant have been taken from the plans provided by the client and their heights inferred from Google Maps. Ground absorption has been set to zero in order to adopt a conservative approach. The receiver height is set 1.5m from the first-floor level i.e., 4.1m.

Where available, the spectral content provided by the manufacturer has been used; however, this is absent for the supply fan and the overall figure has been treated as being in the 500Hz octave band. The fixed plant items have been assumed to be point sources and the ducts for the extract and supply fans have been modelled as small objects to account for their directivity. Noise contour plots illustrating the propagation of the specific sound from source to receiver are given in Figure 6 and Figure 7.

The model illustrates that the incident specific sound level at the nearest residential receiver is predicted to be 57dB(A). A breakdown of the model showed that this was dominated by the sound from the supply fan.

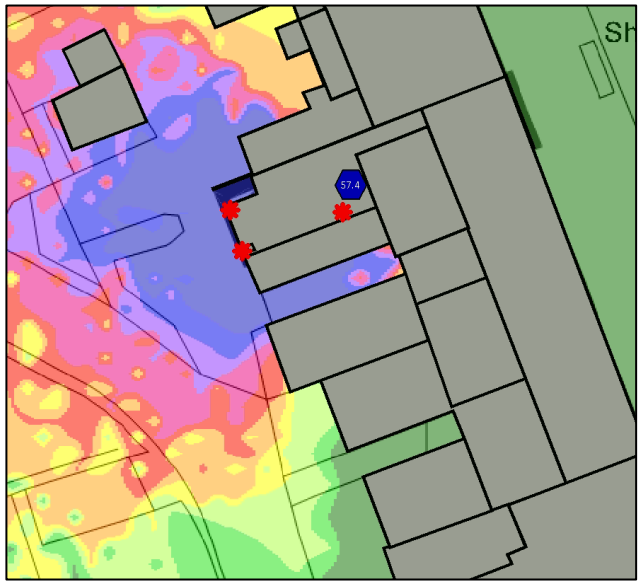


Figure 6 – Aerial view showing the propagation of sound from the specific sound sources to the nearest residential receiver.

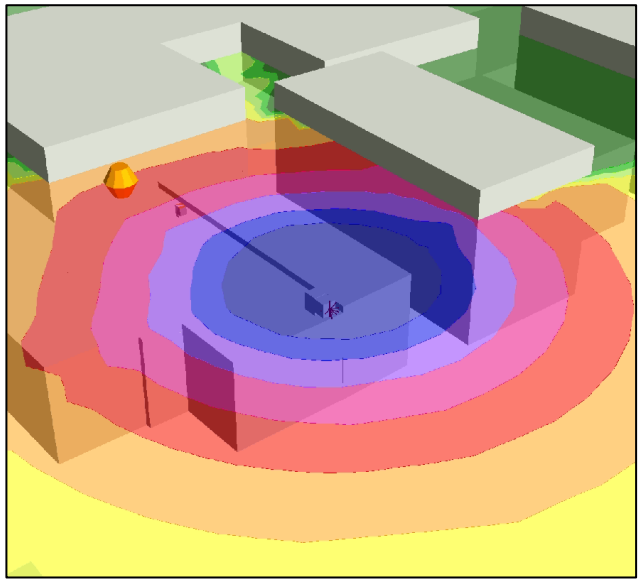


Figure 7 – 3D view showing the propagation of the sound from the specific sound sources to the nearest residential receiver.

[4] ISO9613-1:1996 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation"

10. BS4142 Assessment

10.1. Rating Level

The specific sound sources were either not operating or not yet installed at the time of the survey visits; therefore, character corrections have been applied based on previous experience of similar installations.

i. Tonality

Most items of heating, ventilation and air conditioning plant have rotating components that would be likely to produce modest tones. Where the specific sound level is above the background sound level, it is possible that these tones could be clearly perceptible; however, when the specific sound level is below the background sound level tones are likely to be effectively masked.

ii. Impulsivity

The sound from continuously running plant would not be expected to contain impulsive noise character under normal operating conditions.

iii. Intermittency

The extract fans and supply fans are likely to operate continuously from the start to the end of the trading day; however, the air-conditioning condenser units operate with demand.

Where the specific sound level is above the background sound level, it is possible that the intermittency could be perceptible; however, when the specific sound level is below the background sound level it is unlikely that the condenser unit switching on and off is likely to be perceptible.

10.2. BS4142 Numerical Assessment (Initial Estimate)

The BS4142 assessment is detailed in Table 4.

	Level	
	Day	Night
Predicted specific sound level, dB(A)	57	
Character corrections Tonality Impulsivity Intermittency	+2 0 +3	
Rating level Specific sound level + Character corrections	62	
Background sound level, dB $L_{A90,15min}$	51	41
Assessment level Rating level – Background sound level	+11	+21
"Typically, the greater this difference, the greater the magnitude of the impact. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, **depending on the context.**"		

Table 4 - The numerical assessment procedure from BS4142

10.3. Full Assessment (Accounting for Context)

In this context the new and relocated fixed plant will replace existing; therefore, the general character of the sound climate would not be changed. Furthermore, there are numerous other items of fixed plant serving neighbouring properties, which include other restaurants.

The nearest residential receiver does not include any outdoor space; therefore, the worst-case situation would occur when residents experience the sound through an open window. This is likely to moderate the 'significant adverse impact' outcome; however, the excess of the rating level over the background sound level warrants further mitigation at source.

11. Mitigation

11.1. Strategy

The BS4142 assessment indicates that additional treatment is required to mitigate and minimise the impact of noise on existing residents. A breakdown of the model indicates that the dominant specific sound source is the supply fan, whose inlet is located relatively close to the façade of the first floor flat and is currently planned not to include silencing. It is recommended that:

- the supply inlet should be attenuated with an in-line silencer; and
- the supply inlet, the extractor exhaust and the condenser unit be relocated to the rear wall of the extension.

The general principles of this mitigation have been illustrated in Figure 8. The supply and extract can be located at high level on the rear wall of the extension and the condenser unit can be located at low level, underneath the proposed stairs to the first floor flat.

To be effective the supply inlet requires attenuating by 10dB overall. Whilst the spectral content of the specific supply fan isn't available, this level of attenuation is likely to be achieved using an in-line silencer lined with absorbent material, similar to the one currently implemented for the extractor hood exhaust.

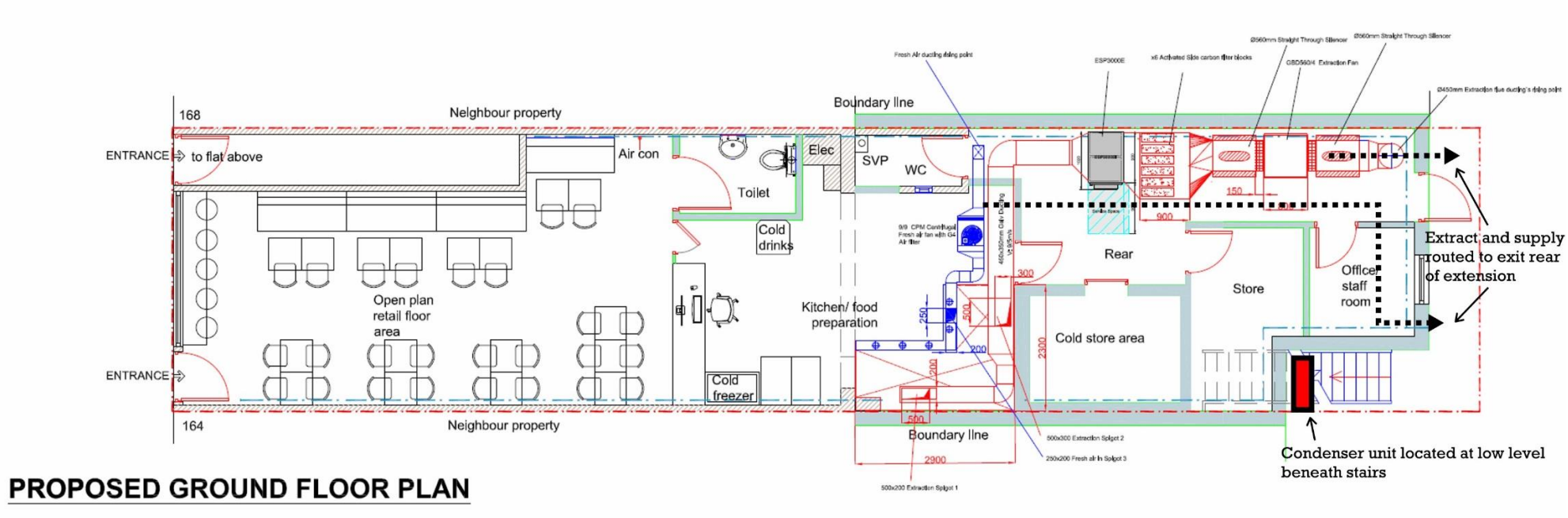


Figure 8 – Illustration showing the general principles of the mitigation strategy

11.2. Re-Assessment

The attenuation measures proposed in the previous section have been included in the noise model and the results have been illustrated in Figure 9.

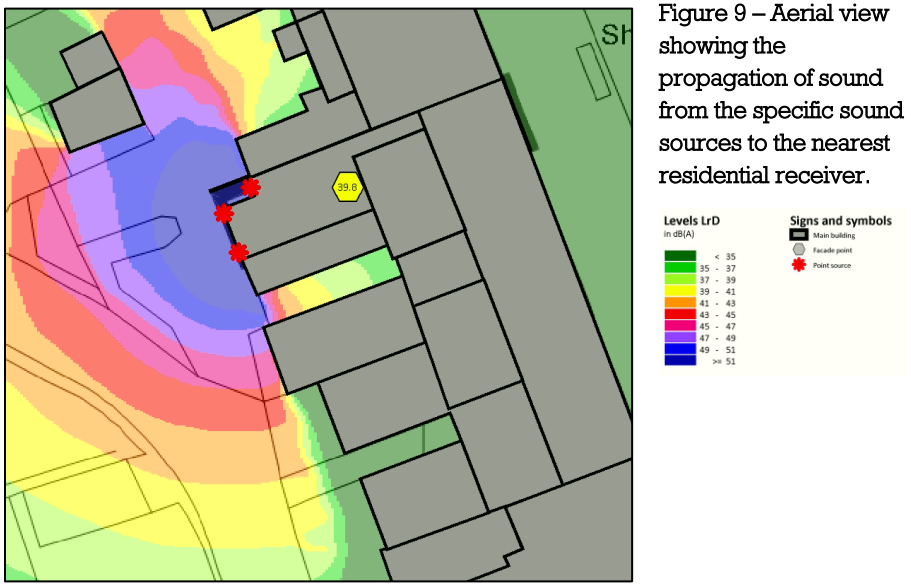


Figure 9 – Aerial view showing the propagation of sound from the specific sound sources to the nearest residential receiver.

With the proposed mitigation, the specific sound level is now predicted to be 40dB(A) at the façade of the nearest residential receiver. The low level character of the proposed new and relocated fixed plant is now not likely to be audible because the specific sound level is below the existing background sound level.

i. BS4142 Numerical Assessment (Initial Estimate)

The BS4142 assessment, taking into account the proposed mitigation, is detailed in Table 4.

	Level	
	Day	Night
Predicted specific sound level, dB(A)	40	
Character corrections Tonality Impulsivity Intermittency	0 0 0	
Rating level Specific sound level + Character corrections	40	
Background sound level, dB $L_{A90,15min}$	51	41
Assessment level Rating level – Background sound level	-11	-1

"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**."

Table 5 - The numerical assessment procedure from BS4142

ii. Full Assessment (Accounting for Context)

With the proposed mitigation the rating level no longer exceeds the background sound level, which is likely to result in the specific sound having a low impact on existing residential receivers.

The increased distance between the specific sound sources and the nearest residential façade is likely to have a reduced impact compared to the existing situation, where it is located directly beneath the nearest residential receiver's window. The proposed new and relocated plant would be a similar distance away from the nearest residential receivers as other plant currently serving neighbouring properties.

The first floor flat does not have external amenity space; therefore, the specific sound would be witnessed indoors. Through an open window,[5] the resulting internal ambient noise levels are likely to be less than 30dB(A), the guideline value for sleeping conditions.[6] This level would be greatly exceeded during the daytime by other residual sound sources such as road traffic noise.

Taking into account this additional context, it is likely that the ''low impact'' assessment outcome is robust.

[5] Allowing for 13dB for attenuation through an open window. ProPG: Planning and Noise, May 2017

[6] BS8233:2014 ''Guidance on sound insulation and noise reduction for buildings''

12. Uncertainty

BS4142 requires that uncertainty be reported and minimised wherever possible. The document acknowledges that all calculation-based modelling practices are ultimately an approximation. However, rather than ignore this fact or consider the results absolute, it is considered good practice to honestly report factors which can affect the robustness of any assessment.

12.1. Specific Sound Source

The data for the specific sound sources has been provided by the manufacturer, which is unlikely to have been affected by other, residual, sound.

12.2. Background Sound Complexity and Variability

The ambient noise climate at the assessment site is reasonably simple and the background sounds levels measured (which include busier and quieter periods) are considered typical for an urban area. Wind speeds during the survey visits were typically under 5ms^{-1}, particularly during the more sensitive night-time period, and the effect of wind generated noise is not considered to have been significant.

There will inevitably be times when the background level at nearby residential receivers is higher or lower than that used in assessment; however, using the typical level is considered to represent the most pragmatic and reasonable solution.

12.3. 3D Noise Model

The attenuation of sound propagating outdoors between fixed source and receivers fluctuates due to variations in the meteorological conditions along the propagation path. ISO9613:1996 restricts the prediction to moderately downwind conditions of propagation. There is an expected uncertainty of ±3dB in the predicted sound pressure levels.

Ultimately, algorithms used to calculate distance attenuation are approximations. However, within all calculations, ground absorption and diffusion (which can be helpful in terms of attenuating sound with distance) have been set to pessimistic levels. In this way, a worst-case scenario can be modelled, increasing the robustness of the assessment.

12.4. Instrumentation

The instrumentation used in noise.co.uk's surveys has valid traceable calibration. It is, however, noted that the degree of measurement tolerance of most Type 2 sound level analysers is approximately 1-2 dB between 63Hz and 8kHz, meaning that two independently-verified meters could measure the same sound level and report marginally differing values.

13. Conclusion

An environmental noise assessment has been carried out for proposed new and relocated fixed plant at a refurbished and extended restaurant at 166 High Street, Ruislip.

Details of the proposals have been provided by the Client and used to calculate the specific sound level at the nearest residential receiver. The rating level of the proposed new and relocated fixed plant is predicted to exceed the existing typical background sound level, which could result in ''significant adverse impact'' on the nearest residential receivers.

Treatment has been specified to mitigate and minimise the impact of the specific sound on the nearest residential receivers. This includes relocating the supply fan inlet, extractor hood exhaust and the air-conditioning condenser unit, as well as providing an additional 10dB attenuation to the supply fan inlet. With the proposed treatment, the rating level is not expected to exceed the existing typical background sound level, which is likely to result in a ''low impact'' on the nearest residential receptors.

Taking into account the context of the situation, it is likely that the BS4142 numerical assessment outcomes are robust and that the proposals would be a significant improvement, in noise terms, compared to the existing situation.

Appendix

APPENDIX A: Summary Information

Required ISO Test Report Information (cross referenced where required)			
		Measurements carried out to:	Analysed to:
A	Standards	BS 7445-1: 2003 BS 7445-2: 1991	BS 4142:2014
B	Organisation performed the measurements	noise.co.uk Ltd, The Haybarn, Newnham Grounds, Kings Newnham Lane, Bretford, Coventry, CV23 0JU.	
C	Name of Client	Sugarland Associates Ltd	
D	Full site address	166 High Street Ruislip	
E	Date of surveys	Survey Date: 23rd February 2021 – 24th February 2021	
F	Description & identification of Proposed Development	Noise assessment of commercial sound sources affecting existing residential receivers	
G	Brief Description of details of Procedure & equipment	See Section 5 of this report.	

APPENDIX B: Technical Appendix

Measurements were made using the following equipment:

Monitoring Position	Sound Level Meter (Serial Number)	Calibrator (Serial Number)
Position 1	Piccolo 2 (P0219092301)	Norsonic 1251 (33826)

The equipment has traceable calibration. The sound level meter was calibrated immediately prior to and immediately after the measurements were carried out.

Sound Level Meter	Before	After
Norsonic 140 (1405560)	114.0 dB	114.0 dB

There was no adverse deviation.

APPENDIX C: Background Sound Level Data

Date	Time	$L_{Aeq,15\text{-}mins}$
23/02/2021	07:45:00	54.8
23/02/2021	08:00:00	53.5
23/02/2021	08:15:01	52.4
23/02/2021	08:30:00	51.2
23/02/2021	08:45:00	51.0
23/02/2021	09:00:01	51.8
23/02/2021	09:15:00	51.0
23/02/2021	09:30:00	50.6
23/02/2021	09:45:01	51.3
23/02/2021	10:00:00	50.5
23/02/2021	10:15:00	50.4
23/02/2021	10:30:01	50.2
23/02/2021	10:45:00	50.2
23/02/2021	11:00:00	50.5
23/02/2021	11:15:01	50.0
23/02/2021	11:30:00	50.0
23/02/2021	11:45:00	50.9
23/02/2021	12:00:01	50.2
23/02/2021	12:15:00	50.5
23/02/2021	12:30:00	50.6
23/02/2021	12:45:01	50.3
23/02/2021	13:00:00	50.3
23/02/2021	13:15:00	49.9
23/02/2021	13:30:01	49.3
23/02/2021	13:45:00	49.6
23/02/2021	14:00:00	49.3
23/02/2021	14:15:01	48.9
23/02/2021	14:30:00	48.5
23/02/2021	14:45:00	48.9
23/02/2021	15:00:01	49.6
23/02/2021	15:15:00	49.0
23/02/2021	15:30:00	49.1
23/02/2021	15:45:01	49.4
23/02/2021	16:00:00	50.2
23/02/2021	16:15:00	49.5
23/02/2021	16:30:01	49.0
23/02/2021	16:45:00	49.6
23/02/2021	17:00:00	49.3
23/02/2021	17:15:01	49.3
23/02/2021	17:30:00	48.9
23/02/2021	17:45:00	48.9
23/02/2021	18:00:00	49.2
23/02/2021	18:15:01	49.5
23/02/2021	18:30:00	50.2
23/02/2021	18:45:00	49.6
23/02/2021	19:00:01	49.3
23/02/2021	19:15:00	48.8
23/02/2021	19:30:00	48.1
23/02/2021	19:45:01	48.4
23/02/2021	20:00:00	47.4
23/02/2021	20:15:00	47.2
23/02/2021	20:30:01	47.3
23/02/2021	20:45:00	46.5
23/02/2021	21:00:00	46.4
23/02/2021	21:15:01	45.3
23/02/2021	21:30:00	46.3
23/02/2021	21:45:00	44.4
23/02/2021	22:00:01	45.5
23/02/2021	22:15:00	44.0
23/02/2021	22:30:00	44.4
23/02/2021	22:45:01	44.2
23/02/2021	23:00:00	43.2
23/02/2021	23:15:00	42.5
23/02/2021	23:30:01	42.0
23/02/2021	23:45:00	41.8
24/02/2021	00:00:00	40.8
24/02/2021	00:15:01	41.0
24/02/2021	00:30:00	40.7
24/02/2021	00:45:00	40.6
24/02/2021	01:00:01	40.5
24/02/2021	01:15:00	40.4
24/02/2021	01:30:00	40.0
24/02/2021	01:45:01	40.0
24/02/2021	02:00:00	40.4
24/02/2021	02:15:00	39.7
24/02/2021	02:30:01	40.4
24/02/2021	02:45:00	40.0
24/02/2021	03:00:00	39.3
24/02/2021	03:15:01	39.7
24/02/2021	03:30:00	39.3
24/02/2021	03:45:00	39.9

Date	Time	$L_{Aeq,15\text{-}mins}$
24/02/2021	04:00:01	40.3
24/02/2021	04:15:00	40.1
24/02/2021	04:30:00	41.2
24/02/2021	04:45:01	42.2
24/02/2021	05:00:00	43.8
24/02/2021	05:15:00	44.4
24/02/2021	05:30:01	46.2
24/02/2021	05:45:00	46.3
24/02/2021	06:00:00	48.6
24/02/2021	06:15:01	49.7
24/02/2021	06:30:00	50.0
24/02/2021	06:45:00	50.7
24/02/2021	07:00:01	50.6
24/02/2021	07:15:00	51.2
24/02/2021	07:30:00	52.2
24/02/2021	07:45:01	52.0
24/02/2021	08:00:00	51.4
24/02/2021	08:15:00	51.7
24/02/2021	08:30:01	51.4
24/02/2021	08:45:00	51.4
24/02/2021	09:00:00	50.1
24/02/2021	09:15:01	50.0
24/02/2021	09:30:00	49.1
24/02/2021	09:45:00	49.6

APPENDIX D: Site Photos

Existing chiller units that will be removed as part of the refurbishment`

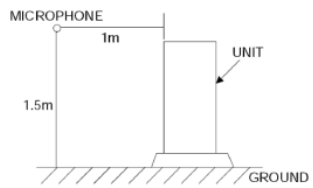
Existing extract grille that will be removed as part of the refurbishment (note: entire extraction system to be replaced)

Existing air-conditioning condenser units that are to be relocated as part of the refurbishment

Example of existing fixed plant serving neighbouring commercial property.

APPENDIX E: Plant Information

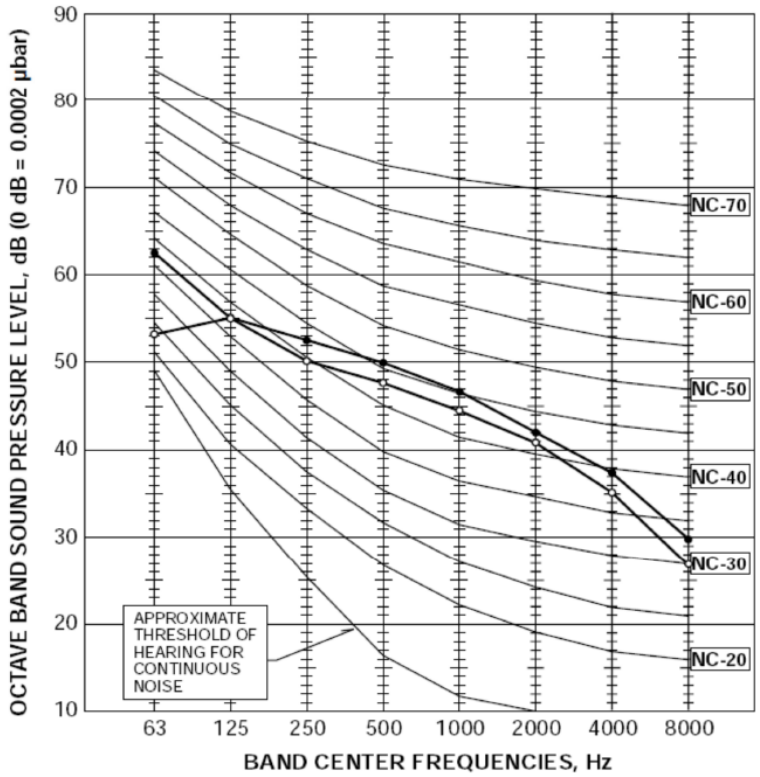
5-3. NOISE CRITERION CURVES



DOUBLE AIR CONDITIONING CONDENSER UNIT

PUHZ-ZRP125/140VKA

MODE	SPL(dB)	LINE
COOLING	50	
HEATING	52	



LOW PRESSURE CENTRIFUGAL FANS WITH EXTERNAL ROTOR MOTOR
CBM-RE Series

TECHNICAL CHARACTERISTICS

Before installation check that the product electrical characteristics listed on the data plate label (voltage, power, frequency, etc.) match those of the intended electrical supply.

Model	Motor power (W)	Speed (r.p.m)	Equivalence (mm)	Capacitor (µF/V)	Maximum absorbed current (A)	Maximum airflow (m³/h)	Maximum temperature air (°C)	Sound pressure level * (dB(A))	Weight (kg)	Speed controller	
										REB	RMB
SINGLE PHASE MOTORS											
CBM-7/7 72W 6P RE VR	72	900	180/180	2,5/450	0,6	1.440	+70	56	6,5	1	1,5
CBM-7/7 147W 4P RE VR	147	1400	180/180	7/450	1,2	1.470	+40	63	6,9	2,5	1,5
CBM-7/7 300W 4P RE VR	300	1400	180/180	6/450	2,0	2.200	+60	64	7,2	2,5	3,5
CBM-7/9 72W 6P RE VR	72	900	180/240	2/450	0,9	1.850	+70	60	6,5	1	1,5
CBM-7/9 300W 4P RE VR	300	1400	180/240	6/450	2,2	2.530	+40	67	9,8	2,5	3,5
CBM-9/7 200W 6P RE VR	200	900	240/180	4/450	1,5	1.900	+40	59	13,5	2,5	1,5
CBM-9/7 245W 6P RE VR	245	900	240/180	13/450	2,0	2.650	+50	64	14	2,5	3,5
CBM-9/7 420W 4P RE VR	420	1400	240/180	15/450	3,2	2.600	+40	68	14,5	5	3,5
CBM-9/9 200W 6P RE VR	200	900	240/240	5/450	1,8	2.760	+40	63	14	2,5	3,5
CBM-9/9 245W 6P RE VR	245	900	240/240	13/450	2,2	2.870	+40	64	14,1	2,5	3,5
CBM-9/9 300W 4P RE VR	300	1400	240/240	20/450	2,8	2.500	+40	64	16,7	5	3,5
CBM-9/9 550W 4P RE VR	550	1400	240/240	20/450	4,3	3.470	+40	71	17,7	5	8
CBM-10/8 245W 6P RE VR	245	900	270/200	9/450	2,8	3.490	+40	67	14,9	5	3,5
CBM-10/8 515W 6P RE VR	515	900	270/200	10/450	3,3	3.750	+40	71	19,5	5	8
CBM-10/8 550W 4P RE VR	550	1400	270/200	20/450	4,2	2.900	+40	68	18,6	5	8
CBM-10/10 245W 6P RE VR	245	900	270/270	9/450	2,8	3.370	+40	64	16	5	3,5
CBM-10/10 515W 6P RE VR	515	900	270/270	10/450	3,4	4.090	+40	67	17,5	5	8
CBM-10/10 600W 4P RE VR	600	1400	270/270	20/450	4,6	3.300	+40	68	20,8	5	8
CBM-12/9 515W 6P RE VR	515	900	320/320	18/450	4,1	4.195	+40	65	21,5	5	8
CBM-12/9 750W 6P RE VR	750	900	320/240	20/450	5,5	4.990	+40	67	23,5	10	8
CBM-12/12 515W 6P RE VR	515	1400	320/320	18/450	4,2	4.540	+40	66	22	5	8
CBM-12/12 750W 6P RE VR	750	900	320/320	20/450	5,3	5240	+40	68	24	10	8

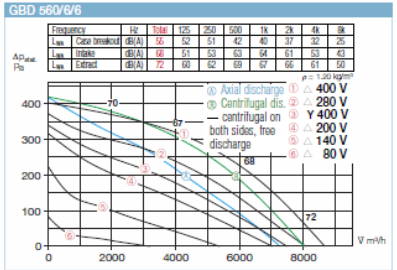
Model	Motor power (W)	Speed (r.p.m)	Equivalence (mm)	Maximum absorbed current (m³/h)		Max. airflow (m³/h)	Maximum temperature air (°C)	Sound pressure level * (dB(A))	Weight (kg)	Speed controller RMT	Inverter controller VFTM Power supply	
				230V	400V						1/230V	3/400V
THREE PHASE MOTORS												
CBM-7/7 250W 4P T RE VR	250	1400	180/180	1,2	0,7	2.320	+65	65	7,1	1,5	VFTM MONO 0,18	VFTM TRI 0,37
CBM-9/7 550W 4P T RE VR	550	1400	240/180	3,1	1,8	3.350	+40	70	14	2,5	VFTM MONO 0,37	VFTM TRI 0,55
CBM-9/9 245W 4P T RE VR	245	900	240/240	1,6	0,9	3.330	+40	67	14,1	1,5	VFTM MONO 0,37	VFTM TRI 0,37
CBM-9/9 550W 4P T RE VR	550	1400	240/240	5,5	3,2	4.830	+40	75	14,1	5	VFTM MONO 1,1	VFTM TRI 1,1
CBM-10/8 245W 6P T RE VR	245	900	270/200	1,9	1,1	3.470	+40	68	14,9	1,5	VFTM MONO 0,37	VFTM TRI 0,37
CBM-10/8 350W 6P T RE VR	350	900	270/200	2,8	1,6	4.330	+40	73	14,9	2,5	VFTM MONO 0,37	VFTM TRI 0,55
CBM-10/8 550W 4P T RE VR	550	1400	270/200	5,4	3,1	4.230	+40	72	18,9	5	VFTM MONO 1,1	VFTM TRI 1,1
CBM-10/10 245W 6P T RE VR	245	900	270/270	1,9	1,1	3.920	+40	67	16	1,5	VFTM MONO 0,37	VFTM TRI 0,37
CBM-10/10 350W 6P T RE VR	350	900	270/270	2,9	1,7	5.000	+40	72	20	2,5	VFTM MONO 0,37	VFTM TRI 0,55
CBM-10/10 550W 4P T RE VR	550	1400	270/270	5,0	2,9	4.010	+40	70	20	5	VFTM MONO 1,1	VFTM TRI 1,1
CBM-10/10 750W 4P T RE VR	750	1400	270/270	7,6	4,4	5.880	+40	76	20	5	VFTM MONO 1,5	VFTM TRI 1,5
CBM-12/12 550W 6P T RE VR	550	900	320/320	5,0	2,9	6.490	+40	73	22	5	VFTM MONO 1,1	VFTM TRI 1,1
CBM-12/12 750W 6P T RE VR	750	900	320/320	5,9	3,4	7480	+40	75	22	5	VFTM MONO 1,1	VFTM TRI 1,5
CBM-12/12 1100W 6P T RE VR	1100	900	320/320	5,7	3,3	7.410	+40	75	25	5	VFTM MONO 1,1	VFTM TRI 1,5
CBM-15/15 2200W 6P T RE VR K	2200	900	380/380	12,2	7	11.650	+40	75	43	8	-	VFTM TRI 3

* Sound pressure levels in dB(A), measured at 1,5 meters at the fan inlet side in free field.

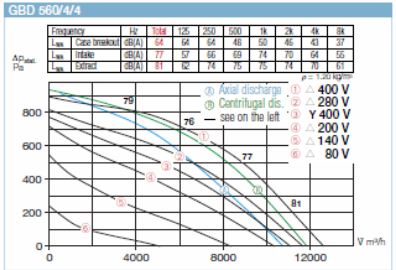
Helios

GigaBox centrifugal fan 560 mm ø

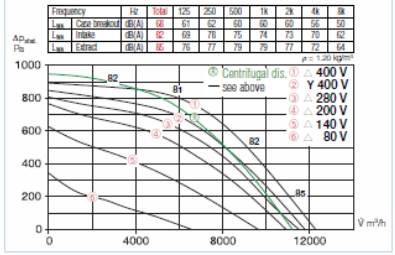
GBD 560/6/6



GBD 560/4/4



GBD 560/4/4 T120



GigaBox

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

Speed control
All types are speed controllable by voltage reduction using a transformer controller.
The 3-phase models can also be 2 speed controlled by star/delta switch (accessories DS 2 or full motor protection unit M 4). The duties at different speeds are given in the performance curve.

Sound levels
Total sound power levels and the spectrum figures in dB(A) are given for:
– sound level case breakout
– sound level intake
– sound level extract
in the tables above the performance curve. Beside, the sound power level (on intake) is stated over the rated characteristic curve. In the table below you can also find the
– case breakout level at 4 m (freefield conditions).

Accessories of both types

Anti vibration mounts for installation indoors. Set of 4.
SDD-U Ref. No. 5627

Wall bracket for wall mounting.
GB-WK 560 Ref. No. 5626

External weather louvers to cover exhaust opening.
GB-WSG 560 Ref. No. 5640

Outdoor cover hood for outdoor installation.
GB-WSD 560 Ref. No. 5749

On/Off and 2-speed switch for 3-phase star/delta motors.
DS 2 2) Ref. No. 1351

2) full motor protection unit recommended: MD Ref. No. 5649

Information	Pages
Design of systems, acoustic	12 on
General techn. information, speed control	17 on

Accessory-Details	Pages
Speed controller and full motor protection unit	397 on

Specific accessories

for types GB..
Condensate collector with condensate spigot for pipe connection.
GB-KW 560 Ref. No. 5645
(Condensate collector with condensate spigot included in delivery with GB.. T120).

for types GB.. T120
Rain drainage for outdoor installation (drill holes for rain drainage is already prepared).
GB-RA Ref. No. 9418

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189

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CASED AXIAL ACCESSORIES

SILENCER ACOUSTIC PERFORMANCE

TYPE B DYNAMIC ATTENUATION

BORE DIA. MM (D)	LENGTH	OCTAVE-BAND MID FREQUENCIES HZ 63	125	250	500	1K	2K	4K	8K
315	10	1	2	4	9	11	10	9	7
	20	1	2	5	11	16	12	11	10
355	10	1	2	4	10	12	10	9	7
	20	2	3	6	13	17	14	11	11
400	10	2	3	5	10	13	11	9	8
	20	3	4	7	14	18	15	11	12
450	10	2	3	6	12	13	11	10	6
	20	3	4	8	17	18	15	11	11
500	10	2	3	6	13	14	10	10	5
	20	3	4	8	19	18	14	11	10
550	10	2	4	7	14	14	9	10	7
	20	3	5	9	19	18	14	12	11
630	10	2	5	7	15	13	8	9	8
	20	4	6	9	19	19	14	13	12
710	10	2	5	7	15	13	9	9	8
	20	4	6	9	19	17	13	12	11
800	10	2	5	8	16	12	9	9	8
	20	4	6	10	19	15	12	11	10
900	10	2	5	10	17	13	11	10	8
	20	4	6	12	19	15	12	11	10
1000	10	4	5	11	16	11	10	8	9
	20	4	6	13	19	14	12	11	11

TYPE C DYNAMIC ATTENUATION

BORE DIA. MM (D)	LENGTH	OCTAVE-BAND MID FREQUENCIES HZ 63	125	250	500	1K	2K	4K	8K
315	10	2	5	5	9	18	20	18	15
	20	2	6	6	12	20	25	20	17
355	10	2	5	6	9	18	22	19	16
	20	2	6	7	13	25	27	21	17
400	10	2	6	6	10	19	24	20	17
	20	3	7	8	14	29	29	23	18
450	10	2	4	7	13	20	23	22	17
	20	2	5	9	16	29	29	21	20
500	10	2	3	8	16	21	22	21	17
	20	2	4	10	20	29	30	20	26
550	10	3	5	8	15	20	18	19	15
	20	4	5	10	20	29	28	21	23
630	10	3	5	8	15	19	16	14	12
	20	5	6	10	19	29	25	21	20
710	10	3	5	8	15	19	15	14	12
	20	5	6	10	20	26	23	18	17
800	10	4	5	8	16	19	15	14	13
	20	5	7	11	22	23	21	16	14
900	10	4	5	9	17	19	15	14	13
	20	5	7	12	24	23	21	16	15
1000	10	5	5	11	16	19	15	14	13
	20	5	7	13	26	24	20	16	16

All performances are derived from tests to BS848.

The above silencers give the following approximate dBA reductions: -
B Type 1 diameter length - 7 to -10 dBA
C Type 1 diameter length - 12 to -15 dBA
For full acoustic details and resistance to airflow for type C please refer to fan selector.

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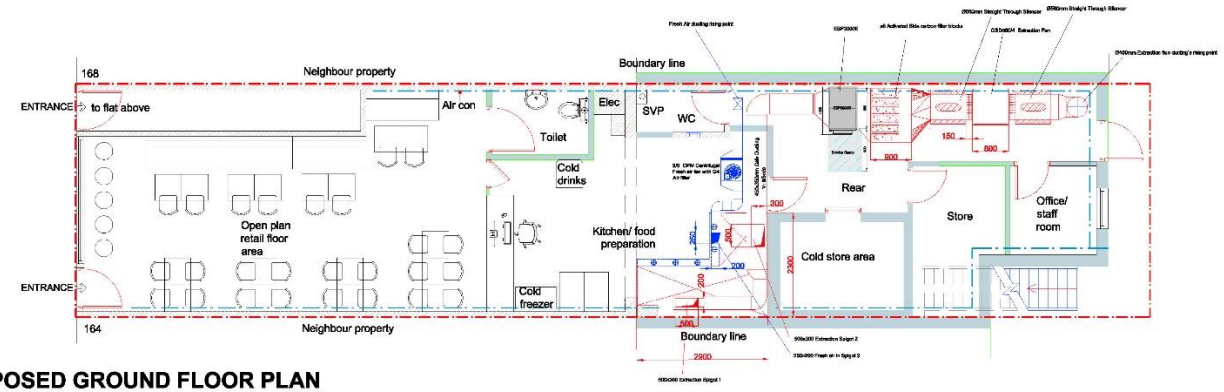
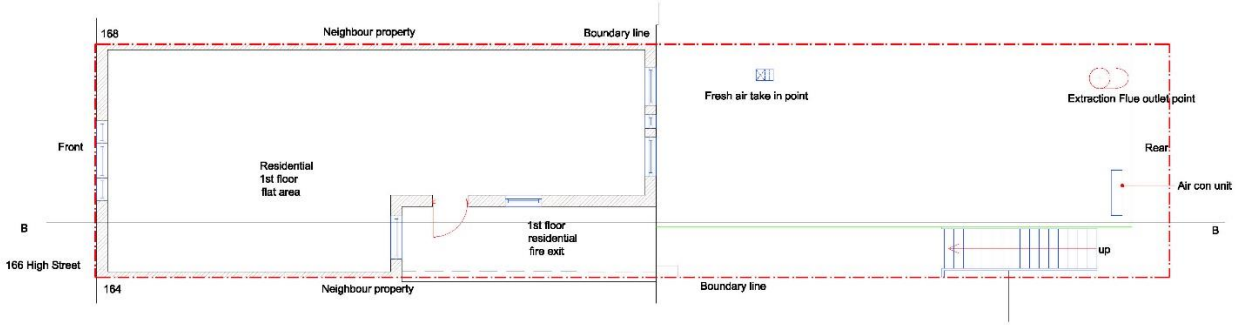
APPENDIX F: Client Drawings



PROPOSED GROUND FLOOR PLAN



PROPOSED ROOF PLAN

0 1 2 3 4 5 M
Meters @ 1:100 @ A3

The drawing is copyright. Only figured dimensions to be worked to.

Key Plan:

Drawing Title:
PROPOSED GROUND FLOOR
PROPOSED ROOF PLAN

Scale: 1@100 A3 SHEET

Status:
PLANNING

Drawing No:
100-E18-001

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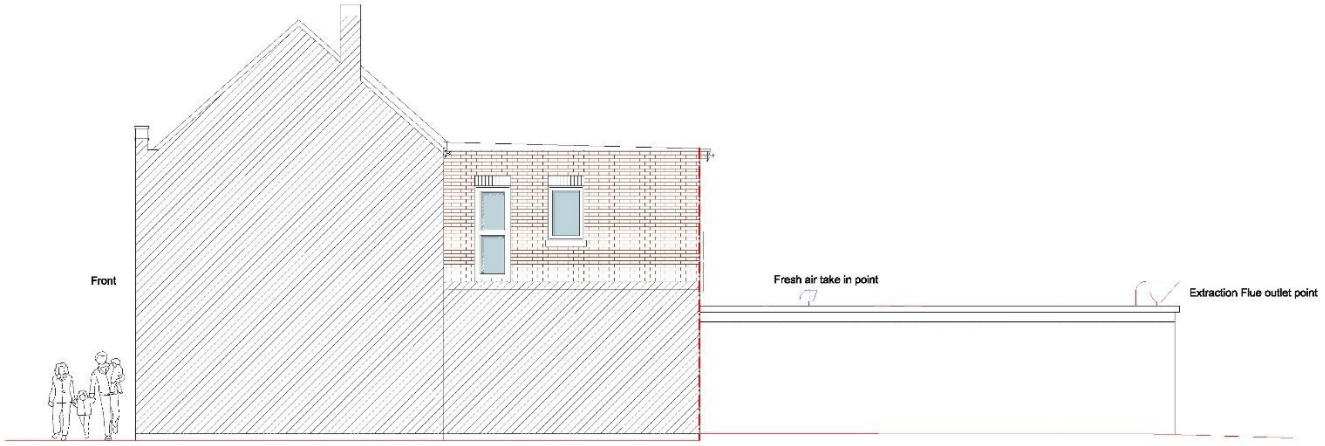
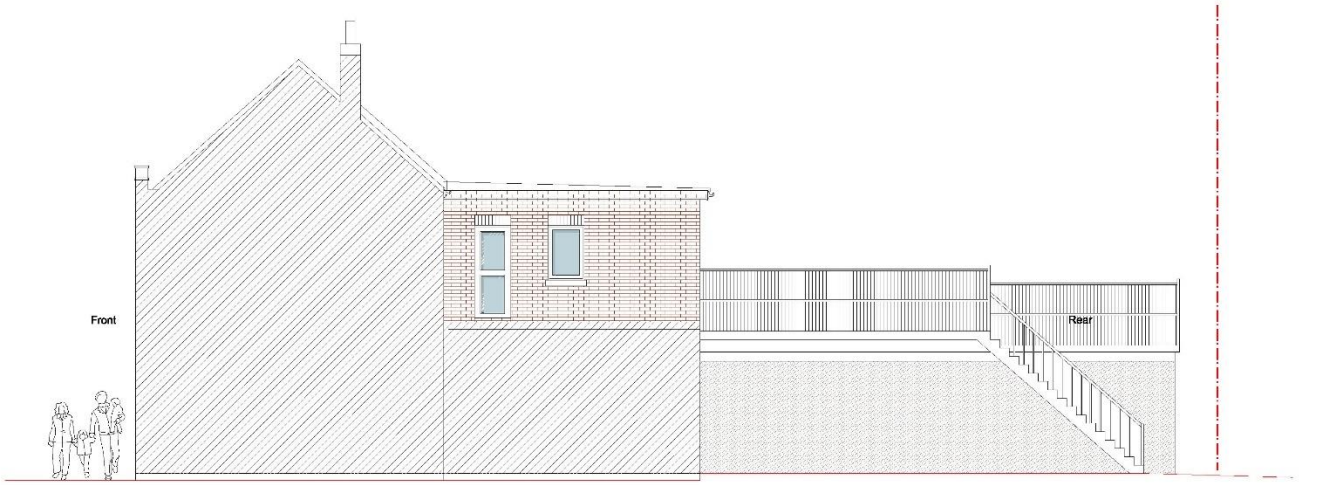
Client:
Mr. Murad Shamsi

Address:
166 High Street, HA4 8LJ



PROPOSED B-B ELEVATION



PROPOSED SIDE ELEVATION

0 1 2 3 4 5 M
Meters @ 1:100 @ A3

The drawing is copyright. Only figured dimensions to be worked to.

Key Plan:

Drawing Title:
PROPOSED BB ELEVATION
PROPOSED SIDE ELEVATION

Scale: 1@100 A3 SHEET

Status:
PLANNING

Drawing No:
100-E15-002

GOYA WORKS

Client:
Mr. Murad Shamsi

Address:
166 High Street, HA4 8LJ