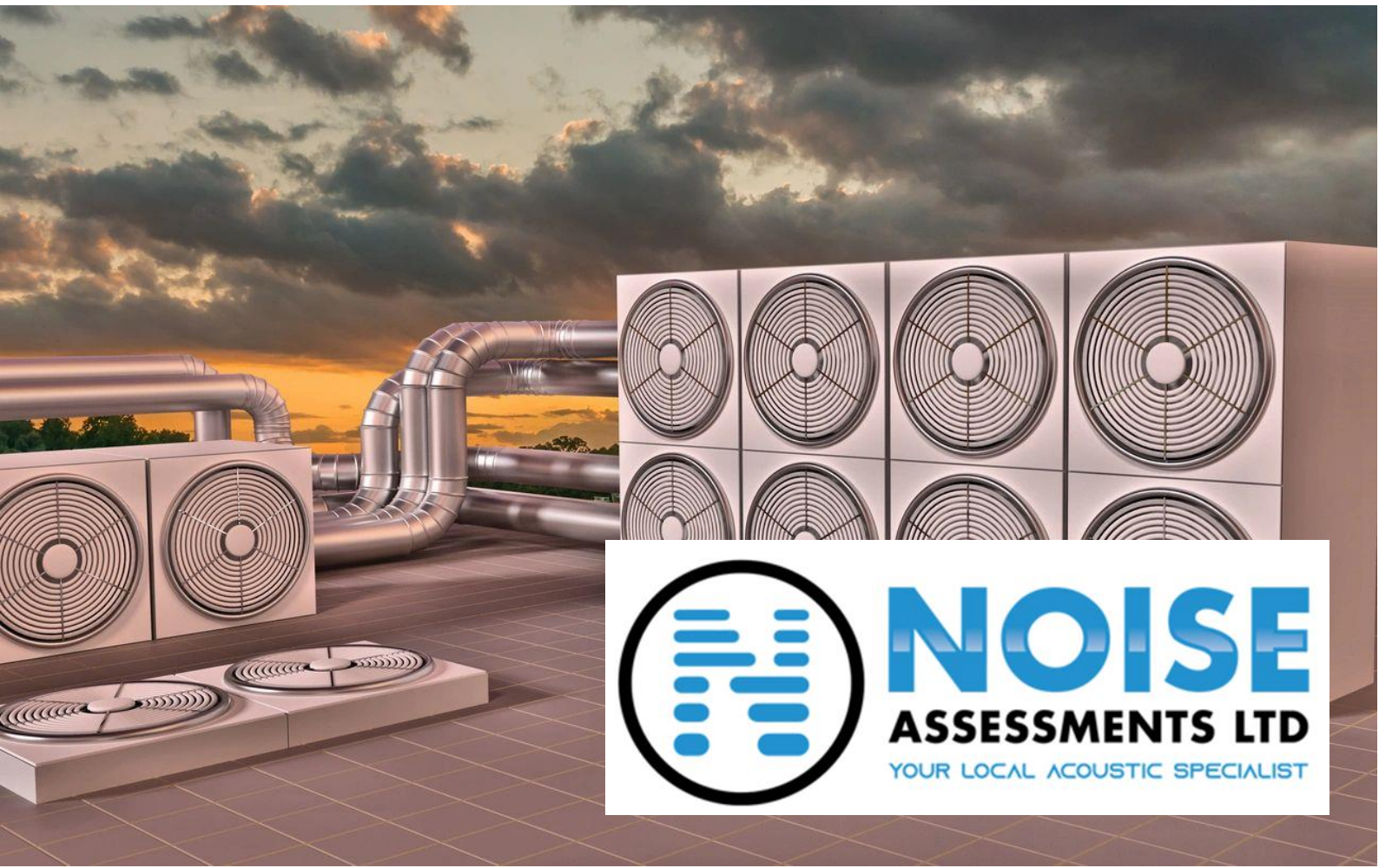


NOISE IMPACT ASSESSMENT

BS 4142:2014+A1:2019

Commercial Noise

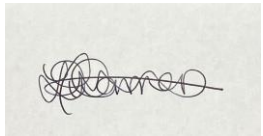


NOISE
ASSESSMENTS LTD
YOUR LOCAL ACOUSTIC SPECIALIST

REPORT DETAILS

Client	Bokhtiar Hussain
Report Title	Noise Assessment: Commercial Noise
Site Address	262 London Road, Waterlooville, PO7 7HG
Project No.	NALPRO150821.02
Consultant Contact	jonathan@noiseassessment.org

QUALITY ASSURANCE

Issue No.	Status	Issue Date	Comments	Author	Approved
1	FINAL	28/08/21	-		
2	Final	27/11/21	Update based on council comments.	J Mape BSc (Hons) PgDip IOA Cert. Environ. Noise TechIOA Noise Consultant	D Warren Director

This report has been prepared by Noise Assessments the trading name of Noise Assessments Limited, with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

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Assessment Summary

A ground commercial property (herein referred to as the site) has Planning Approval (CONS/21/00892) for a change of use of no.260 from A1 classification (retail units) and no.262 from A2 Classification to a A3/A5 classification (Restaurants and Cafes/Hot food takeaways).

A Planning condition states that “acoustic mitigation measures related to any extraction systems, chiller units, have been submitted for approval.” The site wishes to install a kitchen extraction and external flue system and 2x condenser units at ground floor level. The client has been requested by the Local Council to complete a noise assessment at 262 London Road, Waterlooville, PO7 7HG.

The primary internal noise source is customers voices within the on the ground floor.

A noise assessment is required to assess the likely noise impact from noise generated from the extractor fan unit with appropriate silencer and flu riser within the rear of the site which will have the air vented at ground floor level above the roofline (4m from nearest window) during the daytime on residents directly above and at the rear of the site, and from 2x ground floor condenser units. (4m from the nearest window) It should be noted that all plant and fans will be turned off prior to 11pm each day.

The internal noise transfer through the current ground floor concrete ceiling/floor partition was calculated over the target criteria of 30 dB therefore mitigation has been specified in the form of ceiling / floor partition enhancements between shared ceiling/floor partition.

By enhancing the ground floor ceiling, the internal level within the first-floor accommodation would be reduced below the target criteria.

Adverse Impact from the combined external noise has been identified at the NSRs therefore mitigation is required.

The proposed extract fan is complete with extract spigots and with flexible connectors to reduce vibration transmission. It will be installed on Anti-vibration mountings, one for each corner of the fan unit in order to mitigate any risk of vibration transmission to the neighbouring properties.

It is recommended to install acoustic enclosures around the condenser units to reduce the overall noise by at least 15dB to reduce the noise level to low impact at the NSR.

Specialist companies who supply and install condenser unit noise abatement are shown below.

<https://www.ambientacoustics.co.uk/index.html>

<http://www.acoustic-enclosures.co.uk/condenser-enclosure.html>

The results of the noise assessment demonstrate that, noise from the use of the extractor unit venting above the eaves and the 2x condenser units beneath the sensitive receivers will be considered **low impact**.

1. Proposal

- 1.1 A ground commercial property (herein referred to as the site) has Planning Approval (CONS/21/00892) for a change of use of no.260 from A1 classification (retail units) and no.262 from A2 Classification to a A3/A5 classification (Restaurants and Cafes/Hot food takeaways).
- 1.2 A Planning condition states that “acoustic mitigation measures related to any extraction systems, chiller units, have been submitted for approval.” The site wishes to install a kitchen extraction and external flue system and 2x condenser units at ground floor level. The client has been requested by the Local Council to complete a noise assessment at 262 London Road, Waterloo, PO7 7HG.
- 1.3 The primary internal noise source is customers voices within the on the ground floor.
- 1.4 A noise assessment is required to assess the likely noise impact from noise generated from the extractor fan unit with appropriate silencer and flu riser within the rear of the site which will have the air vented at ground floor level above the roofline during the daytime on residents directly above and at the rear of the site, and also from 2x ground floor condenser units. It should be noted that all plant and fans will be turned off prior to 11pm each day.
- 1.5 The proposed permitted hours of operation are:
 - Monday – Sunday 09:00 – 23:00

Consultant

- 1.6 Jonathan has experience in environmental, noise and vibration monitoring, acoustic consultancy and impact assessment gained over a period of 16 years in the industry, across the UK, Australia, Brunei, Turkey and the Middle East. He has a Degree in Environmental Science, Postgraduate Diploma in Environmental Monitoring and is a member of the Institute of Acoustics (TechIOA). He has also completed the IOA Certificate in Environmental Noise, from the University of Liverpool.
- 1.7 Jonathan specialises in the measurement and assessment of noise and vibration for a wide range of planning applications, including those requiring EIA, across the industrial, commercial, residential, and mineral extraction sectors. Jonathan is also involved in undertaking various aspects of indoor occupational monitoring and reporting for projects relating to worker health.

2. Existing Context

- 2.1 The site (ground floor level) is set within a commercial row of 2-storey attached buildings with residential apartments on the first and second floor located along the main high street with shops and restaurants for traffic including for deliveries. The site is surrounded by a mixture of restaurants, retail and residential.

- 2.2 The environmental health department of the local planning authority raised concerns of noise emissions from the use of the fan extraction unit venting on neighbouring noise sensitive residential properties above the site and at the rear of the site during the daytime.

3. Criteria

- 3.1 The following targets have been selected in accordance with 'BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound.' This will be achieved when the Rating Level is below the representative background sound level.
- 3.2 Whilst there are no prescribed standards for the assessment of noise impact where human voice is the primary source, reference can be made to 'BS8233:2014 – Guidance on sound insulation and noise reduction for buildings' [British Standards Institution] which gives guideline criteria for internal ambient noise levels in residential dwellings.

4. Noise Policy and Guidance

Noise Policy Statement for England (NPSE)

- 4.1 The NPSE sets out the Government's policy on noise and includes the long-term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.
- 4.2 This long-term vision is supported by the following aims:
- 4.3 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; and
 - where possible, contribute to the improvement of health and quality of life.
- 4.4 There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:
- NOEL (No Observed Effect Level) – this is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise;
 - LOAEL (Lowest Observed Adverse Effect Level) – this is the level above which adverse effects on health and quality of life can be detected.
- 4.5 Extending these concepts further, NPSE leads to the concept of a significant observed adverse effect level:

- SOAEL (Significant Observed Adverse Effect Level) – this is the level above which significant adverse effects on health and quality of life occur.

4.6 NPSE acknowledges that it is not possible to have a single objective noise-based measure that defines NOEL, LOAEL and SOAEL that is applicable to all sources of noise in all situations. It is therefore suggested that more specific advice from other applicable noise standards and guidance could be employed to determine suitable noise level criteria within the overall principles of the NPSE.

National Planning Policy Framework (NPPF)

4.7 The revised NPPF was updated on 20 July 2021 and sets out the government's planning policies for England and how these are expected to be applied. This document replaces the first NPPF published in March 2012, and includes minor clarifications to the revised version published in July 2018 and June 2019.

4.8 Where issues of noise impact are concerned the NPPF provides brief guidance in Chapter 15 'Conserving and enhancing the natural environment' as follows:

Paragraph 170:

Planning policies and decisions should contribute to and enhance the natural and local environment by preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

Paragraph 180:

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

- mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
- limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

Paragraph 182:

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

Planning Practice Guidance (PPG)

- 4.9 PPG is written in support of the NPPF and provides an increased level of specific planning guidance.
- 4.10 It suggests that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. It is also suggested that noise should not be considered in isolation and separately from issues such as the economic, social and other environmental dimensions of proposed development.
- 4.11 Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:
- whether or not a significant adverse effect is occurring or likely to occur;
 - whether or not an adverse effect is occurring or likely to occur; and
 - whether or not a good standard of amenity can be achieved.

Technical Guidance

BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound'

BS4142 is a recognised standard for assessing the noise impact of fixed plant machinery via relation of noise emissions to current background noise levels.

5. Nearest Sensitive Receptor Locations

- 5.1 The nearest noise sensitive receptors (NSRs) have been identified as a residential apartment directly above the site.

6. Subjective Impressions

- 6.1 The noise climate at the rear of the site is dominated by bird song, noise from a nearby fast food and commercial outlets. Secondary noise sources have been identified as road traffic throughout the day including cars and HGVs / LGVs where tyre / road interaction noise was most prominent from Victoria Road and car park.

7. Measurement Locations

- 7.1 Unattended background noise measurements were undertaken outside the rear of the nearest sensitive receptor. The data collected during this period has been used to characterise the existing acoustic environment around the site.
- 7.2 Measurement and NSR locations are shown in figure 1 below:



Figure 1: Site & Measurement Location

- Background measurement location M1
- ▬ Site location
- ★ NSR1

8. Measurement Procedure

- 8.1 Noise levels were measured on Sunday 15th to Monday 16th August 2021. Full measurement times and durations can be found in **Appendix B**.

9. Measurement Equipment

- 9.1 Measurements were undertaken using a calibrated, Pulsar N45 class 1 sound level meter. Full equipment details can be found in **Appendix C**
- 9.2 During all measurements the microphone was protected with an outdoor windshield.
- 9.3 The calibration level of the meter was checked before and after the survey with a Pulsar N45 sound calibrator with no variation in the levels observed.
- 9.4 The sound level meters were set to measure various noise parameters including LAeq and LAmx values using a 'fast' time weighting.
- 9.5 Full calibration details can be found in **Appendix D**.

10. Weather Conditions

- 10.1 Weather conditions were deemed acceptable for background noise measurement. Full meteorological conditions are detailed in **Appendix E**.

11. Noise Source Levels

- 11.1 The noise level of the extraction unit and condenser unit has been provided by the manufacturer.
- 11.2 The outlet noise level is tabulated below:

Table 2: Manufacturer Noise Level

Equipment	LAeq (dB)	r, m
Extractor fan outlet (with silencers)	75 (45dB)	3.0

Table 3: Manufacturer Noise Level

Equipment	LAeq (dB)	r, m
2x Condenser units	62	1.0

BS4142:2014 Assessment

12. Specific Sound Levels

- 12.1 The specific sound level is denoted L_{As} and is the A-weighted, equivalent noise level at the NSR locations over the reference time period.
- 12.2 The NSRs are located adjacent to and directly above the site, however the location of the exit flue will be above the receptor roofline and with no direct line of sight for the apartments below. This is also the same for the location of the proposed condenser units, which will not be in sight from the windows above. See Figure 1 for the location of sensitive receptors. Full calculations are shown in **Appendix F**:
- 12.3 The Specific Sound Level of the air vented from the top of the proposed flue and silencer at the nearest NSR locations at the rear of the site is summarised below:

Table 3: Specific Sound Levels

NSR	Specific Sound Level, dB L_{As}
1 (4m)	38

- 12.4 The Specific Sound Level of the 2x condenser units at the nearest NSR locations at the rear of the site is summarised below:

13. Table 4: Specific Sound Levels

NSR	Specific Sound Level, dB L_{As}
1 (4m)	45

- 13.1 The overall combined specific Sound Level of the 2x condenser units and extraction system at the nearest NSR locations at the rear of the site is summarised below:

14. Table 4: Specific Sound Levels

NSR	Specific Sound Level, dB L_{As}
1 (4m)	46

15. Background Sound Level

15.1 Environmental noise levels were measured on site 15th to 16th August 2021.

15.2 The lowest daytime background sound level was measured between 21:45-22:00 on Sunday as 43 dB LA90,15min.

16. Rating Level

16.1 The specific sound level may be corrected for certain characteristics that make a sound more noticeable at the NSR locations. Corrections for tonality, impulsivity and intermittency may be applied.

16.2 The associated rating penalties and resultant sound rating levels, dB L_{Ar}, are tabulated below:

Table 4: Rating Penalties, dB, and Sound Rating Levels

NSR	dB L _{As}	Tonality	Impulsivity	Intermittency	dB L _{Ar}
1	46	3	3	0	52

17. Rating Level Vs Background

17.1 The rating level is to be compared to the background sound level to determine the resultant noise impact in accordance with BS4142:

A Sound Rating Level at or below the background noise level is indicative of *Low Impact*;

A Sound Rating Level that exceeds the background noise level by around + 5dB is likely an indication of *Adverse Impact*, depending on the context;

A Sound Rating Level that exceeds the background noise level by around + 10dB is likely an indication of *Significant Adverse Impact*, depending on the context.

17.2 The noise impact during the daytime is tabulated below:

Table 5: Noise Impact

NSR	Rating Level, dB L _{Ar}	Difference, dBA	Impact
1	52	+9	Adverse Impact

17.3 Adverse Impact has been identified at the NSR therefore mitigation is required.

17.4 It is recommended to install acoustic enclosures at the condenser units to reduce the noise by at least 15dB is required to reduce the noise level to low impact at the NSR.

17.5 Specialist companies who supply and install noise abatement are shown below.

Specialist companies who supply and install condenser unit noise abatement are shown below.

<https://www.ambientacoustics.co.uk/index.html>

<http://www.acoustic-enclosures.co.uk/condenser-enclosure.html>

18. Internal Noise Level

18.1 At the time of the assessment, the site was under refurbishment and any noise impact is based on worst case noise levels from similar restaurants operations.

18.2 Whilst there are no prescribed standards for the assessment of noise impact where human voice is the primary source, reference can be made to 'BS8233:2014 – Guidance on sound insulation and noise reduction for buildings' [British Standards Institution] which gives guideline criteria for internal ambient noise levels in residential dwellings.

18.3 The primary noise source within the site will be customer' voices and background music. Spectral noise data from American Standard ANSI 3.5 1997 (Appendix A) has been utilised within the calculations.

18.4 The Octave Band noise levels from the source data have been normalised. This figure is assumed as a worst-case scenario for internal noise levels. The Octave Band noise levels from the source data have been normalised to an overall A-Weighted internal noise level of 80 dB(A). This figure is assumed as a worst-case scenario for internal noise levels with everything in the restaurant occurring at the same time.

Table 2: Internal Noise Within Ground Floor Area

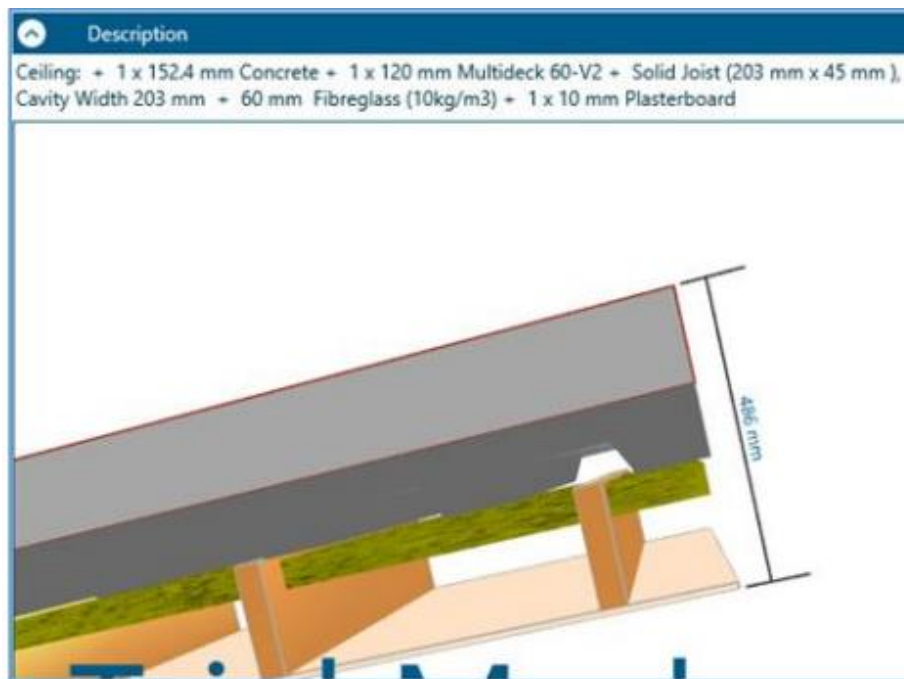
	Octave Centre-Frequency Band, Hz							Equivalent A-Weighted Sum, dB L _{Aeq}
	63	125	250	500	1k	2k	4k	
Noise Level of Voices (Normalised), dB L _{eq}	65.3	71.3	77.3	80.3	74.3	69.3	64.3	80

19. Internal Noise Transfer

19.1 Ground floor ceiling partition specifications have been modelled in InsulTM (Marshall Day Acoustics).

Proposed Building Ceiling Insulation

19.2 The ground floor ceiling is concrete. The proposed floor/ceiling partition separating the ground-floor from the first-floor apartments has been determined as shown below.



19.3 The model of the ground floor / first floor partition showed a performance of 65 R_w , this will be adequate in attenuating internal noise transfer to within the target criteria (30 dB) within first floor apartments.

19.4 The ground floor ceiling construction can consist of the following acoustic material or similar:

- Concrete ceiling with the following within the ground floor ceiling...
- 120mm Multideck 60-V2
- Solid joist 203mmx45mm
- Cavity width 203mm

20. Summary

- 20.1 A ground commercial property (herein referred to as the site) has Planning Approval (CONS/21/00892) for a change of use of no.260 from A1 classification (retail units) and no.262 from A2 Classification to a A3/A5 classification (Restaurants and Cafes/Hot food takeaways).
- 20.2 A Planning condition states that “acoustic mitigation measures related to any extraction systems, chiller units, have been submitted for approval.” The site wishes to install a kitchen extraction and external flue system and 2x condenser units at ground floor level. The client has been requested by the Local Council to complete a noise assessment at 262 London Road, Waterloooville, PO7 7HG.
- 20.3 The primary internal noise source is customers voices within the on the ground floor.
- 20.4 A noise assessment is required to assess the likely noise impact from noise generated from the extractor fan unit with appropriate silencer and flu riser within the rear of the site which will have the air vented at ground floor level above the roofline (4m from nearest window) during the daytime on residents directly above and at the rear of the site, and from 2x ground floor condenser units. (4m from the nearest window) It should be noted that all plant and fans will be turned off prior to 11pm each day.
- 20.5 The internal noise transfer through the current ground floor concrete ceiling/floor partition was calculated over the target criteria of 30 dB therefore mitigation has been specified in the form of ceiling / floor partition enhancements between shared ceiling/floor partition.
- 20.6 By enhancing the ground floor ceiling, the internal level within the first-floor accommodation would be reduced below the target criteria.
- 20.7 Adverse Impact from the combined external noise has been identified at the NSRs therefore mitigation is required.
- 20.8 The proposed extract fan is complete with extract spigots and with flexible connectors to reduce vibration transmission. It will be installed on Anti-vibration mountings, one for each corner of the fan unit to mitigate any risk of vibration transmission to the neighbouring properties.
- 20.9 It is recommended to install acoustic enclosures around the condenser units to reduce the overall noise by at least 15dB to reduce the noise level to low impact at the NSR.
- 20.10 Specialist companies who supply and install condenser unit noise abatement are shown below.

<https://www.ambientacoustics.co.uk/index.html>

<http://www.acoustic-enclosures.co.uk/condenser-enclosure.html>

20.11 The results of the noise assessment demonstrate that, noise from the use of the extractor unit venting above the eaves and the 2x condenser units beneath the sensitive receivers will be considered **low impact**.

21. Uncertainties

21.1 Uncertainty can arise when a calculation method, such as distance correction, is used to determine an overall noise level at an NSR location; however, it is an accepted method when the noise sources are yet to be introduced to the site.

21.2 The monitoring equipment is subject to a 1dB error margin, however calibration before and after measurements allows the drift within the margin to be monitored and thus demonstrates that minimal drift occurred throughout the measurements.

Appendices

APPENDIX A – Extraction Details

Canopy Hood

The wall type canopy will be manufacturer from Stainless steel sheets in brush finish. Measuring, length 2off; 3000mm, depth; 1100mm Incorporate within the canopy would be a full-length purpose-built filter housing to accommodate 4 off, 500mm (wide) x 500mm (height) x 50mm (deep) stainless steel baffle grease filters.

The Face velocity of the Canopy will reach 0.35m/s (medium Cooking), Canopy 1, Face Velocity: $3\text{m} \times 1.1\text{m} \times 0.35 = 1.155\text{m}^3/\text{s}$ Canopy 2, Face Velocity: $3\text{m} \times 1.1\text{m} \times 0.35 = 1.155\text{m}^3/\text{s}$ Design Volume $2.31\text{m}^3/\text{s}$ Duct air speed 9m/s Pressure 398 pa Noise level of 450mm cased axial flow Fan motor produces 75dBA in free field condition at 3m, using our recommended Silencers, 450mm 1D with 80mm thick wall, will bring the noise level down to less than 45dB. The system will be located on the rear of the building, and exhaust away from the residential buildings. All ductwork are low pressure class A and constructed in accordance with HVCA specification DW/144(1) with a minimum thickness of 0.8mm.

Duct Work

The main duct work will be manufactured from galvanised mild steel sheet of a spiral lock formed and coupler construction in accordance with DW144 specification. We will also fit a bird beak in order to provide sufficient efflux, and prevent any nuisance to surrounding residential properties.

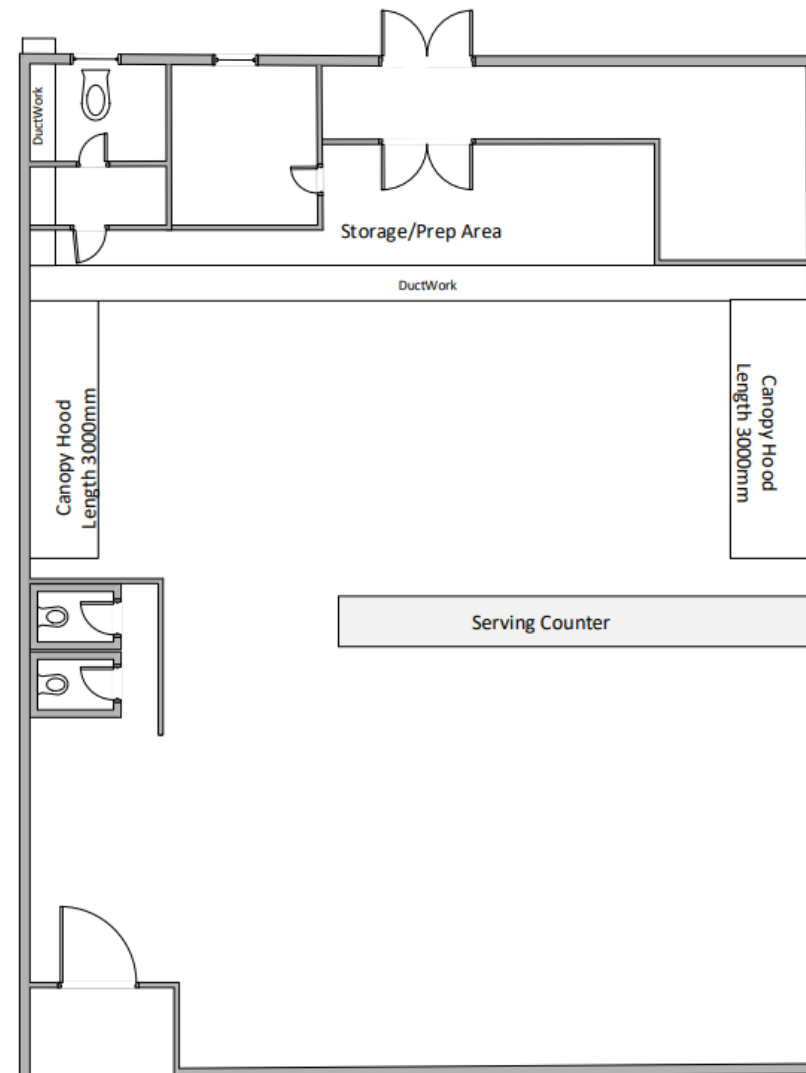
Extract fan

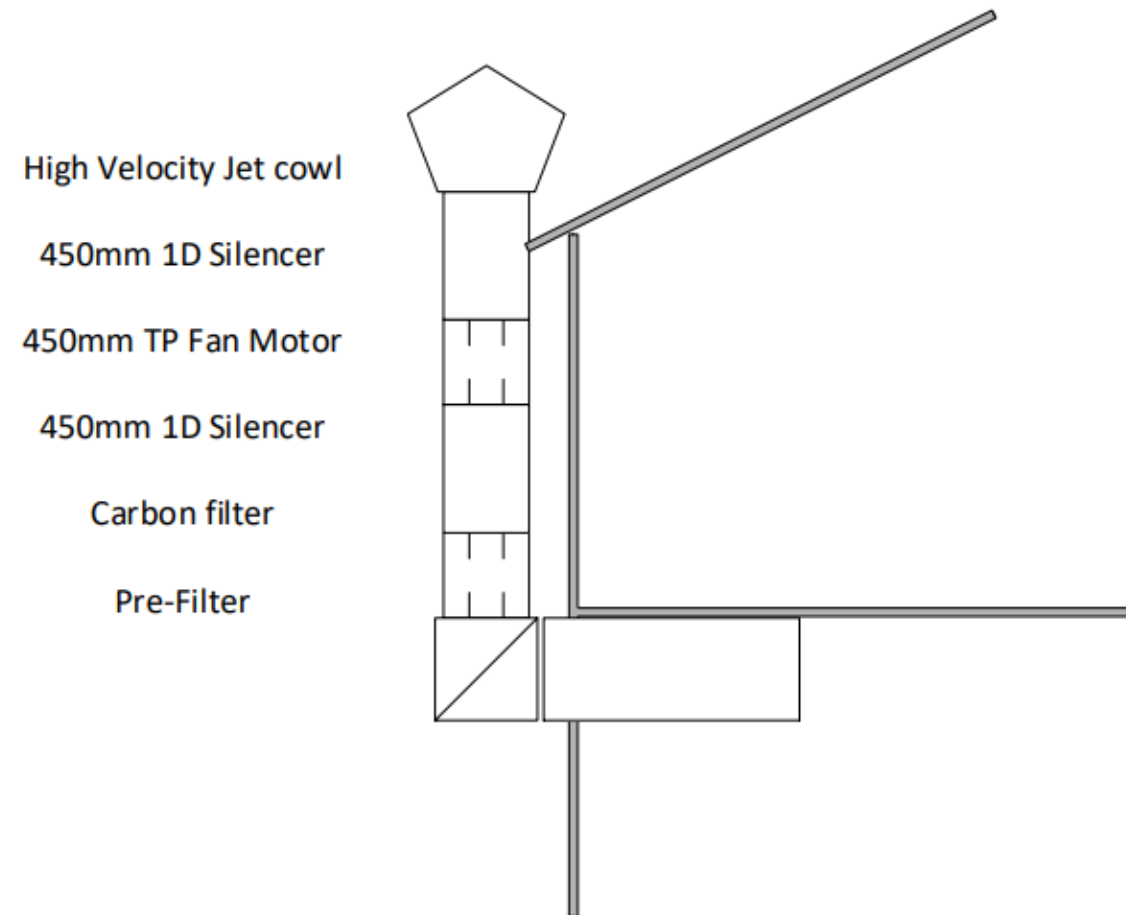
Located within the ducting will be a 450mm diameter, 4 pole, and single phase cased axial fan motor running via a variable speed controller. This fan will handle an airflow in excess of $2.4\text{m}^3/\text{second}$, against the resistance of the system @398pa. Thereby easily giving 35 air changes per hour within the kitchen area as per CIBSE B2. The fan runs at 1380rpm with maximum operating noise level of 75 dBA (free field) without any silencer at a distance of 3m.

Air Make up

If gas equipment is to be used within the kitchen an additional air supply fan will be required to allow for 85% of the extracted air to be returned back into the kitchen, this will include a 315mm dia cased axial fan, variable speed controller and external air supply vent.

KITCHEN EXTRACT SYSTEM DETAILS





Rear view of the building with equipment showing in black





Stainless Steel Fabrication Commercial Kitchen Design and Installation

Anti Vibration Mounts (A.V. Mounts)



Load range per mount 5Kg -28Kg

Anti Vibration Mounts (A.V. Mounts) attach to the bottom of Mounting Feet.

A.V. Mounts are used to isolate the fan from the system to prevent vibration transfer through fixings or structures.

A.V. Mounts can be used to isolate any products from the main system to prevent vibration transfer

The main uses A.V. Mounts for are, Axial flow fans, Box fans, Centrifugal fans, in fact A.V. Mounts can be used with anything that causes vibration.



Stainless Steel Fabrication
Commercial Kitchen Design and Installation

Unit5 Firefly Square Plantation Road Burscough Industrial Estate L40 8JT

VAT No. 245073616

Tel: 01704-893945 Fax: 0844-4122296

Email: fusionhot1@gmail.com Web: www.FusionHot.co.uk

APPENDIX B - Measurement Details				
Measurement	Start Date	Start Time	End Date	End Time
M1	15/08/21	11:30	16/08/21	12:15

APPENDIX C - Equipment Details				
Equipment	Make	Model	Class	Serial Number
Sound Meter	Pulsar	N45	1	1365
Calibrator	Pulsar	PM1	1	011121C

APPENDIX D - Calibration Details					
Measurement	Calibrator Ref Level (dB)	Level Before (dB)	Deviation Before (dB)	Level After (dB)	Deviation After (dB)
M1	94.0	94.0	0	94.0	0

APPENDIX E - Meteorology Details						
Date	Temp C	Wind Speed m/s*	Wind Direction	Humidity %	Precipitation mm	Cloud Cover (Oktas)
15-16/08/21	18-22	2.9	ssw	57	0.0	3/8

*Windspeeds measured on site using a Skywatch Xplorer 2 Anemo-Thermometer.

APPENDIX F - Noise Attenuation

Utilising Measured Levels

Equipment	Manufacturer Data, dB $L_{Aeq,T}$	r_1 , m	r_2 , m	Barrier	Level at NSR ₂
Extractor (with silencer)	75 (45)	4.0	3.0	-5	38 (NSR1)
2x condenser unit	62	4.0	1.0	-5	45

Barrier attenuation assumed as 5 dB and 10 dB for the partial and complete blockage of the line of sight respectively between source and receiver as per 'BS5228-1:2009 – Noise and vibration control on construction and open sites' pg. 130.

Point source distance attenuation

$$L_y = 20 \times \log \frac{r_1}{r_2}$$

Where L_y is the distance attenuation factor and $r_{1,2}$ are the source -> measurement distance and source -> NSR distance in metres respectively

APPENDIX G – Calibration Certificates

CERTIFICATE OF CALIBRATION		
ISSUED BY	Pulsar Instruments Plc	
DATE OF ISSUE	05 July 2021	CERTIFICATE NUMBER 159501
 Pulsar Instruments Plc Acoustic House Bridlington Road Hunmanby North Yorkshire YO14 0PH United Kingdom		Page 1 of 2 Approved signatory R.Thomas Electronically signed: 
Sound Level Meter : IEC 61672-3:2013		
Instrument information		
Manufacturer:	Pulsar Instruments Plc	Notes:
Model:	Model 45	
Serial number:	PN1432	
Class:	1	
Firmware version:	2.5.0.296	
Test summary		
Date of calibration: 05 July 2021		
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.		
Periodic tests were performed in accordance with procedures from IEC 61672-3:2013.		
The sound level meter submitted for testing successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.		
As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications in IEC 61672-1:2013.		
Notes		
This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.		

CERTIFICATE OF CALIBRATION

ISSUED BY **Pulsar Instruments Plc**
DATE OF ISSUE **05/07/21** CERTIFICATE NUMBER **159502**



Pulsar Instruments Plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

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Test engineer:
D.Swalwell
Electronically signed:

A handwritten signature in black ink, appearing to be 'D. Swalwell', written over a horizontal line.

Microphone

Microphone capsule

Manufacturer: Pulsar Instruments

Model: PM1

Serial Number: 011121C

Calibration procedure

Date of calibration: 28 June 2021

Open circuit: 50.4 mV/Pa

Sensitivity at 1 kHz: -25.9 dB rel 1 V/Pa

The microphone capsule detailed above has been calibrated to the published data as described in the operating manual of the associated sound level meter (where applicable).

The frequency response was measured using an electrostatic actuator in accordance with BS EN 61094-6:2005 with the free-field response derived via standard correction data traceable to a National Measurement Institute.

The absolute sensitivity at 1 kHz was measured using an acoustic calibrator conforming to IEC 60942:2003 Class 1.

Environmental conditions

Pressure: 101.00 kPa

Temperature: 21.0 °C

Humidity: 55.0 %

CERTIFICATE OF CALIBRATION

ISSUED BY **Pulsar Instruments Plc**

DATE OF ISSUE **05 July 2021**

CERTIFICATE NUMBER **159503**



Pulsar Instruments Plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

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Approved signatory

R. Thomas

Electronically signed:

Sound Calibrator : IEC 60942:2003

Instrument information

Manufacturer: Pulsar Instruments

Notes:

Model: MODEL 105

Serial number: 77511

Class: 1

Test summary

Date of calibration: 05 July 2021

The sound calibrator detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC60942_2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The manufacturer's product information indicates that this model of sound calibrator has been formally pattern approved to IEC60942_2003 Annex A to Class 1. This has been confirmed with the Physikalisch-Technische Bundesanstalt (PTB).

Notes:

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

APPENDIX H – Terminology and Definitions

Noise

Sound only becomes noise (often defined as ‘unwanted sound’ or sound that is considered undesirable or disruptive) when it causes or contributes to some harmful or otherwise unwanted effect, like annoyance or sleep disturbance.

Acoustic Environment

Sound from all sound sources as modified by the environment.

Equivalent continuous A-weighted sound pressure level $L_{Aeq,T}$

Value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval T , has the same mean square sound pressure as a sound under consideration whose level varies with time.

A-weighting

The human ear is most sensitive to frequencies in the range 1 kHz to 5 kHz. On each side of this range the sensitivity falls off. A-weighting is used in sound level meters to replicate this sensitivity and respond in the same way as the human ear.

Octave Band

Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit.

Maximum Sound Pressure Level $L_{Amax,T}$

Highest value of the A-weighted sound pressure level with a specified time weighting that occurs during a given event or measuring period.

The $L_{A10,T}$ Sound Level

The A-weighted sound pressure that is exceeded for 10% of a given time interval, T . It is often used to evaluate road traffic noise.

The $L_{A90,T}$ Sound Level

The A-weighted sound pressure that is exceeded for 90% of a given time interval, T , measured using time weighting F . It is often referred to as the background noise level and which might in part be an indication of relative quietness at a given location

Free-field Level

The sound pressure level away from reflecting surfaces.

NOTE Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source).

Façade Level

The sound pressure level 1 m in front of the façade.

NOTE Facade level measurements of LpA are typically 1 dB to 2 dB higher than corresponding free-field measurements because of the reflection from the facade.

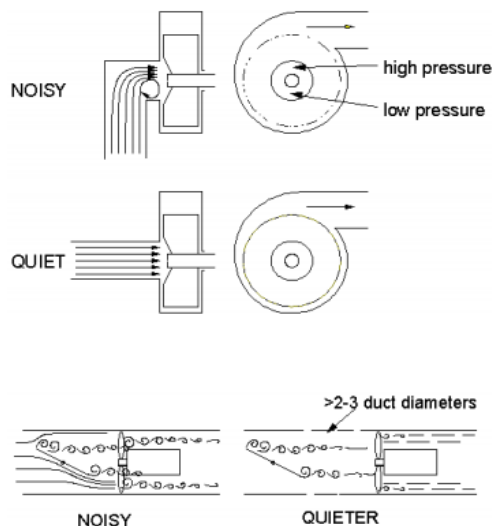
Indoor Ambient Noise

Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants.

APPENDIX I – Noise Control Technique Examples

FAN INSTALLATIONS

Typical applications Axial flow or centrifugal fans. Technique Maximum fan efficiency coincides precisely with minimum noise. Any fan installation feature that tends to reduce fan efficiency is therefore likely to increase noise. Two of the most common examples are bends close to the fan (intake side in particular) and dampers (close to the fan intake or exhaust).



Ideally, for maximum fan efficiency and minimum noise, make sure there is at least 2 - 3 duct diameters of straight duct between any feature that may disturb the flow and the fan itself. Noise reductions of 3 - 12 dB are often possible.

DUCTWORK

Typical applications Extraction, ventilation, cooling, openings in walls and enclosures. Technique Instead of fitting silencers, it is often possible to achieve a 10 - 20 dB reduction in airborne noise from a duct or opening by lining the last bend in the ductwork with acoustic absorbent (foam or rockwool / fibreglass). Alternatively, construct a simple absorbent lined right-angled bend to fit on the opening. Ideally, either side of the bend should be lined along a length equivalent to twice the duct diameter. Where flow velocities are high ($> 3\text{m/s}$), consider using cloth faced absorbent.



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We can also undertake Noise Modelling if required.