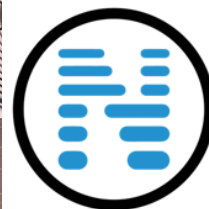
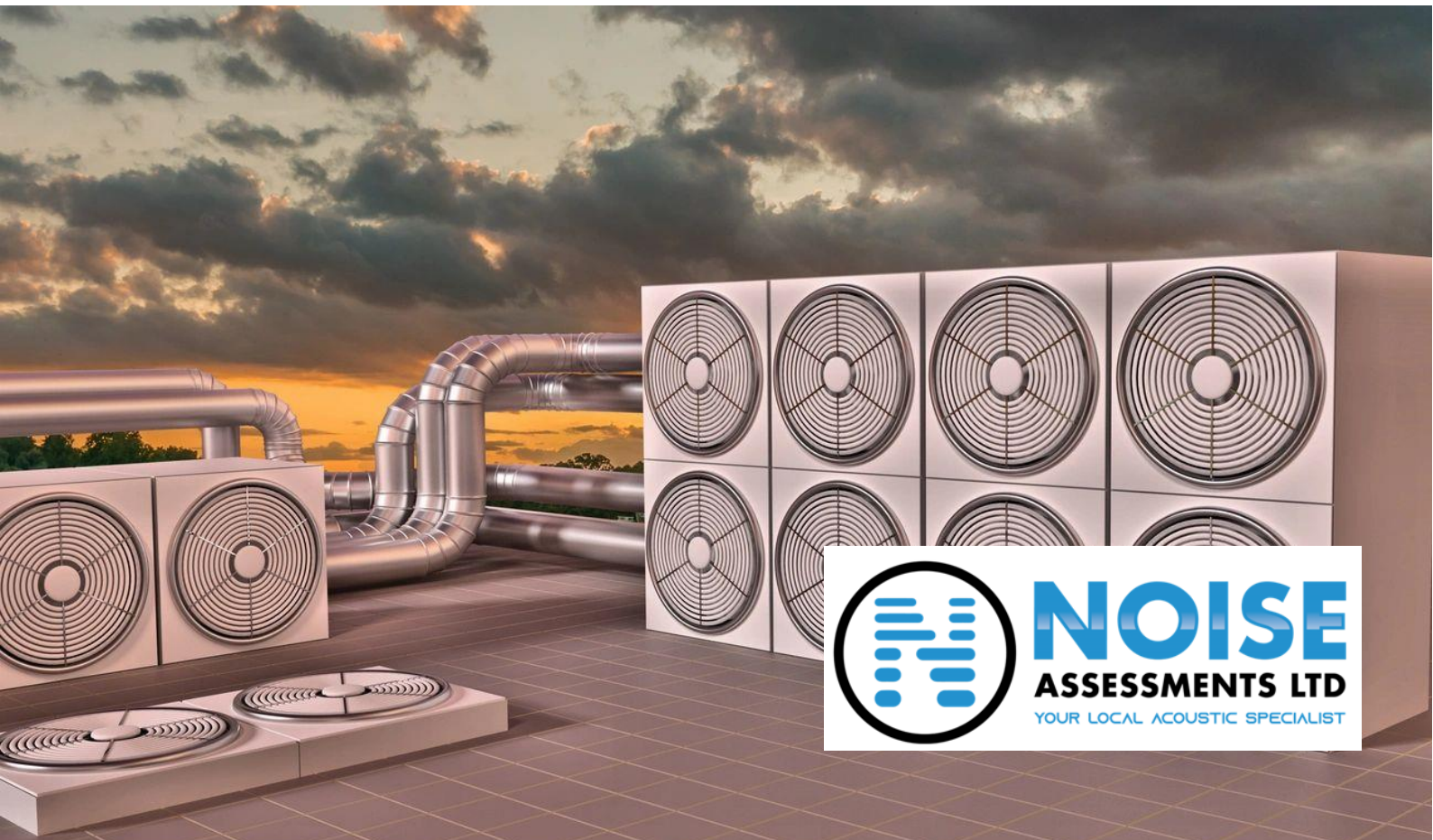


NOISE IMPACT ASSESSMENT

BS 4142:2014+A1:2019 and BS 8233:2014

Change of Use:
E(c)(ii) to Sui
Generis



NOISE
ASSESSMENTS LTD
YOUR LOCAL ACOUSTIC SPECIALIST

REPORT DETAILS

Client	Natalie Power
Report Title	Change of Use: E(C)(ii) to Sui Generis
Site Address	320 Wilmslow Rd, Manchester M14 6XQ
Project No.	NALPRO090821.03
Consultant Contact	jonathan@noiseassessment.org

QUALITY ASSURANCE

Issue No.	Status	Issue Date	Comments	Author	Approved
1	Final	25/09/21	-		
2	Final	18/12/22	Updated based on changes to extraction system	J Mape BSc (Hons) PgDip IOA Cert. Environ. Noise 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 floor commercial property (herein referred to as the site) is applying for planning permission to operate as a bar/restaurant with the ability to cook food (2 combination convection microwaves) with a proposed extraction fan, indoor seating, and front outdoor seating at 320 Wilmslow Rd, Manchester M14 6XQ.

The primary internal noise source is expected to be seated customers voices and music within the proposed bar/restaurant on the ground floor during the daytime and night-time.

One internal extractor fan unit to be installed to the side of the site with the air vented at ground floor level, during the daytime and night-time.

Noise from seated customers chatting at the front of the site to the residential windows above (NSR1) and opposite the site (NSR2) is 38 dBA and 28 dBA respectively, below the lowest measured background noise level of 44 dB LA90 daytime and 39 dB LA90 night-time, therefore; the noise impact as a result is expected to be low.

The internal noise transfer through the ceiling/floor partition was calculated as 11.7 dB 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.

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

To achieve a 13dB reduction from the fan noise, by installing an acoustic louver with a reduction rating of 13 dBA will be indicative of a low impact at the NSR locations.

Provided that the proposed enhancements are made and thereafter retained, the noise impact of the proposed ground-floor use is deemed to be low.

1. Proposal

- 1.1 A ground floor commercial property (herein referred to as the site) is applying for planning permission to operate as a bar/restaurant with the ability to cook food (2 combination convection microwaves) with a proposed extraction fan, indoor seating, and front outdoor seating at 320 Wilmslow Rd, Manchester M14 6XQ.
- 1.2 The primary internal noise source is expected to be seated customers voices and music within the proposed bar/restaurant on the ground floor during the daytime and night-time
- 1.3 One internal extractor fan unit to be installed to the side of the site with the air vented at ground floor level during the daytime and night-time.
- 1.4 The proposed hours of operation are:
 - Mon-Sat 08:00 to 02:00
 - Sun and Bank Hols 09:00 to 23:00

2. Existing Context

- 2.1 The site (ground floor level) is set within a commercial row of 2-storey attached buildings located along a main pedestrian street. The site is surrounded by a mixture of commercial shops/offices, restaurants, and apartments on the top floors.
- 2.2 The environmental health department of the local planning authority is likely to raise concerns of noise from the extraction system, customers inside transferring noise to the apartment above and noise from customers sat outside on sensitive residential properties during the daytime and night-time.

3. Criteria

- 3.1 The following targets have been selected in line with '*BS8233:2014 – Guidance on sound insulation and noise reduction for buildings*' [British Standards Institution]:
 - 35 dB $L_{Aeq, 16hr}$ within living areas during the day (07:00 – 23:00)
 - 30 dB $L_{Aeq, 8hr}$ within bedrooms during the evening (23:00 – 07:00)
- 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.
- 3.3 The noise impact of external plant equipment is to be Low 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 5 dB below the representative background sound level.

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 19 February 2019 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.
- 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:

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

5. Nearest Sensitive Receptor Locations

- 5.1 The nearest noise sensitive receptors (NSR) have been identified as first floor residential apartments directly above the site, over 38 meters from the front of the site and 13 meters from the rear of the site.

6. Subjective Impressions

- 6.1 The noise climate on Wilmslow Road is dominated by road traffic including cars and HGVs / LGVs and buses where tyre / road interaction noise was most prominent. Engine noise was also noted as traffic was idle loading and unloading nearby. Secondary noise sources have been identified as conversing pedestrians.
- 6.2 At the rear of the site, within the small courtyard area, the dominant noise sources have been identified as distant road traffic and adjacent restaurant noise.

7. Measurement Locations

- 7.1 A long-term unattended background noise measurement was undertaken from a secure open first floor window at a representative location to the NSR at the front of the site.
- 7.2 As it was deemed unsafe to leave noise monitoring equipment unattended at the rear of the site, short term day and night-time attended noise monitoring was undertaken at the rear of the site.
- 7.3 Measurement and NSR locations are shown in figure 1 below:

Figure 1: Site & Measurement Location



● Background measurement location M1

● Background measurement location M2

▬ Site location

★ NSR1 ★ NSR2 ★ NSR3

8. Measurement Procedure

- 8.1 Background noise levels were measured between the 20th to 25th August 2021. Full measurement times and durations can be found in **Appendix A**.
- 8.2 A -3dB façade correction is applicable due measurements being taken <1m from the nearest reflective surface.

9. Measurement Equipment

- 9.1 Measurements were undertaken using calibrated, class 1 sound level meters. Full equipment details can be found in **Appendix B**.
- 9.2 Full calibration details can be found in **Appendix C**.

10. Weather Conditions

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

11. Background Noise Survey

11.1 A background noise survey was conducted from the 20th to 25th August 2021. This period was chosen to obtain background noise levels over a weekday/end period.

Environmental Noise Levels

Location	Date	T (hrs)	dB L _{Aeq}	dB L _{Amax}	dB L _{A90}	dB L _{A10}
M1	22/08/21	24hrs daytime	52	72	44	56
		24hrs night-time	50	70	39	54
M2	22/08/21	30 (min) daytime	46	66	41*	-
M2	22/08/21	30 (min) night-time	45	67	37*	-

*LA90 daytime reference period is 1hr *LA90 night-time reference period is 15 mins

11.2 The reference time interval for night-time noise of 15-minutes is considered as proposed operating times include the night-time period, 23:00 – 02:00.

11.3 A -3.0 dB façade correction has been applied.

11.4 Background noise measurements were obtained in 5-minute time intervals.

11.5 A noise limit of 44 dB is therefor set for the front of the site and 41 dB for the rear of the site during the daytime.

11.6 A noise limit of 39 dB is therefor set for the front of the site and 37 dB for the rear of the site during the night-time.

12. Noise From outdoor seating

12.1 Noise from seated customer voices will occur during the opening hours when weather permits.

12.2 Voice spectra data (ANSI 3.5-1997) has been used to calculate noise at front of NSR1 and NSR2.

Voice Spectra – ANSI 3.5-1997

	dB Leq @ Octave Band Centre Frequency (Hz)								
Vocal Effort	63	125	250	500	1k	2k	4k	8k	dB L _{Aeq}
Normal	45	51	57	60	54	49	44	39	60

12.3 NSR1 (front of site first floor window) will benefit from having no line of sight with the noise source, affording an assumed minimum 10.0 dB attenuation (BS 5228-1:2009, p.130) and will result in a noise level of 38 dBA, therefore; the noise impact is expected to be low for both during the daytime and night-time.

- 12.4 Noise to the residential windows at NSR2 is 9 dBA below the lowest measured background noise level of 37 dB LA90, therefore; the noise impact as a result of outdoor seated customer, noise is expected to be *low* for both daytime and night-time.

13. Noise Source Levels

- 13.1 The noise level of the extraction unit has been provided by the manufacturer.

- 13.2 The outlet noise level is tabulated below:

Manufacturer Noise Level

Equipment	L _{Aeq} (dB)	r, m
Extractor fan outlet	51	3.0

BS4142:2014 Assessment

14. Specific Sound Levels

- 14.1 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.
- 14.2 The NSRs are located adjacent to and directly above at the rear of the site, See Figure 1 for the location of sensitive receptors. Full calculations are shown in **Appendix E**:
- 14.3 The Specific Sound Level of the air vented from the internal extractor fan unit at the nearest NSR locations at the rear of the site are summarised below:

Specific Sound Levels

NSR	Specific Sound Level, dB L _{As}
1 (5m)	42
3 (13m)	33

15. Specific Sound Level

- 15.1 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.

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

Rating Penalties, dB, and Sound Rating Levels

NSR	dB L _{As}	Tonality	Impulsivity	Intermittency	dB L _{Ar}
1	42	3	0	0	45
3	33	3	0	0	36

16. Rating Level Vs Background

16.1 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.

16.2 The noise impact during the daytime is tabulated below:

Noise Impact

NSR	Rating Level, dB L _{Ar}	Difference, dBA	Impact
1	45	+4	Adverse Impact
3	36	5	Low Impact

16.3 The noise impact during the night-time is tabulated below:

Noise Impact

NSR	Rating Level, dB L _{Ar}	Difference, dBA	Impact
1	45	+8	Adverse Impact
3	36	1	Low Impact

16.4 Adverse Impact has been identified at the NSRs therefore mitigation is required.

16.5 To achieve a 13dB reduction from the fan noise, by installing an acoustic louver with a reduction rating of 13 dBA will be indicative of a low impact at the NSR locations.

17. Internal Noise Level

17.1 The primary noise source within the proposed bar/restaurant will be customer's voices and music. Spectral noise data from *American Standard ANSI 3.5 1997 (Appendix E)* has been utilised within the calculations.

17.2 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.

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 with music (Normalised), dB L _{Aeq}	65.3	71.3	77.3	80.3	74.3	69.3	64.3	80

18. Existing Building Insulation

18.1 The floor/ceiling partition separating the ground-floor has been assumed to be standard wooden floor joist from the residential dwellings has been determined as shown in **Appendix F**.

18.2 Noise breakout through the wall partitions to the ground floor neighbouring buildings have not been considered due to the neighbouring partitions adjoining commercial units.

19. Internal Noise Transfer

19.1 Ground floor ceiling partition specifications have been provided by the client and modelled in Insul™ (Marshall Day Acoustics) as shown in **Appendix F**. The initial model of the current ground floor / first floor partition showed a performance of 47 R_w, this will be inadequate in attenuating internal noise transfer to within the target criteria.

19.2 Considering the internal noise levels and the proposed construction of the separating ceiling, internal sound transmission would result in levels of 41.7 dB L_{Aeq,1hr} within the first-floor accommodation. Details of this calculation are given in **Appendix F**.

19.3 The resultant noise level is above the target criterion of 30 dB L_{Aeq} by 11.7 dB, therefore mitigation is necessary to reduce the noise levels within the receiving room.

19.4 By enhancing the ceiling, the internal level within the first-floor accommodation would be reduced to 28.6 dB L_{Aeq} which is 2.4 dB below the target criteria (see **Appendix F**).

20. Conclusions

- 20.1 A ground floor commercial property (herein referred to as the site) is applying for planning permission to operate as a bar/restaurant with the ability to cook food (2 combination convection microwaves) with a proposed extraction fan, indoor seating, and front outdoor seating at 320 Wilmslow Rd, Manchester M14 6XQ.
- 20.2 The primary internal noise source is expected to be seated customers voices and music within the proposed bar/restaurant on the ground floor during the daytime and night-time.
- 20.3 One internal extractor fan unit to be installed to the side of the site with the air vented at ground floor level, during the daytime and night-time.
- 20.4 Noise from seated customers chatting at the front of the site to the residential windows above (NSR1) and opposite the site (NSR2) is 38 dBA and 28 dBA respectively, below the lowest measured background noise level of 44 dB LA90 daytime and 39 dB LA90 night-time, therefore; the noise impact as a result is expected to be low.
- 20.5 The internal noise transfer through the ceiling/floor partition was calculated as 11.7 dB 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 Adverse Impact has been identified at the NSRs therefore mitigation is required.
- 20.7 To achieve a 13dB reduction from the fan noise, by installing an acoustic louver with a reduction rating of 13 dBA will be indicative of a low impact at the NSR locations.
- 20.8 Provided that the proposed enhancements are made and thereafter retained, the noise impact of the proposed ground-floor use is deemed to be low.

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.
- 21.3 InsulTM sound insulation software states an error margin of +/- 3dB for RW values.

Appendices

APPENDIX A - Measurement Details				
Measurement	Start Date	Start Time	End Date	End Time
M1	20/08/21	11:30	25/08/21	11:30
M2	22/08/21	11:40	22/08/21	12:10
M2	22/08/21	23:00	22/08/21	23:30

APPENDIX B - Equipment Details				
Equipment	Make	Model	Class	Serial Number
Sound Meter	RION	NL52	1	00586905
Calibrator	RION	NC74	1	34825717
Sound Meter	CIRRUS	CR:171A	1	4531675
Calibrator	CIRRUS	CR:515	1	8956410

APPENDIX C - 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
M2	115.0	115.0	0	115.0	0

APPENDIX D - Meteorology Details

Date	Temp C	Wind Speed m/s*	Wind Direction	Humidity %	Precipitation mm	Cloud Cover (Oktas)
20/08/21	21	3.9	WSW	69	0.0	4/8
21/08/21	23	4.5	W	68	0.0	6/8
22/08/21	19	4.6	WS	70	0.3	2/8
23/08/21	19	4.5	W	67	0.0	5/8
24/08/21	20	2.9	W	71	0.2	5/8
25/08/21	20	3.8	SE	68	0.0	6/8

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

APPENDIX E - Noise Attenuation

Utilising Measured Levels

Equipment	Manufacturer Data, dB $L_{Aeq,T}$	r_1 , m	r_2 , m	Barrier	Level at NSR ₂
Extractor	51	5	3.0	- 5	42 (NSR1)
		13	3.0	- 5	33 (NSR3)
Outdoor customer noise	60	4	1.0	-10	38 (NSR1)
		38	1.0	-	28 (NSR2)

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

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

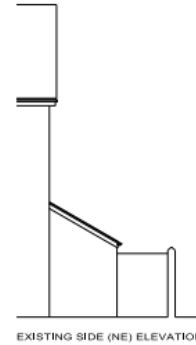
Where L_y is the distance attenuation factor and $r_{1,2}$ are the source -> measurement distance and source -> NSR distance in metres respectively



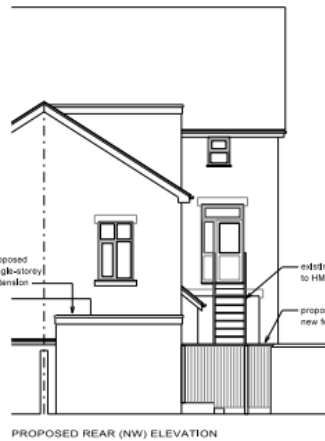
EXISTING REAR (NW) ELEVATION



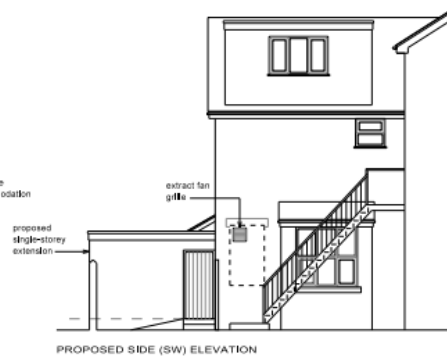
EXISTING SIDE (SW) ELEVATION



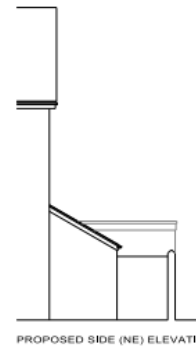
EXISTING SIDE (NE) ELEVATION



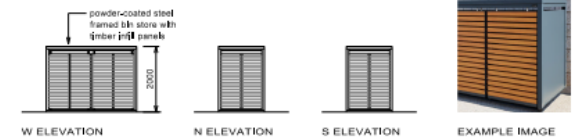
PROPOSED REAR (NW) ELEVATION



PROPOSED SIDE (SW) ELEVATION



PROPOSED SIDE (NE) ELEVATION



W ELEVATION

N ELEVATION

S ELEVATION

EXAMPLE IMAGE

APPENDIX F - Internal Noise Transfer Within Residential Dwelling

Sound Insulation Prediction (v9.0.5)

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- Key No. 5547

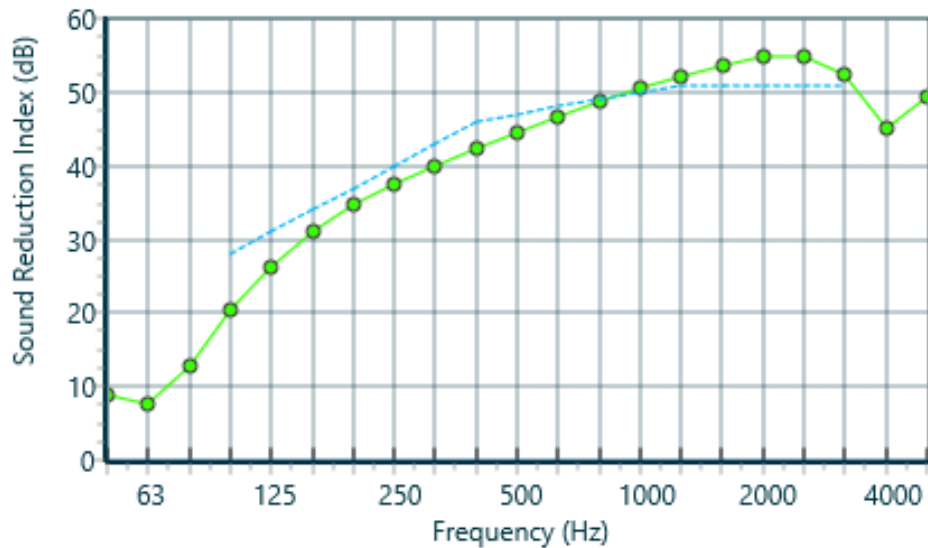
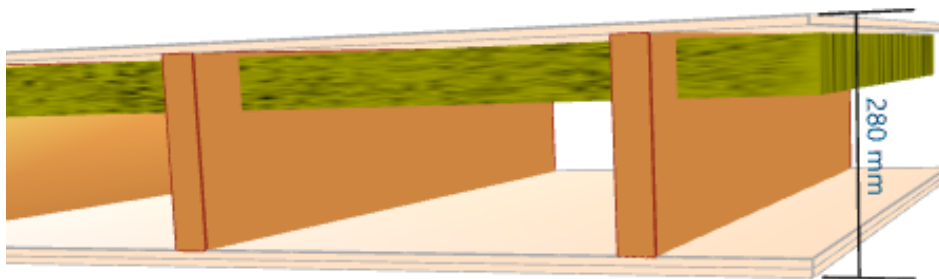
Job Name:



63	125	250	500	1k	2k	4k
9	24	37	44	50	54	48

Rw 47 dB

C -3
Ctr -9
Rw+Ctr 38 dB
 100-3150 Hz



Current Floor/Ceiling Specification							
Frequency, Hz	63	125	250	500	1000	2000	4000
Source, dB Leq	65.3	71.3	77.3	80.3	74.3	69.3	64.3
R1, dB (floor/ceiling)	9.0	24.0	37.0	44.0	50.0	54.0	48.0
Comp R, dB	-9.0	-24.0	-37.0	-44.0	-50.0	-54.0	-48.0
Breakout, dB Leq	60.1	51.1	44.1	40.1	28.1	19.1	20.1
A-Weighting, dB	-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0
Breakout, dB LAeq	33.9	35.0	35.5	36.9	28.1	20.3	21.1

Receiver Room Level, dB LA	41.7
----------------------------	------

S1, m^2	24
S Total, m^2	24
S Facing NSR, m^2	24

Source Room Level, dB Lz	80
--------------------------	----

S1 = ceiling/floor surface area estimated from proposed floor plans

Floor/Ceiling Specification with enhancements							
Frequency, Hz	63	125	250	500	1000	2000	4000
Source, dB Leq	65.3	71.3	77.3	80.3	74.3	69.3	64.3
R1, dB (floor/ceiling)	-18.0	-45.0	-51.0	-56.0	-61.0	-59.0	-61.0
Comp R, dB	50.3	29.3	29.3	27.3	16.3	13.3	6.3
Breakout, dB Leq	-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0
A-Weighting, dB	24.1	13.2	20.7	24.1	16.3	14.5	7.3
Breakout, dB LAeq	-18.0	-45.0	-51.0	-56.0	-61.0	-59.0	-61.0

Receiver Room Level, dB LA	28.6
-------------------------------	------

S1, m ²	24
S Total, m ²	24
S Facing NSR, m ²	24

Source Room Level, dB Lz	80
--------------------------	----

Sound Insulation Prediction (v9.0.5)

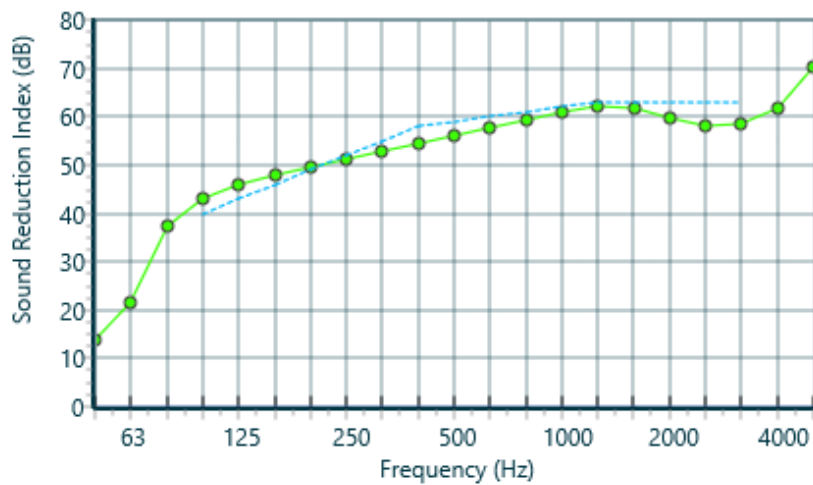
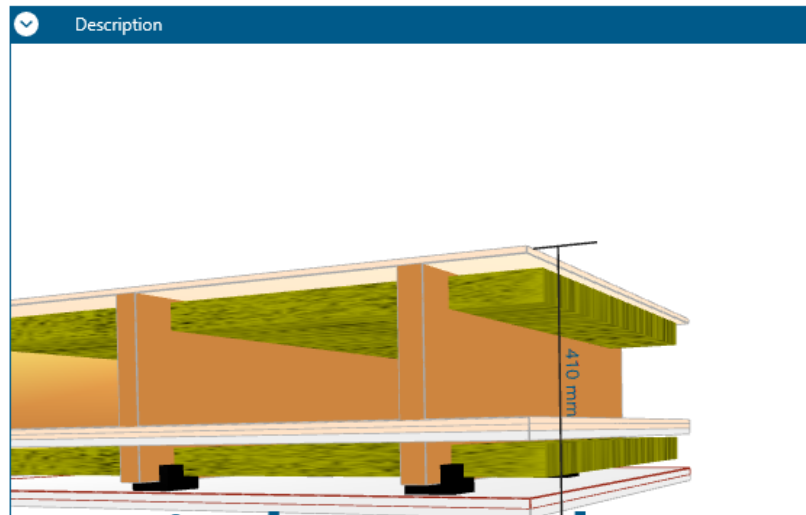
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- Key No. 5547
Job Name:



63	125	250	500	1k	2k	4k
18	45	51	56	61	59	61

Rw 59 dB C -1
Ctr -3
Rw+Ctr 56 dB
100-3150 Hz



Batten and cradle

Gyproc Duraline 15mm

Fibreglass

Gyproc Duraline 15mm

Gyproc Duraline 15mm

The following formula applies (Watson, et al, in “The Little Red Book of Acoustics, 3rd Edition, p111):

$$L_2 = L_1 - SRI + 10\log \left[\frac{S}{A} \right], dB$$

- L_2 : The noise level within the receiving room;
- L_1 : The noise level within the source room;
- -SRI: The sound reduction of the separating partition;
- S: The surface area of the partition shared with the receiving room;
- A: The equivalent absorptive area within the room;

Appendix G – Acoustic Louver Example

QA/QAF Acoustical Louvers

PERFORMANCE DATA

Model QA1245

Acoustic Performance Ratings

	Measured at Octave Band Center Frequencies					
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Free-Field Noise Reduction (dB)	11	12	17	28	32	23
Transmission Loss (dB)	5	6	11	22	26	17

Performance Notes:

1. Test data obtained in accordance with ASTM E90 test standard for Transmission Loss.
2. Free Field Noise Reduction = Transmission Loss + 6 dB
3. Sound Transmission Class (STC) = 17, obtained in accordance with ASTM E413.

Free Area (sq. ft.)

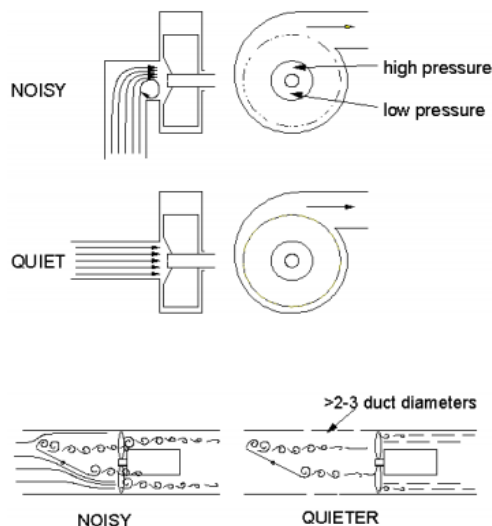
Height in.	Width in.										
	12	18	24	30	36	42	48	54	60	66	72
24	0.28	0.44	0.61	0.77	0.94	1.10	1.27	1.43	1.60	1.76	1.93
30	0.41	0.66	0.91	1.16	1.41	1.66	1.91	2.16	2.41	2.65	2.90
36	0.55	0.89	1.22	1.55	1.88	2.22	2.55	2.88	3.21	3.55	3.88
42	0.69	1.11	1.53	1.94	2.36	2.78	3.19	3.61	4.02	4.44	4.86
48	0.83	1.33	1.83	2.33	2.83	3.33	3.83	4.33	4.83	5.33	5.83
54	0.97	1.56	2.14	2.72	3.31	3.89	4.48	5.06	5.64	6.23	6.81
60	1.11	1.78	2.45	3.12	3.78	4.45	5.12	5.79	6.45	7.12	7.79
66	1.25	2.00	2.75	3.51	4.26	5.01	5.76	6.51	7.26	8.01	8.77
72	1.39	2.23	3.06	3.90	4.73	5.57	6.40	7.24	8.07	8.91	9.74
78	1.53	2.45	3.37	4.29	5.21	6.13	7.04	7.96	8.88	9.80	10.72
84	1.67	2.67	3.68	4.68	5.68	6.68	7.69	8.69	9.69	10.69	11.70
90	1.81	2.90	3.98	5.07	6.16	7.24	8.33	9.41	10.50	11.59	12.67
96	1.95	3.12	4.29	5.46	6.63	7.80	8.97	10.14	11.31	12.48	13.65



Appendix H - 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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