

ACOUSTICS CENTRAL



Domino's, 2-3 Botley Road, Fair Oak, Eastleigh

Plant Noise Assessment

20230704-0 R1

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Plant Noise Assessment

20230704-0 R1

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Document History and Version Control

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Executive Summary

Planning consent has been granted for the change of use of Unit 2 to 3, Botley Road, Fair Oak, Eastleigh from a betting shop (Sui Generis) to a hot food takeaway (Sui Generis), including the installation of ventilation/plant equipment.

An assessment of plant noise emissions has been undertaken to consider the potential noise impact.

Based upon the results of a noise survey undertaken at the site and the requirements of planning condition 4, noise limits for the plant have been defined.

In order to meet the noise limits, acoustic enclosures have been specified for the AC and cold room condensers, and silencers have been specified for the supply and extract fans.

The assessment has demonstrated that allowing for the specified mitigation measures the noise limits can be achieved.

Table of Contents

31st July 2023

1	Introduction	5
2	Site Layout	6
2.1	General	6
2.2	Proposals	6
3	Noise Criteria	7
3.1	Planning Condition 4	7
3.2	Noise Survey	7
3.3	Plant Noise Limits	8
4	Atmospheric-Side Plant Noise Assessment	8
4.1	General	8
4.2	Assessment Locations	9
4.3	Proposed Scheme	9
4.4	Hours of Operation	10
4.5	Mitigation	10
4.6	Assessment Results	11
5	Conclusion	12

Attachments

20230704-0 R1 PNS1
Plant noise schedule

20230704-0 R1 SCH1
Silencer schedule

20230704-0 R1 CS1-CS6
Assessment Calculations Results and Summaries

Appendix A
Glossary of Acoustics Terms

Appendix B
Document Naming and Version Control Policy

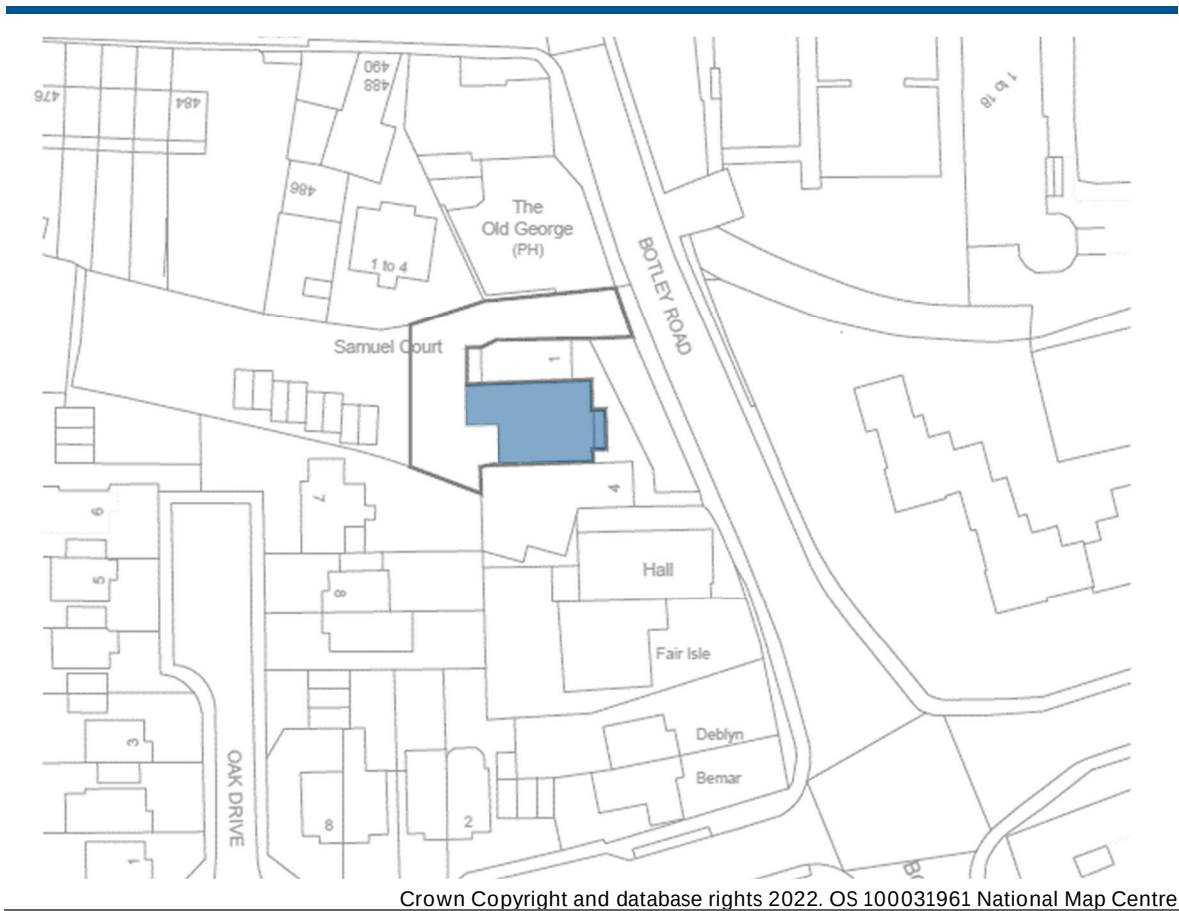
1 Introduction

- 1.1 Planning consent has been granted (LPA reference F22/64393) for the change of use of Unit 2 to 3, Botley Road, Fair Oak, Eastleigh from a betting shop (Sui Generis) to a hot food takeaway (Sui Generis), including the installation of ventilation/plant equipment. One of the conditions (no. 4) attached to the planning consent requires details of external noise emissions from the mechanical services to be submitted for approval.
- 1.2 Acoustics Central has been instructed to undertake an assessment of mechanical services noise emissions. The aim of the assessment is to demonstrate that noise emissions from proposed plant will be suitably controlled to noise sensitivities within the vicinity of the site.
- 1.3 This report provides summary details of a noise survey undertaken at the site by others, details of the plant noise assessment undertaken using equipment manufacturer's noise data as a basis, and any subsequent conclusions or recommendations.
- 1.4 The report is necessarily technical in nature; however, every effort has been made to make it as clear as possible. In this regard, the Glossary of Acoustics Terms attached as Appendix A gives further explanation on relevant acoustics terminology used within the report.

2 Site Layout

2.1 General

- 2.1.1 The site is located at Unit 2 to 3, Botley Road, Fair Oak, Eastleigh SO50 7AN as indicated in the following figure.



F1 Site location

- 2.1.2 The building comprises the commercial unit on the ground floor, and two floors of residences above. The ground floor of the building extends further to the rear than the first and second floor residences, creating a flat roof.
- 2.1.3 Adjoining premises to either side similarly comprise commercial use at ground floor and residences above.

2.2 Proposals

- 2.2.1 It is proposed to install two fans internally (supply and kitchen extract) and two external condenser units. The fans are to terminate through grilles in the rear elevation, the condensers are to be located at ground level to the rear of the building.

3 Noise Criteria

3.1 Planning Condition 4

3.1.1 Condition 4 attached to the planning consent is quoted below for reference:

4 Prior to commencement of the development, details shall be submitted to and approved in writing by the Council, of the external sound level emitted from the premises, plant, machinery and equipment and mitigation measures as appropriate. The measures shall ensure that the external sound level emitted from the premises, plant, machinery and equipment will be lower than the lowest existing background sound level by at least 10 dB(A) in order to prevent any adverse impact. The assessment shall be made in accordance with BS4142:2014 at the nearest and/or most affected noise sensitive premises, with the premises and machinery operating together at maximum capacity. A post installation noise assessment shall be carried out where required to confirm compliance with the sound criteria and additional steps to mitigate noise shall be taken, as necessary. Approved details shall be implemented prior to occupation of the development and thereafter be permanently retained. Reason: To protect nearby residents from adverse noise impacts in accordance with Policies DM1 and DM8 of the Eastleigh Borough Local Plan (2016-2036).

3.1.2 The referenced British Standard regarding noise from plant is BS 4142:2014¹. The primary methodology of the standard compares the rating level of the noise of the plant to the existing representative background noise level (during the relevant period of operation).

3.1.3 The greater the excess of rating level over background noise level, the greater the likelihood of an adverse noise impact. On this comparison of rating level to background noise, BS 4142:2014 notes:

a) Typically, the greater this difference, the greater the magnitude of the impact.

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

c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

d) 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.

3.2 Noise Survey

3.2.1 A noise survey has been undertaken at the site by Mayer Brown as summarised in report "Noise Assessment" ver. 1.0 dated February 2023.

3.2.2 Noise measurements were undertaken at the rear of the building (monitoring location A1), a summary of results relevant to the assessment of plant noise is presented in the following table.

¹ BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

Location	Measured Background Noise Level, L_{A90} dB	
	Daytime (0700-2300 only)	Night time (2300-0700)
A1	44	48

T1 Measured background noise levels (L_{A90}).

- 3.2.3 As indicated in the Mayer Brown report and subsequent technical notes also submitted to the LPA, the background noise levels presented above are representative for the time periods stated as opposed to the minimum measured, as per BS4142:2014 guidance, the standard referenced within the condition.

3.3 Plant Noise Limits

- 3.3.1 Based on the results of the noise survey and the requirements of planning condition 4, the limits in table T2 below are applicable.

Location	Noise Limit, rating level $L_{Ar,Tr}$ dB	
	Daytime (0700-2300 only)	Night time (2300-0700)
Residential windows to rear of store	34	38

T2 Plant noise limits at the nearest noise sensitive properties.

- 3.3.2 The above limits apply to the cumulative noise emissions from all new plant items under normal operating conditions, and are to apply at 1 m from the outside of the windows of the nearest noise sensitive receptors. Any plant with a tonal or other component out of character with the existing noise environment would be subject to a further penalty in line with BS4142:2014+A1:2019 guidance.

4 Atmospheric-Side Plant Noise Assessment

4.1 General

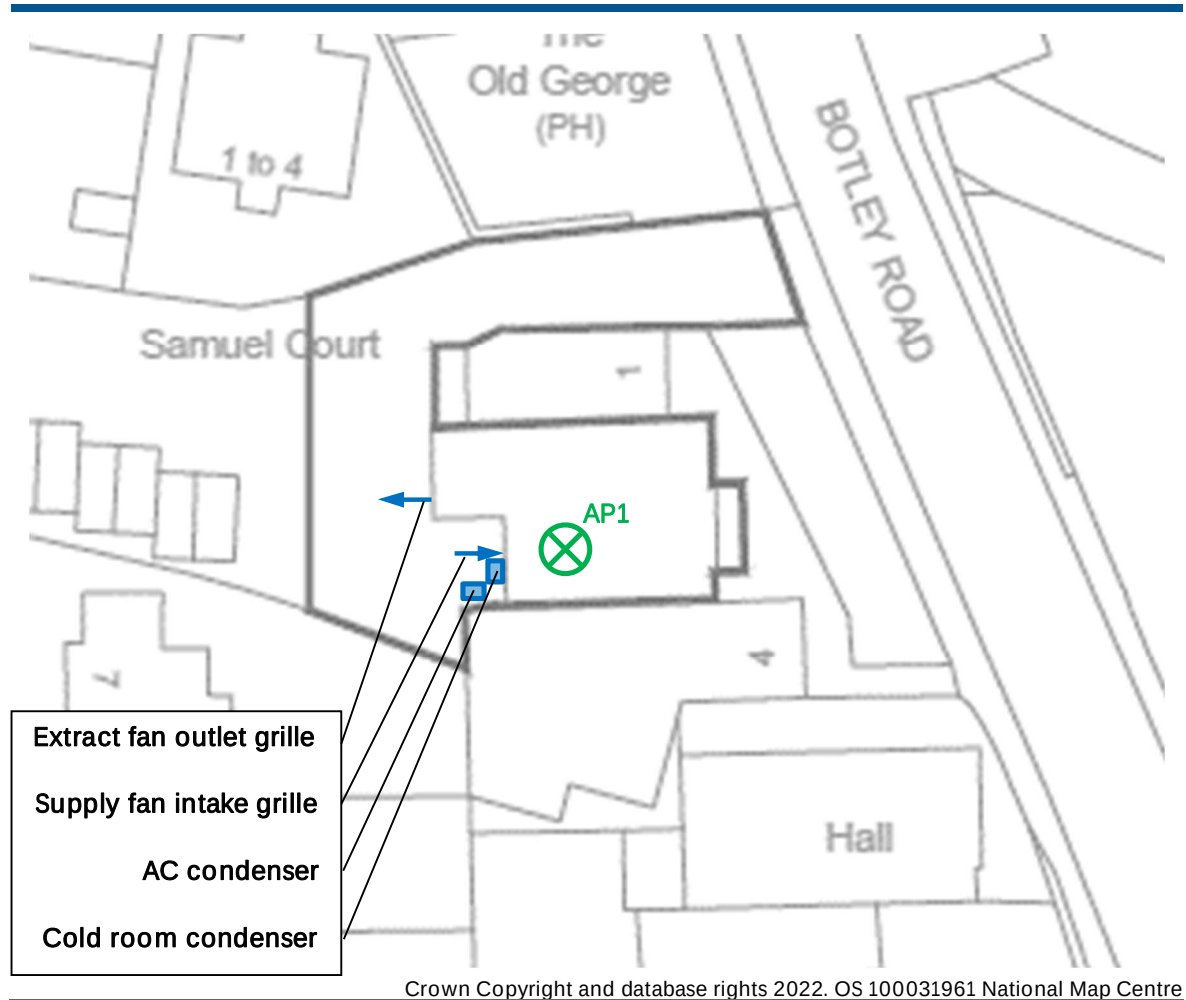
- 4.1.1 In order to compare the proposed plant items with the requirements, an atmospheric plant noise assessment has been carried out.
- 4.1.2 In essence, the assessment starts with manufacturer's plant noise levels, takes account of any system or propagation losses, and compares the resultant levels with the plant noise limits established in the previous section.
- 4.1.3 Our calculations take into account propagation losses such as distance and, where relevant, screening from building, roof and wall edges where these obscure the plant from direct view.

4.2 Assessment Locations

- 4.2.1 The closest noise sensitive residential premises potentially affected by the proposed plant are the rear first-floor windows directly above the store.
- 4.2.2 The assessment position is identified as AP1 on figure F2 overleaf in relation to the plant positions.

4.3 Proposed Scheme

- 4.3.1 It is proposed to install the following items of plant:
- EF1 – Kitchen Extract Fan (ductwork terminating through grille in ground floor rear façade)
 - SF1 – Fresh Air Supply AHU (ductwork terminating through grille in ground floor rear façade)
 - CU1 – AC condenser (located externally to rear at ground level)
 - CU2 – Cold store condenser (located externally to rear at ground level)
- 4.3.2 The full specification details and manufacturers noise data for the proposed plant items can be seen in the attached Plant Noise Schedule PNS1. For the AC condenser unit we have utilised the noise spectrum from the manufacturer for the pressure levels and scaled up to match the manufacturers single figure (dBA) sound power level.
- 4.3.3 The spectra for the supply and extract fans indicate a peak within the 125Hz octave band, therefore a +2dB character correction has been applied to both in the calculations.
- 4.3.4 The plant locations are shown indicatively on the following figure.



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F2 Figure indicating the plant and assessment receptor locations

4.3.5 The receptor AP1 is at first floor level and set back slightly from the ground floor rear façade, meaning it is screened from each of the proposed plant items.

4.4 Hours of Operation

4.4.1 We understand the fans and the AC condenser unit are expected to operate during the store opening hours between 11h00-23h00. The cold store condenser can though run 24 hours a day.

4.5 Mitigation

4.5.1 In order to reduce noise from the AC condenser and cold room condenser, they are both to be housed within acoustic enclosures, the minimum insertion losses for which are set out in the attached mitigation schedule SCH1.

4.5.2 In order to reduce noise from the supply and extract fans, atmospheric-side silencers are to be fitted, the minimum insertion losses for which are set out in the attached mitigation schedule SCH1.

- 4.5.3 The performances noted in the schedule are the minimum that must be achieved in each octave band. Indicative lengths and free areas are indicated on the schedule based upon generic selections.
- 4.5.4 The silencers and duct termination devices should be sized to avoid creating excessive pressure drops or regenerative noise that might otherwise increase the assessed noise at the receptor.
- 4.5.5 The supply and extract fans located internally should be installed on suitable AV mounts/hangers to minimise structure borne noise transmission. Flexible connections should be used between fans and rigid ductwork.

4.6 Assessment Results

- 4.6.1 By utilising the methodology set out above we calculate noise levels at the aforementioned assessment position as presented in the following table. The noise limits are also reproduced for ease of comparison.

Location	Assessed Noise Level, dB (Limit, dB)	
	Daytime (0700-2300 only)	Night time (2300-0700)
AP1: first floor residential windows to rear above store	34 (34)	25 (38)

T3 Levels calculated for the proposed plant

- 4.6.2 As the above table T3 shows, the noise arising as a result of the proposed plant items is calculated to meet the noise limits established for both daytime and night time. As such, the proposed plant items are expected to meet the requirements of the local planning authority.
- 4.6.3 Details of the calculations and the summary sheets for the combined daytime and night time noise at each assessment position are presented in attached figures CS1-CS6.

5 Conclusion

- 5.1 Planning consent has been granted (LPA reference F22/64393) for the change of use of Unit 2 to 3, Botley Road, Fair Oak, Eastleigh from a betting shop (Sui Generis) to a hot food takeaway (Sui Generis), including the installation of ventilation/plant equipment.
- 5.2 One of the conditions (no. 4) attached to the planning consent requires details of external noise emissions from the mechanical services to be submitted for approval.
- 5.3 Based upon the results of a noise survey undertaken at the site and the requirements of planning condition 4, noise limits for the plant have been defined.
- 5.4 An assessment of plant noise emissions has been undertaken. In order to meet the noise limits, acoustic enclosures have been specified for the AC and cold room condensers, and silencers have been specified for the supply and extract fans (specifications given herein).
- 5.5 The assessment has demonstrated that allowing for the specified mitigation measures the noise limits can be achieved.

Plant Noise Schedule

Reference	Description	Unit Details	Data Source	Noise Level Type	dB(A)	Noise Levels (dB)							
						63	125	250	500	1k	2k	4k	8k
CU1	AC Condenser	Mitsubishi Heavy Industries FDC125VNX	Man	Sound Power, Lw		54	64	65	68	66	62	59	52
CU2	Cold room condenser	Tecumseh Wintsys WINAJ4519Z	Man	Sound Power, Lw		68	68	60	57	53	57	57	55
EF1	Extract fan	Systemair MUB T 042 400 EC	Man	Sound Power, Lw		64	71	66	65	65	62	57	54
SF1	Supply fan	Elta Jetflow SJMF 315	Man	Sound Power, Lw		76	84	76	67	66	61	57	50

Mitigation Schedule

Reference	Description	Location	Insertion Losses (dB)							
			63	125	250	500	1k	2k	4k	8k
ENC1	Acoustic enclosure(s)	AC and cold room condensers	5	9	9	15	22	23	24	25
AS-01	43% 900mm	Extract fan exhaust	3	6	11	20	25	25	15	8
AS-02	33% 1500mm	Supply fan intake	8	15	26	43	50	53	45	32

Calculation Sheet

CU1 to AP1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<i>Noise Source</i>									
Noise Source - CU1									
Sound Power Levels		54.0	64.0	65.0	67.5	66.0	61.5	58.5	52.0
<i>Silencer</i>									
Silencer - ENC1									
		-5.0	-9.0	-9.0	-15.0	-22.0	-23.0	-24.0	-25.0
<i>Point Source Radiation Loss</i>									
Radiation - Quarterspherical									
Single Figure Read	5.0								
		-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
<i>Point Source Distance Loss</i>									
Start Distance (m)	1.0								
End Distance (m)	4.0								
		-12.0	-12.0	-12.0	-12.0	-12.0	-12.0	-12.0	-12.0
<i>Maekawa Screening Loss</i>									
Path Difference (m)	0.0								
		-4.9	-5.0	-5.2	-5.5	-6.2	-7.3	-8.8	-10.9
<i>External Receiver</i>									
External Receiver - AP1									
Sound Pressure, Lp		27.1	33.0	33.8	29.9	20.8	14.2	8.6	-0.9

Calculation Sheet

CU2 to AP1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<i>Noise Source</i>									
Noise Source - CU2									
Sound Power Levels		67.8	67.8	60.4	57.2	52.8	56.7	57.0	54.8
<i>Silencer</i>									
Silencer - ENC1									
		-5.0	-9.0	-9.0	-15.0	-22.0	-23.0	-24.0	-25.0
<i>Point Source Radiation Loss</i>									
Radiation - Quarterspherical									
Single Figure Read	5.0								
		-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
<i>Point Source Distance Loss</i>									
Start Distance (m)	1.0								
End Distance (m)	4.0								
		-12.0	-12.0	-12.0	-12.0	-12.0	-12.0	-12.0	-12.0
<i>Maekawa Screening Loss</i>									
Path Difference (m)	0.0								
		-4.9	-5.0	-5.2	-5.5	-6.2	-7.3	-8.8	-10.9
<i>External Receiver</i>									
External Receiver - AP1									
Sound Pressure, Lp		40.9	36.8	29.2	19.6	7.6	9.4	7.1	1.9

Calculation Sheet

SF1 to AP1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<i>Noise Source</i>									
Noise Source - SF1									
Sound Power Levels		76.0	84.0	76.0	67.0	66.0	61.0	57.0	50.0
<i>Silencer</i>									
Silencer - AS-02									
		-8.0	-15.0	-26.0	-43.0	-50.0	-53.0	-45.0	-32.0
<i>End Reflection</i>									
Width/Diameter (m)	0.6								
Length (m)	0.6								
Rec or Circ - Rectangular									
Free or Flush - Flush									
		-7.9	-3.4	0.0	0.0	0.0	0.0	0.0	0.0
<i>Point Source Radiation Loss</i>									
Radiation - Quarterspherical									
Single Figure Read	5.0								
		-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
<i>External Grille Directivity</i>									
Width (m)	0.6								
Height (m)	0.6								
Angle (°)	75.0								
		-0.4	-1.3	-2.7	-4.5	-6.3	-8.1	-8.6	-8.6
<i>Point Source Distance Loss</i>									
Start Distance (m)	1.0								
End Distance (m)	4.0								
		-12.0	-12.0	-12.0	-12.0	-12.0	-12.0	-12.0	-12.0
<i>Maekawa Screening Loss</i>									
Path Difference (m)	0.0								
		-4.9	-5.0	-5.2	-5.5	-6.2	-7.3	-8.8	-10.9

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<i>BS 4142 Characteristic Feature</i>									
<i>Correction</i>									
Tonality - Marginally Perceptible									
Impulsivity - None									
Other - None									
Intermittency - None									
Rating Correction (dB)	2.0								
		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
<i>External Receiver</i>									
External Receiver - AP1									
Sound Pressure, Lp		39.8	44.3	27.1	-1.0	-11.5	-22.4	-20.5	-16.6

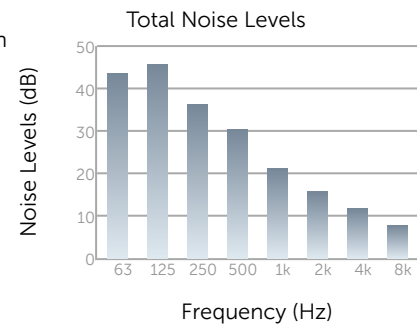
Calculation Sheet

EF1 to AP1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<i>Noise Source</i>									
Noise Source - EF1									
Sound Power Levels		64.2	71.1	65.6	65.2	65.0	61.8	57.0	54.1
<i>Silencer</i>									
Silencer - AS-01									
		-3.0	-6.0	-11.0	-20.0	-25.0	-25.0	-15.0	-8.0
<i>End Reflection</i>									
Width/Diameter (m)	0.7								
Length (m)	0.7								
Rec or Circ - Rectangular									
Free or Flush - Flush									
		-6.8	-2.4	0.0	0.0	0.0	0.0	0.0	0.0
<i>Point Source Radiation Loss</i>									
Radiation - Quarterspherical									
Single Figure Read	5.0								
		-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
<i>External Grille Directivity</i>									
Width (m)	0.6								
Height (m)	0.6								
Angle (°)	75.0								
		-0.4	-1.3	-2.7	-4.5	-6.3	-8.1	-8.6	-8.6
<i>Point Source Distance Loss</i>									
Start Distance (m)	1.0								
End Distance (m)	8.0								
		-18.1	-18.1	-18.1	-18.1	-18.1	-18.1	-18.1	-18.1
<i>Maekawa Screening Loss</i>									
Path Difference (m)	0.0								
		-4.9	-5.0	-5.2	-5.5	-6.2	-7.3	-8.8	-10.9

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<i>BS 4142 Characteristic Feature</i>									
<i>Correction</i>									
Tonality - Marginally Perceptible									
Impulsivity - None									
Other - None									
Intermittency - None									
Rating Correction (dB)	2.0								
		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
<i>External Receiver</i>									
External Receiver - AP1									
Sound Pressure, Lp		28.0	35.5	25.7	14.2	6.5	0.4	3.5	5.5

Project Name Domino's, 2-3 Botley Road, Fair Oak, Eastleigh
 Project Reference 20230704-0
 Reference AP1 day
 Description Residence above store
 Noise Limit (dBA) 34
 Calculated Level (dBA) 34

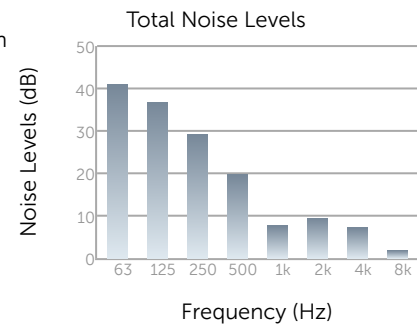


Noise Sources

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
CU1	1	27	33	34	30	21	14	9	-1
CU2	1	41	37	29	20	8	9	7	2
SF1	1	40	44	27	-1	-11	-22	-21	-17
EF1	1	28	35	26	14	7	0	3	6

Domino's, 2-3 Botley Road, Fair Oak, Eastleigh

Project Name	Domino's, 2-3 Botley Road, Fair Oak, Eastleigh
Project Reference	20230704-0
Reference	AP1 night
Description	Residence above store
Noise Limit (dBA)	38
Calculated Level (dBA)	25



Noise Sources

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
CU2	1	41	37	29	20	8	9	7	2

Appendix A

Glossary of Acoustics Terms – Noise Levels

Single Figures and Spectra

Generally speaking, the human ear is capable of hearing noise within the frequency range 20Hz to 20kHz. To make handling of data more meaningful and manageable, the range is often divided into 'bands', each of which covers a specific part.

For most acoustics applications, either octave or third-octave bands are used. Each band has a specific centre frequency which is used to identify it. When reported, the band centre frequency is given, along with the associated noise level, e.g. 63dB L_{eq} at 500Hz.

Noise levels can also be reported as single figure values where all energy contained within the measured frequency range is summed to provide a single figure. However, as the human ear does not hear noise at different frequencies with equal loudness, a weighting curve is often applied to levels before summing to account for this fact.

The most common curve is the A-weighting curve, and its use is denoted by including the letter 'A' with either the index e.g. 63dB L_{Aeq} , or with the decibel suffix (if the index is described elsewhere), e.g. 63dBA. 'B' and 'C' weighting curves may also be applied, depending on the application. A 'Z' is used to indicate a single figure where no weighting has been applied, e.g. 63dB L_{Zeq} .

Noise Level Indices

Noise level measurements can be made and reported in a variety of indices. The index is reported using the letter L to indicate Level, followed by, for example, abbreviations to represent the specifics of the index, and time intervals where applicable. The most commonly used are given below.

$L_{eq,T}$ (dB) - Equivalent Continuous Sound Pressure Level

The $L_{eq,T}$ value is the sound pressure level in decibels of a continuous steady sound that within a specified time interval, T, has the same mean-squared sound pressure as a sound that varies with time. It is often used as a descriptor of the ambient noise climate, and commonly seen as a single A-weighted figure $L_{Aeq,T}$.

L_{max} (dB) - Maximum Sound Pressure Level

The L_{max} value is the highest recorded sound pressure level in decibels averaged across a specified time constant during a noise measurement of certain duration. Two time constants are used, Fast and Slow, where the time constants are 0.125s and 1s respectively. The time constant is denoted in the index, $L_{max,F}$ for Fast and $L_{max,S}$ for Slow. It is often used to identify transient events that have a high-level relative to the ambient noise climate, and commonly seen as a single A-weighted figure L_{Amax} .

$L_{10,T}$ (dB) - Equivalent Continuous Sound Pressure Level

The $L_{10,T}$ value is the sound pressure level in decibels that is exceeded for 10% of a given time interval, T. It is often used as a measurement of noise from transportation sources such as road and rail. It is commonly seen as a single A-weighted figure $L_{A10,T}$.

$L_{90,T}$ (dB) - Equivalent Continuous Sound Pressure Level

The $L_{90,T}$ value is the sound pressure level in decibels that is exceeded for 90% of a given time interval, T. It is often used as a descriptor of the background noise climate, and commonly seen as a single A-weighted figure $L_{A90,T}$.

Appendix B

Document Naming and Version Control Policy

All documents are issued with a unique number which comprises the principle 8-digit project and 1-digit subsection numbers, for example 20151203-0, and a reference indicating iteration of document type, for example R1 for Report 1, M2 for Memorandum 2 etc.

All documents employ version control through the use of a unique version number. The version numbers employ two levels of hierarchy, and use the format illustrated below:

V 1 . 2

Major Minor

Major

A major revision occurs when the report is revised to reflect significant changes in design strategy. For example, wide scale changes to building footprint or general arrangements, changes to principle construction type (e.g. masonry to lightweight), reselection of mechanical services plant etc. A change in strategy that takes place within the same RIBA work stage for example will prompt a major revision to a document.

Minor

A minor revision occurs when the report is revised to reflect minor changes to the design implementation. For example a change in the type of natural vent, extract fan, surface finish etc. to be used, on the project. Minor revisions will also occur when there is a change in wording of the report text.

Reporting

The Document History and Version Control table on the second page of each report identifies the versions through which the document has moved, along with the date, author that produced the version, and a description of its purpose or change.

Electronic File Naming

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