

# Acoustic Assessment of Proposed Mechanical Services Equipment at 19- 21 Sicilian Avenue, London

**Report Reference: 140813-002A**

**Date: September 2014**

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Site Address: 19-21 Sicilian Avenue  
London  
WC1A

Client: Planet of the Grapes  
9 New Oxford Street  
Holborn  
London  
WC1A 1BA

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## 0. SUMMARY

- ACA Acoustics Limited have been commissioned by the client to assess noise emissions from proposed new supply and extract ventilation systems to be installed during the refurbishment of a commercial property at 19-21 Sicilian Avenue, London.
- The assessment is required in order to provide evidence that noise emissions from the new ventilation systems complies with London Borough of Camden Council's acoustic requirements. London Borough of Camden Council's requirement, applicable at this site, is that noise from the new equipment shall be designed to 10dBA below the prevailing background level at 1m outside windows of the nearest affected noise-sensitive property.
- A noise survey has been carried out in the vicinity to establish existing background noise levels. Whilst on site the author did not identify any residential properties in the immediate vicinity, however it is understood that London Borough of Camden Council consider commercial offices to be classed as noise-sensitive. Therefore closest noise-sensitive properties have been identified as non-associated offices within upper floors of the development site itself and university buildings to the rear of the site. Closest windows of the offices will be 5m from the supply and discharge terminals and windows to the university buildings are approximately 8m from the terminals, partially screened by the high boundary wall at the rear of the site.
- Lowest background noise levels are measured at LAF90 53dB during daytime hours (07:00 – 19:00) when the offices are likely to be in use. It is anticipated that the university building may be occupied into the evening on occasions; lowest background noise levels during the evening (19:00 – 23:00) are measured at LAF90 45dB. Based on results of the noise survey and London Borough of Camden Council's planning consent requirement, the overall noise limit for the equipment to outside nearest commercial office windows is set at  $\leq 43$  dBA during the daytime and to  $\leq 35$  dBA during the night-time outside university building windows.
- Based on calculations using manufacturer's noise data, the overall noise level for the equipment is 35dBA outside the any nearby noise-sensitive windows with the new supply and extract fans operating. This achieves London Borough of Camden Council's planning consent requirement. Noise from the equipment should not be detrimental to the amenity of any residential occupiers in the vicinity. The assessments include benefit of an atmospheric side in-duct silencers to the fans. No further noise mitigation treatments are necessary.
- The proposed fan and associated ductwork is directly structurally linked to adjoining non-associated commercial offices. To control structure-borne noise and vibration it is recommended that the fans are installed on high-deflection vibration isolators with flexible connections to adjoining ductwork. Details of suitable noise and vibration control measures are included within this report.

## 1. INTRODUCTION

New supply and extract fans are proposed to be installed during the refurbishment of a commercial property at 19-21 Sicilian Avenue, London.

The Planning Department of London Borough of Camden Council requires information in the form of an acoustic report regarding noise from the new equipment. The report is required to demonstrate that the new equipment will comply with London Borough of Camden Council's acoustic requirements applicable for mechanical services equipment affecting nearby noise-sensitive properties.

ACA Acoustics Limited has been commissioned by the client to carry out an assessment of noise from the new equipment and, where necessary, make recommendation to reduce noise and vibration levels from the equipment to comply with London Borough of Camden Council's planning requirements.

This report presents results of the noise survey and assessment and includes:

- Review of London Borough of Camden Council's noise requirements;
- Measurement of existing background noise levels;
- Calculation of equipment noise levels;
- Review of any noise/vibration control treatments necessary to the equipment to ensure compliance with the requirements of London Borough of Camden Council.

## 2. LONDON BOROUGH OF CAMDEN COUNCIL PLANNING CONSENT ACOUSTIC REQUIREMENTS

London Borough of Camden Council’s policies relating to noise from new mechanical services equipment are contained within the Council’s Local Development Framework; Policy DP28.

In Summary, London Borough of Camden’s noise conditions are:

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**Noise level from plant and machinery at which planning permission will not be granted:**

<i>Noise at 1m external to a sensitive façade;</i>	<i>5dBA &lt; LA90</i>
<i>Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1m external to a sensitive façade;</i>	<i>10dBA &lt; LA90</i>
<i>Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1m external to a sensitive façade;</i>	<i>10dBA &lt; LA90</i>
<i>Noise at 1m external to sensitive façade where LA90 &gt; 60dB</i>	<i>55dB LAeq</i>

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**Table 1:** London Borough of Camden Council noise related planning conditions

Each of the above is applicable over a period of 60 minutes and measured at 1m external to noise-sensitive facades.

The characteristic of noise from mechanical fans is often described as containing a dominant low-frequency tone or ‘hum’. Therefore to ensure that the assessment is robust and that the amenity of nearby occupiers is not detrimentally affected, the more onerous noise condition of 10dBA below the existing background noise is used for the assessment in this report.

### 3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The development site is over the lower-ground and ground floor levels of 19-21 Sicilian Avenue, London. 19-21 Sicilian Avenue is set within a larger terraced row in Bloomsbury, London.

The area is predominately of commercial premises, being a mix of offices, retail shops and cafes/licensed properties. A university campus building is located to the rear of the site. London Borough of Camden Council consider commercial offices and the university building to be noise-sensitive; the closest windows to non-associated commercial offices is at upper floor levels above the development site, at least 5m from the proposed supply and discharge terminals at lower ground floor level. The closest windows to the university building is at least 8m diagonally to the rear.

Planning permission is sought for new mechanical services equipment items associated with supply and extract ventilation. The equipment comprises a Torin Sifan centrifugal extract fan and CIL inline centrifugal supply fan along with associated ductwork and ancillaries. The fans are to be installed internally within the lower-ground floor level, ducted to inlet and discharge terminals at the rear facade.

Drawing showing proposed layout of the system, provided by the client, is shown in Figure A below.

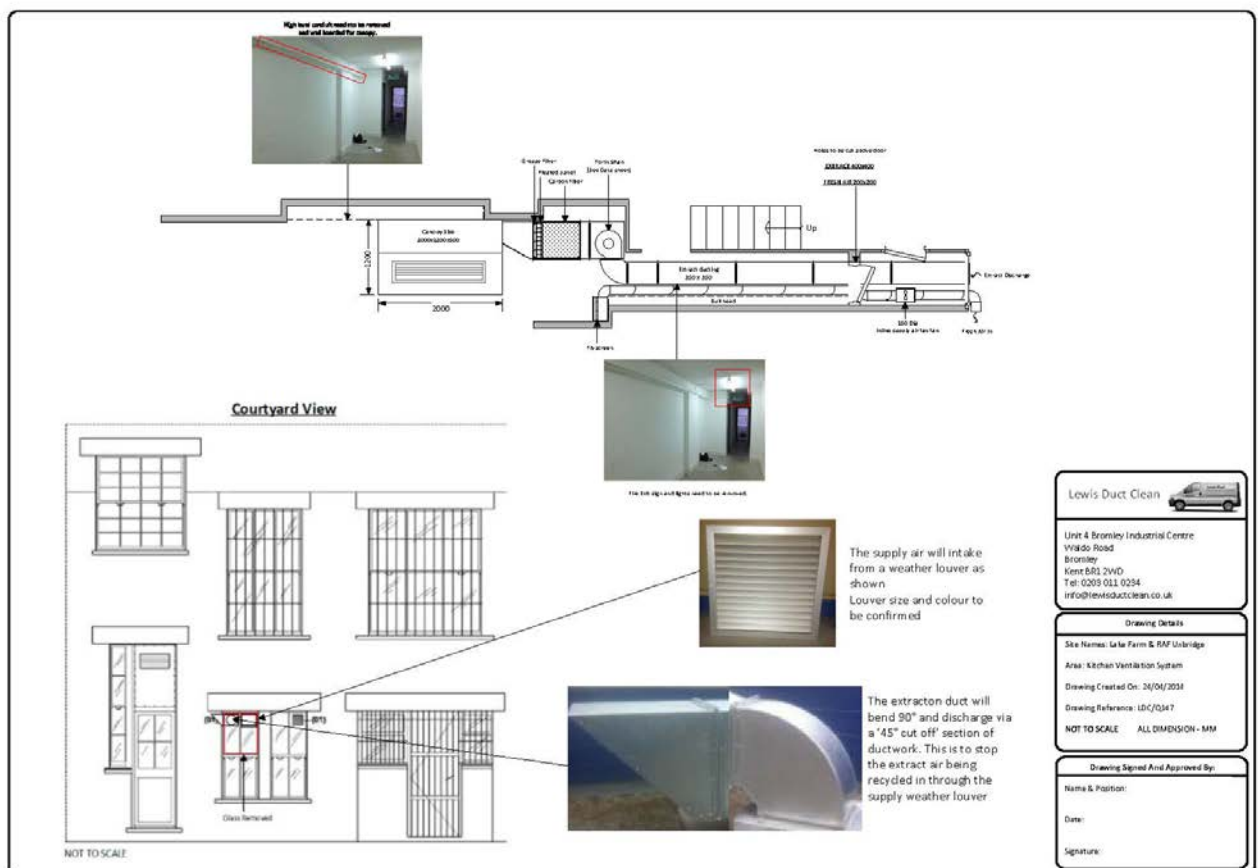


Figure A: Site layout drawing

## 4. NOISE SURVEY

In order to assess noise from the mechanical services equipment in accordance with London Borough of Camden Council's requirements it is necessary to establish representative background noise levels at the nearest noise-sensitive properties. Details of the background noise survey carried out by ACA Acoustics Limited are provided in Sections 4.1 to 4.3 below.

### 4.1 Noise Measurement and Assessment Procedure

The background noise measurement position was selected at the rear façade at a position equivalent to the closest non-associated office windows.

The site was considered secure and therefore an unmanned noise survey was carried out over nominally a 24-hour period between Tuesday 9<sup>th</sup> and Wednesday 10<sup>th</sup> September 2014. During the survey the weather included dry and calm periods.

### 4.2 Instrumentation

The following equipment was used during the noise survey; the sound level meter was calibrated before and after the survey measurements with no change noted:

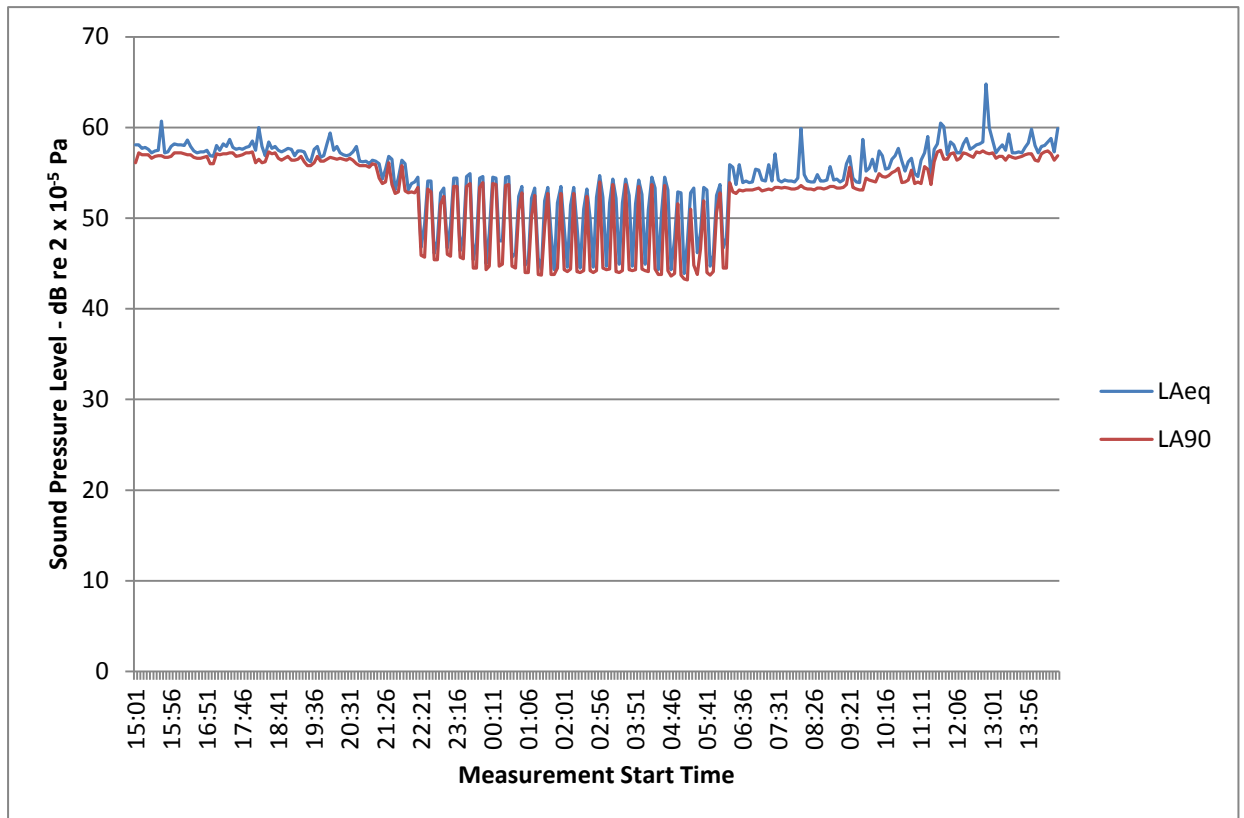
Equipment	Serial Number
Rion sound level meter type NL-31 Class 1 complete with weatherproof and lockable outdoor environmental kit	00773045
NTi Audio calibrator type CAL200 94/114dB. Compliant to IEC 60942-1:2003 (Calibrated to a reference traceable to NIST)	11441
Microphone extension cable and telescopic boom arrangements	-

**Table 2:** Equipment used

### 4.3 Noise Measurement Results

Complete results of the noise survey are provided in graphical form in Figure B on the following page.





**Figure B:** Noise Survey Results

The lowest measured background noise level during daytime hours (07:00 – 19:00) when the offices are likely to be occupied was LA90 53dB and during the evening (19:00 – 23:00) when the university building may be in use was LA90 45dB.

The values recorded by ACA Acoustics Limited are used as basis for acoustic design such that noise from the proposed equipment is  $\leq 43\text{dBA}$  outside nearest non-associated office windows and  $\leq 35\text{dB}$  outside the university buildings ( $\geq 10\text{dBA}$  below the lowest recorded values). Summary of measured noise levels are provided in Table 3 below.

Time Period	Lowest Recorded LA90	Camden Council Noise Limit
Daytime (07:00 – 19:00)	53dB	$\leq 43\text{dBA}$
Evening (19:00 – 23:00)	45dB	$\leq 35\text{dBA}$

**Table 3:** Summary noise survey results and London Borough of Camden Council noise limit

The limit to achieve London Borough of Camden Council's requirement outside nearby noise-sensitive windows is 43dBA during daytime hours and 35dBA in the evening; this is 10dBA below the lowest measured background noise level. At these levels the equipment noise will not increase the prevailing background noise and will not be disturbing or detrimental to the amenity of nearby occupants.

## 5. NOISE FROM MECHANICAL SERVICES EQUIPMENT

The planning application includes installation of a kitchen extract fan and general supply fan along with associated ductwork and ancillaries. The fans are to be installed internally, ducted to inlet and discharge terminals at the rear facade.

Noise levels from the proposed equipment can be determined from manufacturer’s noise data. Summary of noise from the equipment is shown in Appendix A.

A computer noise model has been used to calculate the noise contribution from the equipment to outside nearest noise-sensitive windows. The model is based on the calculation methods for ducted mechanical services equipment set out in the Chartered Institute of Building Services Engineers’ CIBSE Guide B5 “*Noise and vibration control for HVAC*” along with environmental corrections based on the calculation method of ISO 9613-2:1996 and takes account of losses within the ductwork system, end reflection at the terminal, distance between the terminal and noise-sensitive windows and environmental conditions.

The cumulative calculated noise level from the proposed equipment outside the nearest noise-sensitive windows compared with the planning requirement is shown in Table 4. Summary print-outs from the calculation models are included in Appendix A.

Description	Calculated Equipment Noise Levels	Camden Council Noise Limit
Non-Associated Offices	34dBA	≤ 43dBA
University Buildings	35dBA	≤ 35dBA

**Table 4:** Calculated equipment noise at nearest noise-sensitive windows

Table 4 shows that the overall noise level from the equipment is at least 10dBA below the lowest measured background noise outside nearby noise-sensitive properties and achieves London Borough of Camden Council’s planning consent requirements.

Resultant noise from the equipment will not be disturbing or detrimental to the amenity of nearby existing occupants. The calculations include benefit of atmospheric side silencers. Details of suitable noise control treatments are included in Section 6 of this report.

## 6. RECOMMENDATIONS FOR NOISE & VIBRATION CONTROL TREATMENTS

To achieve the noise limit requirement of London Borough of Camden Council it is necessary to install duct-mounted silencers to the atmospheric side of the fans.

The fans are directly structurally linked to non-associated commercial offices and therefore it is considered that structure-borne noise and vibration may transmit to these properties. As such it is recommended that the fans are isolated from the structure on high-deflection anti-vibration mounts and that flexible connections are used between the fans and adjoining ductwork.

*Note that considerations of non-acoustic aspects such as structural, visual, airflow and construction materials are outside the scope of ACA Acoustics Limited and should be considered by others accordingly.*

The atmospheric silencers shall provide the following minimum dynamic insertion losses at the design duty:

Description	Octave Band Centre Frequency – Hz (IL – dB)							
	63	125	250	500	1k	2k	4k	8k
EF1 Exhaust	12	21	28	40	48	33	24	15
SF1 Fresh Air Inlet	3	6	10	14	15	11	9	5

**Table 5:** Silencer minimum insertion loss performance

As the proposed fans and associated ductwork is directly structurally connected to non-associated commercial offices, to control structure-borne noise to these properties it is recommended that the fans are installed on vibration isolators. Suitable isolators are typically steel spring type mounts providing a deflection of not less than 25mm at the working load. The isolators shall incorporate rubber or neoprene high-frequency isolation pads. Flexible connections should be incorporated between the fan and adjoining ductwork sections.

Alternative methods of attenuation may be acceptable. Full details of any alternative scheme, including detailed design drawings and manufacturer’s certified performance tests should be submitted to ACA Acoustics Limited and approved prior to manufacture.

## APPENDIX A

### Acoustic Calculations



## Planet of the Grapes, 19-21 Sicilian Avenue

### Source Noise Schedule

Reference	Description	Volume (m <sup>3</sup> /s)	Data Source	Noise Level Type	Noise Level Index	Noise Levels (dB)							
						63	125	250	500	1k	2k	4k	8k
Extract Fan	Kitchen Extract Fan	0.8	Emp	Sound Power, Lw	Leq	99	97	94	92	90	87	84	80
Supply Fan	General Supply Fan	0.068	Emp	Sound Power, Lw	Leq	70.9	68.9	62.9	61.9	58.9	53.9	50.9	47.9

Calculation Sheet

Extract Fan to Offices

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<b>Noise Source</b>									
Noise Source - Extract Fan									
<b>Sound Power Levels</b>		<b>99.0</b>	<b>97.0</b>	<b>94.0</b>	<b>92.0</b>	<b>90.0</b>	<b>87.0</b>	<b>84.0</b>	<b>80.0</b>
<b>Silencer</b>									
Silencer - SIL1									
		-12.0	-21.0	-28.0	-40.0	-48.0	-33.0	-24.0	-15.0
<b>Bend Loss</b>									
		0.0	-1.0	-2.0	-3.0	-3.0	-3.0	-3.0	-3.0
<b>Rect Unlined Duct Losses</b>									
		-4.5	-2.0	-3.0	-2.0	-2.0	-2.0	-2.0	-2.0
<b>End Reflection - Rect Flush</b>									
		-9.7	-5.2	-2.1	-0.7	-0.2	-0.1	0.0	0.0
<b>External Grille Directivity</b>									
		-0.7	-1.7	-3.8	-6.7	-10.0	-13.4	-15.0	-15.0
<b>ISO 9613 Geometrical Divergence</b>									
Horiz. Distance (m)	0.0								
Source Height (m)	2.0								
Receiver Height (m)	7.0								
		-25.0	-25.0	-25.0	-25.0	-25.0	-25.0	-25.0	-25.0
<b>ISO 9613 Atmospheric Attenuation</b>									
		0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.6
<b>ISO 9613 Ground Attenuation</b>									
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>ISO 9613 Barrier Attenuation</b>									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Facade Reflection</b>									
		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
<b>External Receiver</b>									
External Receiver - Offices									
<b>Sound Pressure, Lp</b>		<b>52.6</b>	<b>46.6</b>	<b>35.6</b>	<b>20.1</b>	<b>7.3</b>	<b>16.0</b>	<b>20.3</b>	<b>24.9</b>

Calculation Sheet

Supply Fan to Offices

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<b>Noise Source</b>									
Noise Source - Supply Fan									
<b>Sound Power Levels</b>		<b>70.9</b>	<b>68.9</b>	<b>62.9</b>	<b>61.9</b>	<b>58.9</b>	<b>53.9</b>	<b>50.9</b>	<b>47.9</b>
<b>Silencer</b>									
Silencer - SIL2									
		-3.0	-6.0	-10.0	-14.0	-15.0	-11.0	-9.0	-5.0
<b>Rect Unlined Duct Losses</b>									
		-1.4	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
<b>End Reflection - Rect Flush</b>									
		-15.0	-9.7	-5.2	-2.1	-0.7	-0.2	-0.1	0.0
<b>External Grille Directivity</b>									
		2.5	-0.7	-1.7	-3.8	-6.7	-10.0	-13.4	-15.0
<b>ISO 9613 Geometrical Divergance</b>									
Horiz. Distance (m)	0.0								
Source Height (m)	2.0								
Receiver Height (m)	7.0								
		-25.0	-25.0	-25.0	-25.0	-25.0	-25.0	-25.0	-25.0
<b>ISO 9613 Atmospheric Attenuation</b>									
		0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.6
<b>ISO 9613 Ground Attenuation</b>									
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>ISO 9613 Barrier Attenuation</b>									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Facade Reflection</b>									
		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
<b>External Receiver</b>									
External Receiver - Offices									
<b>Sound Pressure, Lp</b>		<b>34.6</b>	<b>31.8</b>	<b>25.4</b>	<b>21.3</b>	<b>15.8</b>	<b>12.0</b>	<b>7.6</b>	<b>6.6</b>



Calculation Sheet

Extract Fan to University

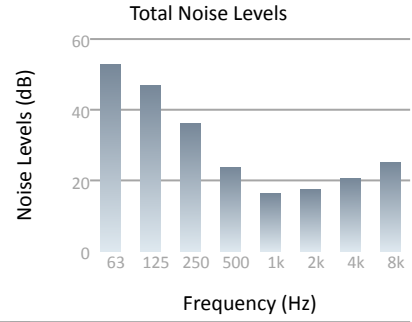
		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<b>Noise Source</b>									
Noise Source - Extract Fan									
<b>Sound Power Levels</b>		<b>99.0</b>	<b>97.0</b>	<b>94.0</b>	<b>92.0</b>	<b>90.0</b>	<b>87.0</b>	<b>84.0</b>	<b>80.0</b>
<b>Silencer</b>									
Silencer - SIL1									
		-12.0	-21.0	-28.0	-40.0	-48.0	-33.0	-24.0	-15.0
<b>Bend Loss</b>									
		0.0	-1.0	-2.0	-3.0	-3.0	-3.0	-3.0	-3.0
<b>Rect Unlined Duct Losses</b>									
		-4.5	-2.0	-3.0	-2.0	-2.0	-2.0	-2.0	-2.0
<b>End Reflection - Rect Flush</b>									
		-9.7	-5.2	-2.1	-0.7	-0.2	-0.1	0.0	0.0
<b>External Grille Directivity</b>									
		0.3	0.9	0.9	1.0	1.2	1.5	1.6	1.6
<b>ISO 9613 Geometrical Divergence</b>									
Horiz. Distance (m)	7.0								
Source Height (m)	2.0								
Receiver Height (m)	8.0								
		-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3
<b>ISO 9613 Atmospheric Attenuation</b>									
		0.0	0.0	0.0	0.0	0.0	-0.1	-0.3	-1.1
<b>ISO 9613 Ground Attenuation</b>									
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>ISO 9613 Barrier Attenuation</b>									
		-6.9	-5.9	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
<b>Facade Reflection</b>									
		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
<b>External Receiver</b>									
External Receiver - University									
<b>Sound Pressure, Lp</b>		<b>41.4</b>	<b>38.0</b>	<b>32.0</b>	<b>19.5</b>	<b>10.2</b>	<b>22.5</b>	<b>28.5</b>	<b>32.7</b>

Calculation Sheet

Supply Fan to University

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<b>Noise Source</b>									
Noise Source - Supply Fan									
<b>Sound Power Levels</b>		<b>70.9</b>	<b>68.9</b>	<b>62.9</b>	<b>61.9</b>	<b>58.9</b>	<b>53.9</b>	<b>50.9</b>	<b>47.9</b>
<b>Silencer</b>									
Silencer - SIL2									
		-3.0	-6.0	-10.0	-14.0	-15.0	-11.0	-9.0	-5.0
<b>Rect Unlined Duct Losses</b>									
		-1.4	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
<b>End Reflection - Rect Flush</b>									
		-15.0	-9.7	-5.2	-2.1	-0.7	-0.2	-0.1	0.0
<b>External Grille Directivity</b>									
		2.5	-0.7	-1.7	-3.8	-6.7	-10.0	-13.4	-15.0
<b>ISO 9613 Geometrical Divergance</b>									
Horiz. Distance (m)	7.0								
Source Height (m)	2.0								
Receiver Height (m)	8.0								
		-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3
<b>ISO 9613 Atmospheric Attenuation</b>									
		0.0	0.0	0.0	0.0	0.0	-0.1	-0.3	-1.1
<b>ISO 9613 Ground Attenuation</b>									
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>ISO 9613 Barrier Attenuation</b>									
		-6.9	-5.9	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
<b>Facade Reflection</b>									
		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
<b>External Receiver</b>									
External Receiver - University									
<b>Sound Pressure, Lp</b>		<b>22.4</b>	<b>20.5</b>	<b>17.0</b>	<b>13.0</b>	<b>7.5</b>	<b>3.6</b>	<b>-0.8</b>	<b>-2.2</b>

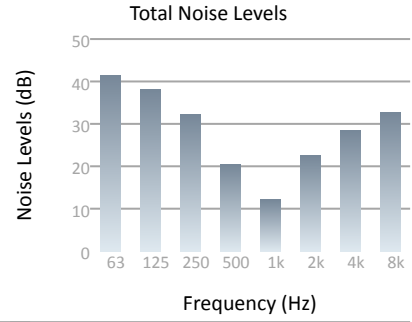
<b>Project Name</b>	Planet of the Grapes, 19-21 Sicilian Avenue
<b>Project Reference</b>	140813
<b>Reference</b>	Offices
<b>Description</b>	Upper Floor Offices
<b>Noise Limit</b>	43
<b>dBA</b>	34.4



## Noise Sources

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Extract Fan	1	52.6	46.6	35.6	20.1	7.3	16	20.3	24.9
Supply Fan	1	34.6	31.8	25.4	21.3	15.8	12	7.6	6.6

<b>Project Name</b>	Planet of the Grapes, 19-21 Sicilian Avenue
<b>Project Reference</b>	140813
<b>Reference</b>	University
<b>Description</b>	University Buildings
<b>Noise Limit</b>	35
<b>dB(A)</b>	34.9



## Noise Sources

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Extract Fan	1	41.4	38	32	19.5	10.2	22.5	28.5	32.7
Supply Fan	1	22.4	20.5	17	13	7.5	3.6	-0.8	-2.2

## APPENDIX B

### Noise Control Treatments



## Planet of the Grapes, 19-21 Sicilian Avenue

### Schedule of Noise Control Treatments

Reference	Description	Location	Pressure Drop (Pa)	Insertion Losses (dB)							
				63	125	250	500	1k	2k	4k	8k
SIL1	1800L 40% Free Area c/w Melinex	Extract Fan Discharge		12	21	28	40	48	33	24	15
SIL2	600L 50% Free Area	Supply Fan Inlet		3	6	10	14	15	11	9	5

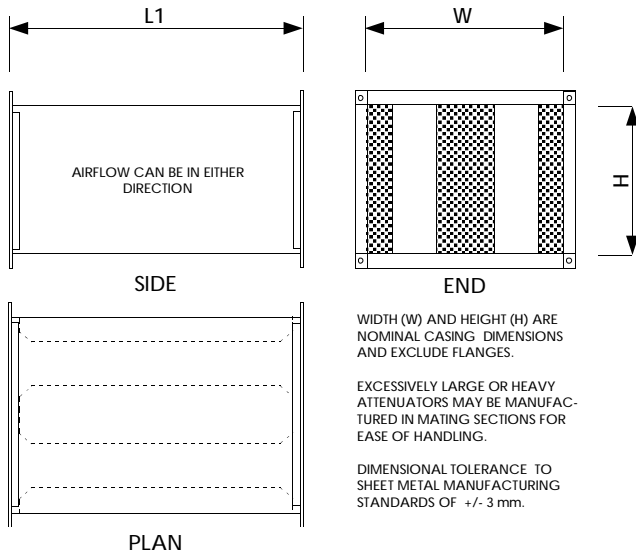
# DATA SHEET A02E RECTANGULAR ATTENUATOR MODEL SP

THIS IS NOT A STAND ALONE DOCUMENT AND UNLESS REFERRED TO IN A DATED EQUIPMENT SCHEDULE IS SUBJECT TO REVISION WITHOUT NOTICE.



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## DIMENSIONS



## SPECIFICATION

ATTENUATORS ARE CONSTRUCTED TO DW144 SPECIFICATION FOR MEDIUM PRESSURE DUCTWORK.

CASES ARE FORMED FROM PRE-GALVANISED STEEL OF THE SPECIFIED GAUGE, BUT IN NO INSTANCE LESS THAN 0.8 mm. CASE SEAMS ARE LOCK FORMED AND MASTIC SEALED.

CASES ARE STIFFENED AND FITTED WITH PROPRIETARY FLANGES.

SOUND ABSORBENT ELEMENTS ARE ARRANGED WITHIN THE CASING TO FORM A SERIES OF CENTRAL SPLITTERS AND SIDE LININGS. SPLITTER FRAMES ARE FORMED FROM PRE-GALVANISED STEEL, AND CONTAIN A FIBROUS INFILL THAT IS NON-SHEDDING, NON-COMBUSTIBLE, NON-HYGROSCOPIC AND CHEMICALLY INERT. THE INFILL IS FACED WITH GLASS CLOTH AND PRE-GALVANISED PERFORATED STEEL.

SPLITTER ELEMENTS HAVE AERODYNAMIC FAIRINGS ON AIR ENTRY AND AIR EXIT END OF ATTENUATOR.

## NOTES

THIS DATA SHEET IS TO BE READ IN CONJUNCTION WITH THE EQUIPMENT SCHEDULE.

EXCESSIVELY LARGE OR HEAVY ATTENUATORS MAY BE MANUFACTURED IN MATING SECTIONS FOR EASE OF HANDLING.

ATTENUATORS WILL BE SUPPLIED WITHOUT SUPPORT STEELWORK, BRACKETS, FIXINGS, GASKET, MASTIC OR OTHER SUCH ITEMS, UNLESS OTHERWISE STATED.

ATTENUATOR SEAMS AND JOINTS WILL BE FACTORY SEALED, HOWEVER, THE FLANGE CONNECTION SEAL, INCLUDING THE FLANGE CORNERS, IS THE RESPONSIBILITY OF THE INSTALLER.

THE PRESSURE LOSS STATED ON THE EQUIPMENT SCHEDULE IS DERIVED FROM TESTS CARRIED OUT IN ACCORDANCE WITH ISO 7235.

DIMENSIONAL TOLERANCE TO SHEET METAL MANUFACTURING STANDARDS OF +/- 3 mm.

## WEIGHT

WEIGHTS ARE GIVEN ON THE EQUIPMENT SCHEDULE.

## CODE

THE ATTENUATOR CODE DEFINES THE SPLITTER AND AIRWAY DIMENSIONS AND IS GIVEN ON THE EQUIPMENT SCHEDULE.

## SUFFIX

THE SUFFIX DEFINES ADDITIONAL FEATURES OR SPECIAL CONSTRUCTIONAL DETAILS.

G - GALVANISED STEEL CONSTRUCTION.

S - STAINLESS STEEL CONSTRUCTION.

U - UPVC/GRP CONSTRUCTION TO DW154 SPECIFICATION (SEPARATE DRAWING)

H1 - 2 HOUR/300°C CONSTRUCTION.

H2 - FIRE DUCT CONSTRUCTION (FINAL TREATMENT BY SPECIALIST CONTRACTOR)

C - CHLORINATED RUBBER PAINT TO INSIDE SURFACES.

J - SPLITTERS ARRANGED HORIZONTALLY.

L - SPLITTERS ONLY (REFER TO DATA SHEET A10 FOR DETAILS).

D - DOUBLE SKIN CASING.

M1 - MELINEX LINED INFILL.

M2 - MELINEX ENCAPSULATED INFILL.

X - SPECIAL CONSTRUCTION, REFER TO EQUIPMENT SCHEDULE FOR DETAILS.

## FLANGE DETAILS

ATTENUATORS ARE FITTED WITH PROPRIETARY FLANGES AS FOLLOWS:

GREATEST DIMENSION (W or H)	FLANGE
0 - 1000 mm	DOBY 20
1001 - 1250 mm	DOBY 30
1251 and above	DOBY 40

NOTE: IT IS THE INSTALLERS RESPONSIBILITY TO PROVIDE THE FLANGE SEAL TO THE CONNECTING DUCT, INCLUDING THE FLANGE CORNERS.

## STANDARD SIZES

THERE ARE NO STANDARD SIZES. ALL ATTENUATORS ARE MADE TO ORDER.