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ACOUSTICS PLUS

Remodelling of Plant Room Ventilation & Climate Control Systems.

55 Loudoun Road
London, NW8 0DL

Environmental Noise Assessment

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Proposed Installation of Mechanical Plant	
Project Address:	55 Loudoun Road London NW8 0DL
Project Reference:	101836

Issue/Revision Record

Issue:	Date:	Remarks:	Author:
1	11/10/2012	First Issue	Andy Dodd
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	Signature:	Print:	Title:	Date:
Author:		**Andy Dodd**	**Consultant**	**12/10/2012**
Reviewer:		**Phil Huffer**	**Principal Consultant**	**12/10/2012**

1. INTRODUCTION

1.1 Acoustics Plus Ltd (APL) is an independent firm of multi-disciplinary acoustic engineers APL is a registered member of The Association of Noise Consultants (ANC) and the author is an associate member of The Institute of Acoustics (IOA).

1.2 APL has been instructed by the applicant's agent, Backyard Design Studios Ltd, to consider and advise upon the noise implications of remodelling the plant room ventilation and climate control systems.

1.3 The plant room ventilation supply and exhaust fans are to be replaced, two existing outdoor condensers are to be repositioned and a new condenser unit is to be installed within the remodelled internal plant room of the building.

1.4 It is understood that the Local Planning Authority (LPA) require further information on noise levels from the proposed installation in order to fully assess the potential noise impact upon the surrounding neighbourhood.

1.5 This report provides the response to the LPA, on behalf of the Applicant.

2. BASELINE SITUATION

2.1 The Application Site (the "site") is situated at 55 Loudoun Road, London, NW8 0DL.

2.2 It is understood that the proposal relates to current B1 office use with associated comfort cooling. The area surrounding the site is predominantly residential; the site accommodates offices on the ground floor with residential properties above. It is further understood the site has operational hours of 06:00 to 20:00.

2.3 The site and its surroundings can be seen in Figures 1 to 8.

2.4 The plantroom proposals are detailed in drawing DB/09.01/M/4 which is included within the Drawings appendix of this report.

2.5 The nearest noise sensitive property to the ventilation louvres on the northern façade of the site is shown in figures 5 and 6. The window is approximately 2m from the proposed panel of exhaust louvres and 5m from the proposed panel of supply louvres.

2.6 Information in regard of the noise levels from the proposed air condenser and ventilation units has been provided by Mitsubishi and Flakt Woods (copy of the information is provided in Appendix A). The units are itemised below:

(a) 3No. Mitsubishi FDCA 140 EXA4
(b) 2No. Mitsubishi FDCA 140 HKEN4
(c) 1No. Mitsubishi FDCA 151 HEN
(d) 1No. Mitsubishi FDCA 251 HEN
(e) 1No. Mitsubishi PUHY EP400SHM
(f) 12No. Flakt Woods 50JM/20/4/6/22 Aerofoil fans

3. NOISE OUTLINE

3.1 In order to produce an environmental noise assessment, consideration must be given to the prevailing background noise in the locality of the installation. Measurements of background noise were obtained over a 24 hour period at the Position 1 site.

3.2 The particulars of the measurement exercise are recorded below:

Date:	16th – 17th September 2010
Start Time:	12:23 hrs
Location:	First floor level, northern façade 55 Loudoun Road.
Weather:	No wind, no rain

3.3 The measurements carried out during the exercise are recorded below:

L_{90} percentile level (dB re 20µPa) at 15 minute intervals

3.4 The measurements obtained during the exercise are presented in Appendix B.

3.5 For the sake of clarity, the lowest measured background noise over the anticipated operational hours of the condenser units is highlighted in yellow. As the units will be utilised for climate control during office hours, it is anticipated that the operational hours will be on a demand basis during the period 06:00 to 20:00.

3.6 Information regarding the noise levels not to be exceeded by the proposed installation was provided by the LPA (London Borough of Camden).

Camden Replacement Unitary Development Plan
Appendix 1 – Noise and Vibration Thresholds

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90 >60dB	Day, evening and night	0000-2400	55dB L_{Aeq}

3.7 Further to Camden Council's Replacement Unitary Development Plan, Appendix 1 – Noise and Vibration thresholds detailed in Table E previously in paragraph 3.6, it is understood that the *"10 dB(A) less than the existing background measurement"* criteria would be appropriate for this application.

3.8 The noise levels of the units to be repositioned within the remodelled plant room was established from the information provided (Appendix A) as detailed.

(a) 3No. Mitsubishi FDCA 140 EXA4 @ 53 dBA @1m (per unit)
(b) 2No. Mitsubishi FDCA 140 HKEN4 @ 53 dBA @1m (per unit)
(c) 1No. Mitsubishi FDCA 151 HEN @ 48 dBA @1m (per unit)
(d) 1No. Mitsubishi FDCA 251 HEN @ 48 dBA @1m (per unit)
(e) 1No. Mitsubishi PUHY EP400SHM @ 60 dBA@1m (per unit)
(f) 12No. Flakt Woods 50JM/20/4/6/22 fans @ 54 dBA@3m (per unit)

4. EQUIPMENT

4.1 All measurements were obtained using the following equipment:

- Rion NL-32
  Serial No. 00840861
- Rion NA-28
  Serial No. 00370311
- Rion Calibrator Type NC-74 Class 1
  Serial No. 00410215

4.2 The relevant equipment carries full and current traceable calibration.

4.3 The equipment, where necessary, was calibrated prior to and after the measurements were carried out.

5. CALCULATIONS

5.1 In order to predict the noise impact of repositioning and upgrading the air conditioning system and installing a new ventilation system within the remodelled plantroom, consideration has been given to noise egress from the plant room through the discharge louvres.

5.2 The calculation exercise utilised information provided by Mitsubishi and Flakt Woods (copy of the data sheets are provided in Appendix A).

5.3 APL were advised the plantroom would be lined with plant room wall lining panels (see Appendix A) to control reverberation and reflected sound.

5.4 The noise level within the remodelled plant room at 55 Loudoun Road from the condenser units is summarised below in Table 1:

Make & Model	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Mitsubishi FDCA 140EXA4	58	56	49	53	45	40	43	32	53
Mitsubishi FDCA 140EXA4	58	56	49	53	45	40	43	32	53
Mitsubishi FDCA 140EXA4	58	56	49	53	45	40	43	32	53
Mitsubishi FDCA 140 HKEN4	58	56	49	53	45	40	43	32	53
Mitsubishi FDCA 140 HKEN4	58	56	49	53	45	40	43	32	53
Mitsubishi FDCA 151 HEN	53	55	47	46	44	38	31	25	48
Mitsubishi FDCA 251 HEN	53	55	47	46	44	38	31	25	48
Mitsubishi PUHY EP400SHM	67	66	63	57	54	49	43	40	60
COMBINEDTOTAL	69	68	64	62	57	52	51	43	**63**

Table 1

5.5 The noise level within the remodelled plant room at 55 Loudoun Road from the new ventilation system is summarised below in Table 2 and utilised formula 1 detailed below in determining the sound pressure level (dBA @1m) within the proposed plant room:

SPL=Lw-20log(R)-8

Formula 1

Make & Model	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
1No. 50JM Aerofoil fan (inlet side)	71	75	72	72	70	66	63	57	
6No. 50JM Aerofoil fans (inlet side)	79	83	80	80	78	74	71	65	
1No. 50JM Aerofoil fan (outlet side)	73	77	73	72	70	66	64	58	
6No. 50JM Aerofoil fans (outlet side)	81	85	81	80	78	74	72	66	
COMBINEDTOTAL	83	87	83	83	81	77	74	68	**73**

Table 2

5.6 Given the proposed location of the condenser units within the proposed new plant room and that the ventilation fans are the dominant noise source, the egress of noise from the Flakt Woods fans through the new intake and exhaust attenuators to the window of the noise sensitive property located above at 58 Loudoun Road has been considered.

5.7 Throughout the calculation exercise, guidance and formula were extracted from the authoritative publication *"Noise Control in Building Services" (published by SRL)*.

5.8 In considering the propagation of noise from the supply and exhaust louvres, consideration was given to point source propagation over a distance of 5m from the supply louvres and 2m from the exhaust louvre to the nearest openable residential window located above.

Plantroom ventilation system	Level at nearest noise sensitive façade
Intake side of ventilation fans servicing plantroom	**25**
Outlet side of ventilation fans servicing plantroom	**34**
TOTAL	**35 [**$10\text{Log}_{10}(10^{(2.5)} + 10^{(3.4)})$**]**

Table 3

5.9 In order to comply with the requirements of the LPA, any noise from the mechanical plant servicing the remodelled plant room should not exceed a level of 35 dBA (10 dB below the lowest measured background noise over the anticipated operational hours of the plant room) at the nearest noise sensitive façade.

6. CONCLUSION

6.1 The foregoing assessment indicates that the installation will meet the requirements imposed by the LPA. Additional mitigation measures will not be required.

6.2 The calculation exercise for the ventilation units to be located within the plant room is based on the use of attenuators on the intake and discharge fans and the use of lining panels on the walls of the vaults to control reverberation and reflected sound. These measures must be incorporated to meet the LPA requirements.

6.3 It is recommended that the condenser and ventilation units are positioned on vibration isolation mounts to minimise structural borne vibration and re-radiated noise into other parts of the building.

6.4 The calculation exercise for the ventilation unit located in plant room is based on the use of unspecified air intake and exhaust attenuators with minimum insertion loss requirements. The unspecified attenuators performance quoted is the minimum performance required to ensure compliance with the requirements imposed by the LPA, if a silencer with different performance data is utilised it should be approved prior to installation to ensure it meets the minimum performance requirements.

Figures

Northern façade of 55 Loudoun Road, London, NW8 and Surrounding Area

Figure 1

Figure 2

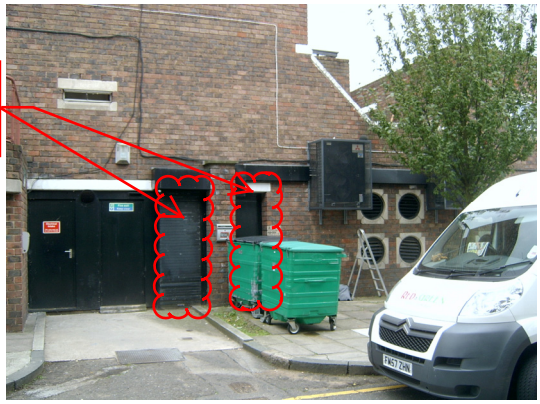


Figure 3

Figure 4

Figure 5

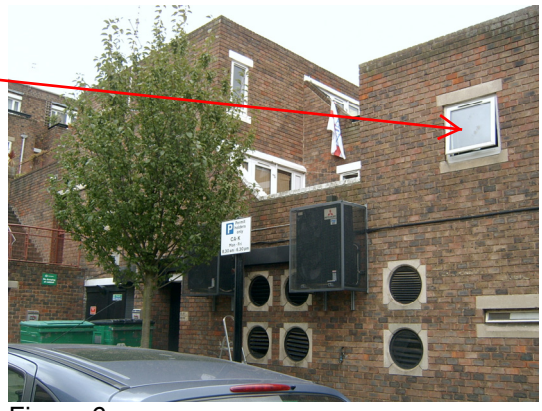
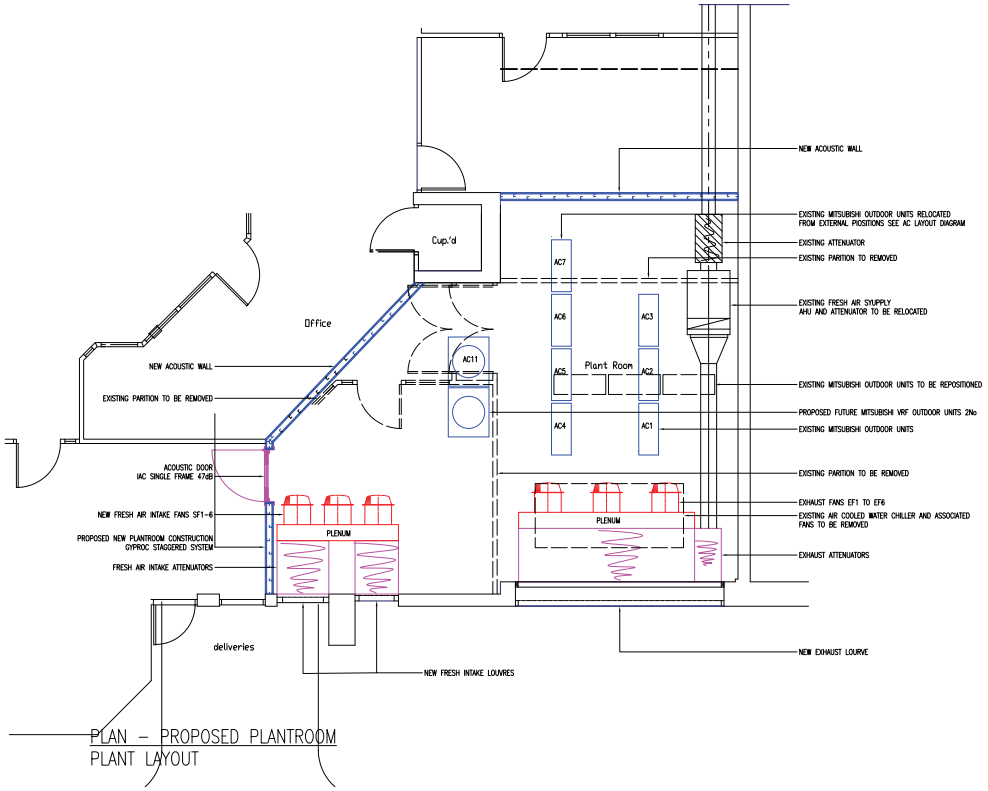


Figure 6

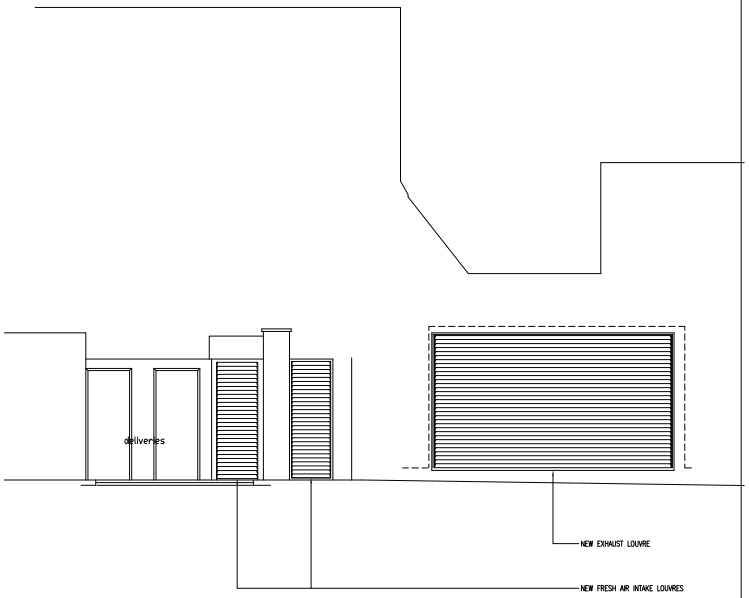
Figure 7

Figure 8

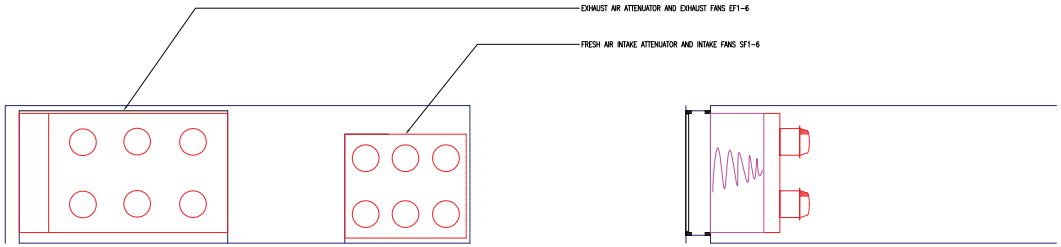
Drawings



PLAN – PROPOSED PLANTROOM
PLANT LAYOUT



NORTH ELEVATION
PROPOSED LOUVRES



SECTION THROUGH PLANTROOM
PROPOSED FANS AND ATTENUATORS

SECTION THROUGH PLANTROOM
PROPOSED FANS AND ATTENUATORS

PLANTROOM EQUIPMENT SCHEDULE

REF	EQUIPMENT	SOUND DATA								SPL
AC1	MITSUBISHI FDCA140EXA4	SEE ATTACHED MITSUBISHI SOUND PRESSURE DATA								53dB @1M
AC2	MITSUBISHI FDCA140EXA4	SEE ATTACHED MITSUBISHI SOUND PRESSURE DATA								53dB @1M
AC3	MITSUBISHI FDCA140EXA4	SEE ATTACHED MITSUBISHI SOUND PRESSURE DATA								53dB @1M
AC4	MITSUBISHI FDCA140HKEN4	SEE ATTACHED MITSUBISHI SOUND PRESSURE DATA								
AC5	MITSUBISHI FDCA140HKEN4	SEE ATTACHED MITSUBISHI SOUND PRESSURE DATA								
AC6	MITSUBISHI FDAC151HEN	SEE ATTACHED MITSUBISHI SOUND PRESSURE DATA								48dB @ 1m
AC7	MITSUBISHI FDCA251HEN	SEE ATTACHED MITSUBISHI SOUND PRESSURE DATA								48dB @ 1M
AC11	MITSUBISHI PUHY-EP400SHM (HIGH COP)	SEE ATTACHED MITSUBISHI SOUND PRESSURE DATA								60dB @ 1M
EF1-6	6NR WOODS FLAKT AXIAL FLOW AEROFOIL FANS 50JM/20/4/6/22	63	125	250	500	1K	2K	4K	8K	MID BAND FREQUENCY (Hz)
		73	77	73	72	70	66	64	58	SWL (dB)
SF1-6	6Nr WOODS FLAKT AXIAL FLOW AEROFOIL FANS 50JM/20/4/6/22	63	125	250	500	1K	2K	4K	8K	MID BAND FREQUENCY (Hz)
		73	77	73	72	70	66	64	58	SWL (dB)

Ref	Date	Description	Checked
A	01/11/2010	PRELIMINARY ISSUE	

REVISIONS

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MARTIN GREENE RAVDEN
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LONDON NW8 0DL

Project
COMFORT COOLING/HEATING SYSTEMS

Title
PLANTROOM PROPOSALS

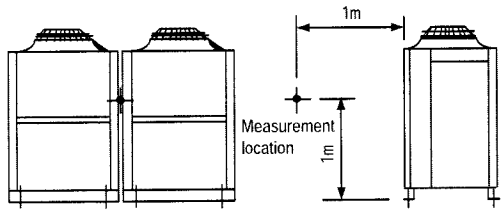
Date	Drawn By
NOVEMBER 2010	--/--
Scale: 1:50 @ A1	Cad Ref: --
	Checked: DRB

PRELIMINARY

Drawing No.: DB/09.01/M/4
Rev: A

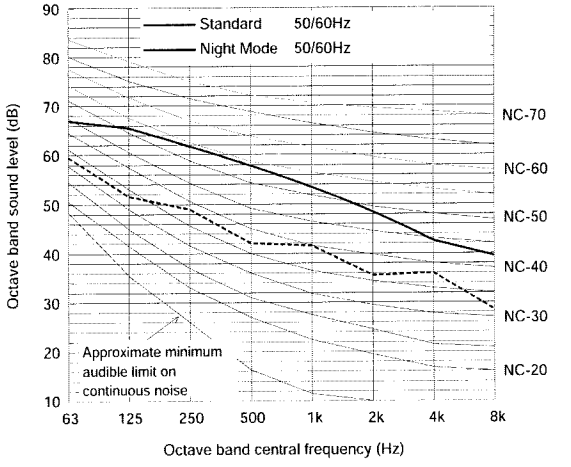
Appendix A

Measurement condition
PUHY-EP400,450,500,550,600,650YSHM



Ref.:PUHY_YHM-A_NCC_EUDB_EP400,EP650_Y1

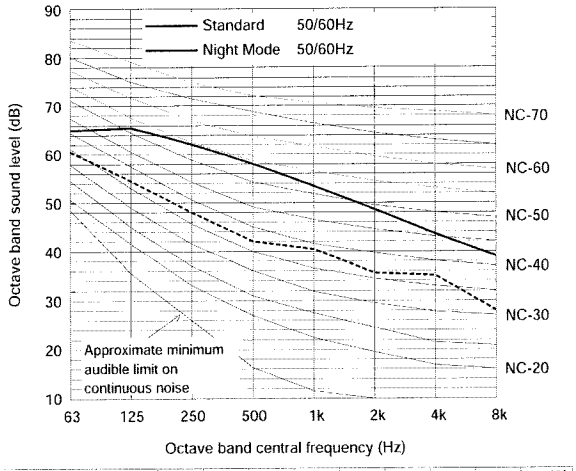
Sound level of PUHY-EP400YSHM-A(-BS) Ref.:PUHY_YHM-A_NCC_EUDB_EP400



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	67.0	65.5	63.0	56.5	53.5	49.0	42.5	39.5	60.0
Night Mode	50/60Hz	59.5	51.5	49.0	42.0	41.5	35.5	36.0	28.5	47.0

When Night Mode is set,the A/C system's capacity is limited. The system could return to normal operation from Night Mode automatically in the case that the operation condition is severe.

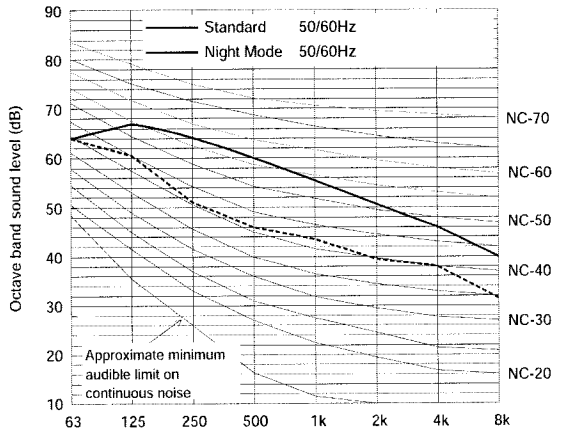
Sound level of PUHY-EP450YSHM-A(-BS) Ref.:PUHY_YHM-A_NCC_EUDB_EP450



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	65.0	65.5	63.0	57.0	53.5	49.0	43.5	39.0	60.0
Night Mode	50/60Hz	60.5	54.5	48.0	42.0	40.5	35.5	35.0	28.0	47.0

When Night Mode is set,the A/C system's capacity is limited. The system could return to normal operation from Night Mode automatically in the case that the operation condition is severe.

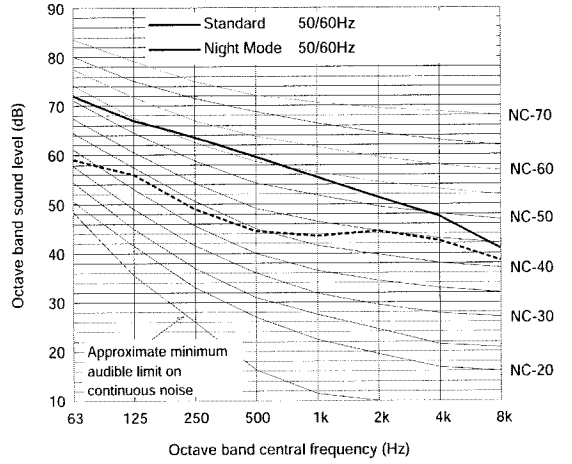
Sound level of PUHY-EP500YSHM-A(-BS) Ref.:PUHY_YHM-A_NCC_EUDB_EP500



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	64.0	67.0	65.0	59.0	55.5	51.0	46.0	40.0	62.0
Night Mode	50/60Hz	64.0	60.5	51.0	46.0	43.5	39.5	38.0	31.5	51.0

When Night Mode is set,the A/C system's capacity is limited. The system could return to normal operation from Night Mode automatically in the case that the operation condition is severe.

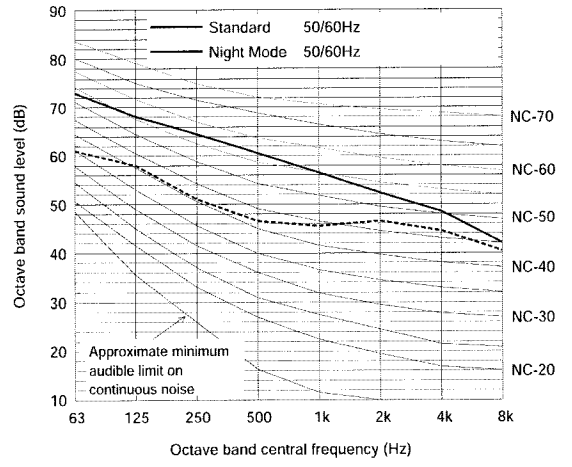
Sound level of PUHY-EP550YSHM-A(-BS) Ref.:PUHY_YHM-A_NCC_EUDB_EP550



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	72.0	67.0	64.0	59.0	55.5	51.5	47.5	41.0	62.0
Night Mode	50/60Hz	59.0	56.0	49.0	44.5	43.5	44.5	42.5	38.5	51.0

When Night Mode is set,the A/C system's capacity is limited. The system could return to normal operation from Night Mode automatically in the case that the operation condition is severe.

Sound level of PUHY-EP600YSHM-A(-BS) Ref.:PUHY_YHM-A_NCC_EUDB_EP600

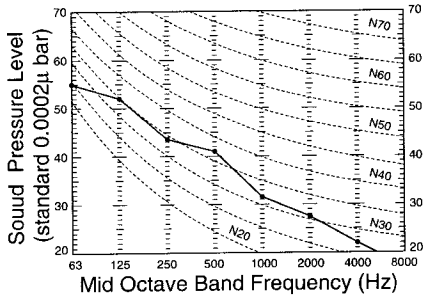


		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	73.0	68.0	65.0	60.0	56.5	52.5	48.5	42.0	63.0
Night Mode	50/60Hz	61.0	58.0	51.0	46.5	45.5	46.5	44.5	40.5	53.0

When Night Mode is set,the A/C system's capacity is limited. The system could return to normal operation from Night Mode automatically in the case that the operation condition is severe.

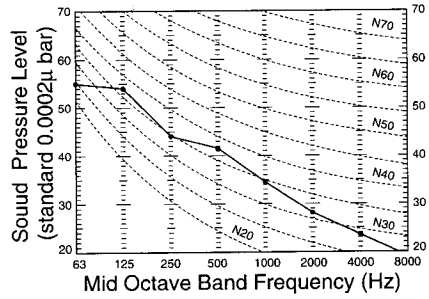
Model FDURA401

Noise level 42 dB (A) at HIGH
37 dB (A) at LOW



Models FDURA501, 601

Noise level 43 dB (A) at HIGH
38 dB (A) at LOW

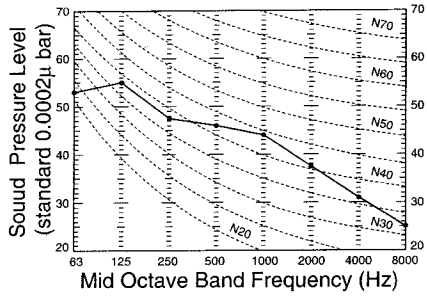


(2) Outdoor unit

Measured based on JIS B 8616
Mike position: at highest noise level in position as below
Distance from front side 1m
Height 1m

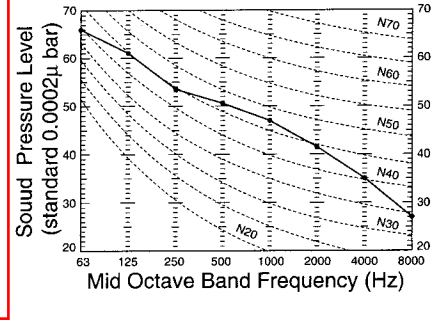
Models FDCVA151HEN, 201HEN, 251HEN

Noise level 48 dB (A)



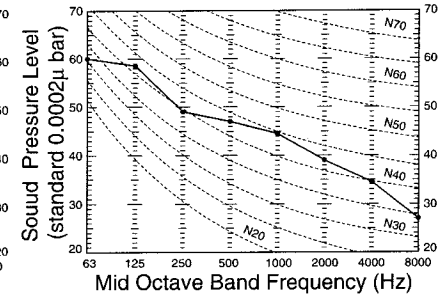
Models FDCA301HEN, 301HES

Noise level 53 dB (A)



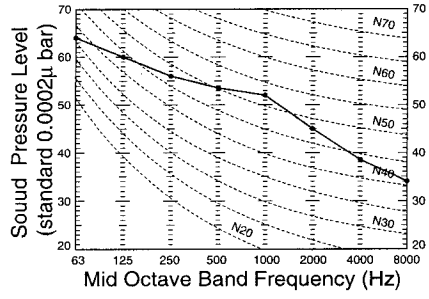
Models FDCA401HEN, 401HES

Noise level 54 dB (A)



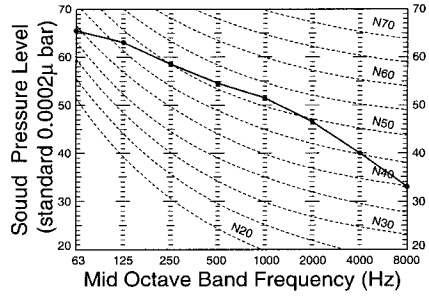
Model FDCA501HES

Noise level 56 dB (A)



Model FDCA601HES

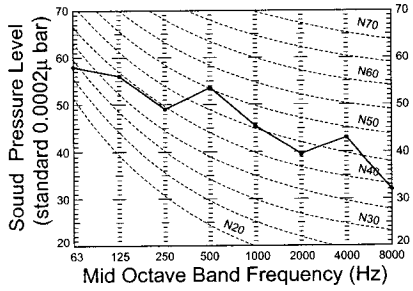
Noise level 57 dB (A)



(2) Outdoor unit (FDC)

Measured based on JIS B 8616
Mike position as highest noise level in position as below
Distance from front side 1m
Height 1m

Model FDCA140HKXEN4
Noise level 53 dB (A)



Fläkt Woods Limited

Technical Data Sheet

JM Aerofoil

Project Name	: MGR	Date:	: Thursday, November 4, 2010
Quotation Number	:	Fan Code	: 50JM/20/4/6/22
Customer	:	Item Reference:	:

Fan Code	50JM/20/4/6/22
Fan Diameter/ Size	500 mm
Blades	6
Fan Speed	1420 rpm
Velocity	7.7 m/s
Blade Angle	22°
Form of Running	B
Fan Casing	Long
Requested Duty	1.50m³/s @ 125 Pa (static)
Outlet Dynamic Pressure	36 Pa
Duty Shaft Power	0.349 kW
Max Shaft Power	0.382 kW
Total Efficiency	71 %
Motor Frame	BT9
Motor Rating	0.390 kW
Full Load Current	1.26 A
Starting Current	3.9A
Motor Mounting	Pad
Electrical Supply	380-420 Volts 50 Hz 3 Phase
Start Type	Enquire
Motor Winding	Standard
Enclosure	Standard All
SFP value	0.35 W/(l/s)
Energy Consumption	1073 kWh (2000 h/year)
Running Cost / Year	£75
Air Density	1.2 kg/m³ / 20 °C / 0 m / 50% RH
Smoke Venting	Non Smoke Venting

Performance data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with ISO 5801 and is specifically applicable for Ducted installations. When an electronic controller is incorporated, enhanced motor noise can occur - particularly when the operating speed is well below maximum. FWL therefore recommend using an auto transformer speed controller for noise sensitive applications.

Acoustic data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with BS 848 Pt 2, 1985 under Ducted conditions. The single figure provided is the overall Inlet sound pressure level at the specified distance, under spherical, free field conditions. Breakout levels stated are estimated from induct sound power levels and are provided for guidance.

Terms and Conditions: This offer is made subject to the terms and conditions detailed on the accompanying letter.

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3 m**
Inlet*	71	75	72	72	70	66	63	57	80	54
Outlet*	73	77	73	72	70	66	64	58	81	54
Breakout*	63	59	51	49	45	38	42	34	65	31

* Lw dB re 10^{-12} W ** dBA re $2x10^{-5}$ Pa

Description	Qty	Unit Price	Price
Fan			
50JM/20/4/6/22	1	enquire	enquire
Fan Accessories (Quantities per Fan)			
Thermostat	1	enquire	enquire
Estimated Despatch : 1 to 3 Weeks			
TOTAL PRICE FAN AND ACCESSORIES (leadtimes subject to parts availability)			enquire

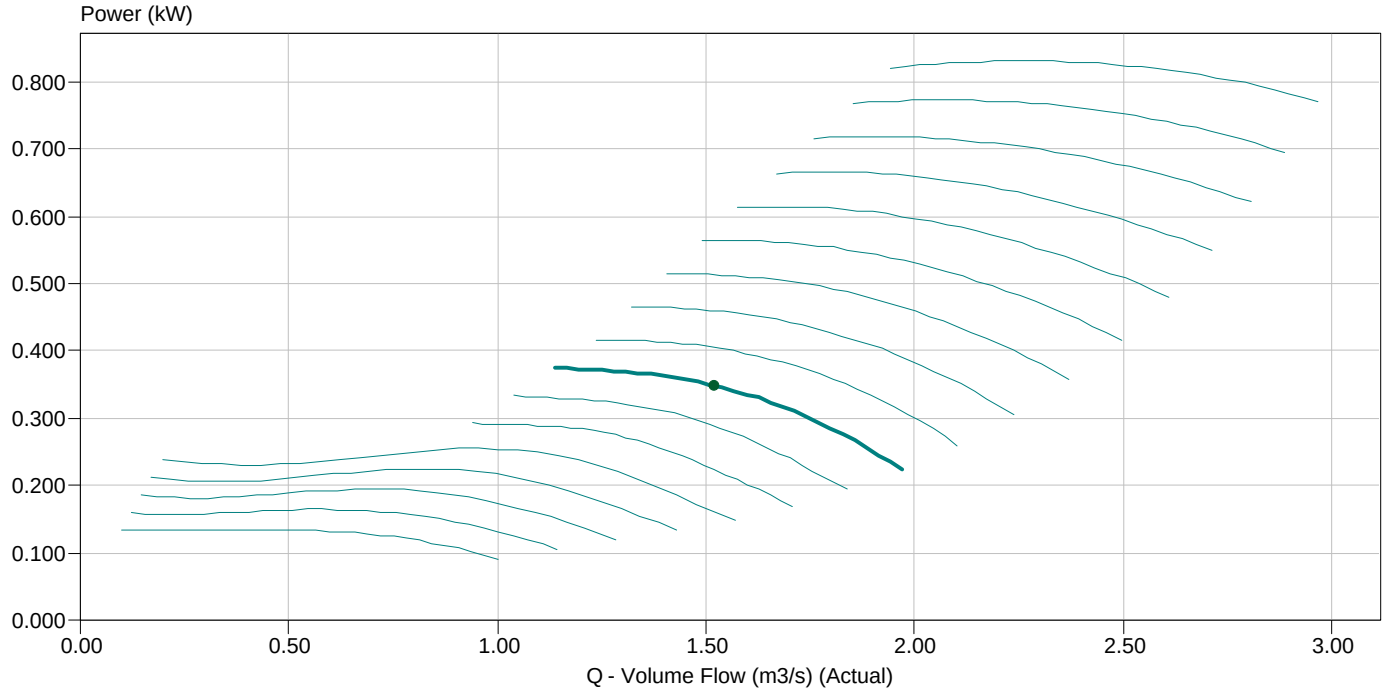
23 Raglan Road
Bromley, Kent, BR2 9NN
Tel: 020 8466 1100 Fax: 020 8464 8445
Website:
Email: david.barker23@btconnect.com

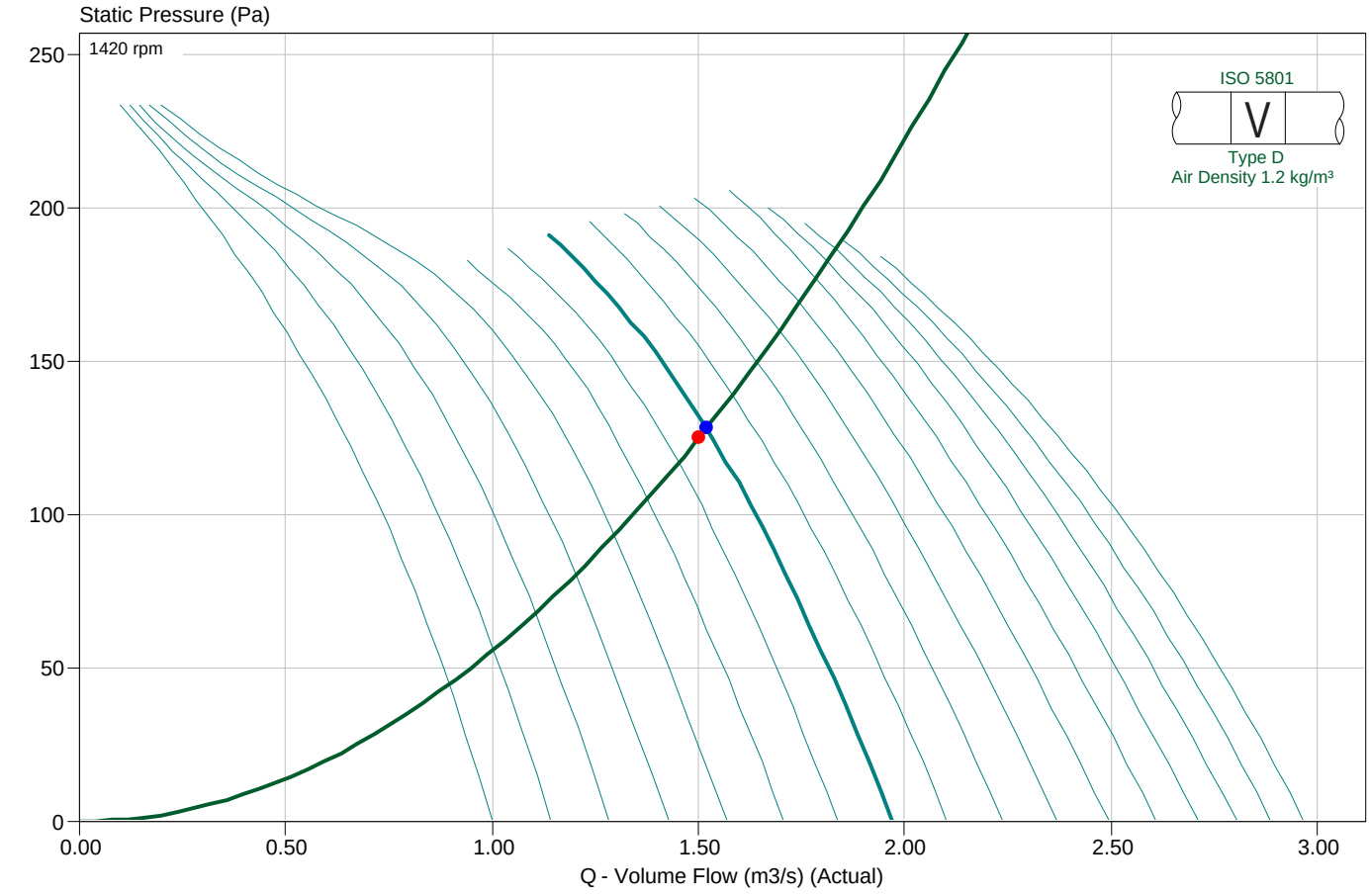
Fläkt Woods Limited

Performance Chart

JM Aerofoil

Project Name	: MGR	Date:	: Thursday, November 4, 2010
Quotation Number	:	Fan Code	: 50JM/20/4/6/22
Customer	:	Item Reference:	:





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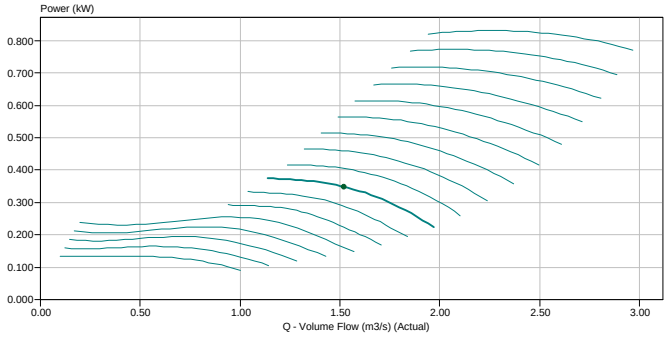
Fläkt Woods Limited

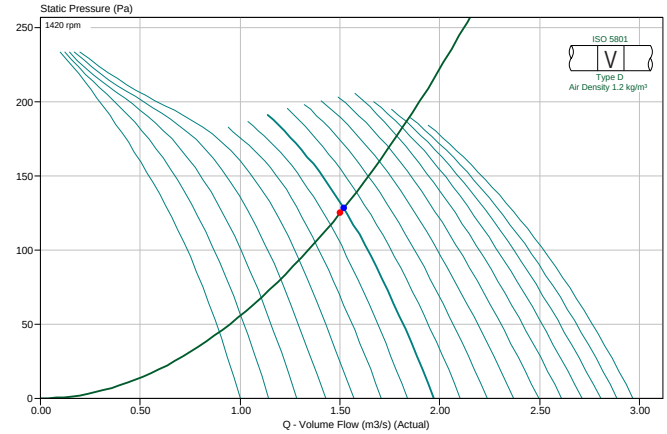
Combination Data Sheet

JM Aerofoil

Project Name	: MGR		Date:	: Thursday, November 4, 2010
Quotation Number	:		Fan Code	: 50JM/20/4/6/22
Customer	:		Item Reference:	:

Fan Code	50JM/20/4/6/22
Fan Diameter/ Size	500 mm
Blades	6
Fan Speed	1420 rpm
Velocity	7.7 m/s
Blade Angle	22°
Form of Running	B
Fan Casing	Long
Requested Duty	1.50m³/s @ 125 Pa (static)
Outlet Dynamic Pressure	36 Pa
Duty Shaft Power	0.349 kW
Max Shaft Power	0.382 kW
Total Efficiency	71 %
Motor Frame	BT9
Motor Rating	0.390 kW
Full Load Current	1.26 A
Starting Current	3.9 A
Motor Mounting	Pad
Electrical Supply	380-420 Volts 50 Hz 3 Phase
Start Type	Enquire
Motor Winding	Standard
Enclosure	Standard All
SFP value	0.35 W/(l/s)
Energy Consumption	1073 kWh (2000 h/year)
Running Cost / Year	£75
Air Density	1.2 kg/m³ / 20 °C / 0 m / 50% RH
Smoke Venting	Non Smoke Venting





	Sound Spectrum (Hz)								Overall	
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Inlet*	71	75	72	72	70	66	63	57	80	54
Outlet*	73	77	73	72	70	66	64	58	81	54
Breakout*	63	59	51	49	45	38	42	34	65	31

* Lw dB re 10^{-12} W ** dBA re $2x10^{-5}$ Pa

Terms and Conditions: This offer is made subject to the terms and conditions detailed on the accompanying letter.

Description	Qty	Unit Price	Price
Fan			
50JM/20/4/6/22	1	enquire	enquire
Fan Accessories (Quantities per Fan)			
Thermostat	1	enquire	enquire
Estimated Despatch : 1 to 3 Weeks			
TOTAL PRICE FAN AND ACCESSORIES (leadtimes subject to parts availability)			enquire

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Plant Room Wall Lining

Advantages

- ***Excellent sound absorption***
- ***Light reflective***
- ***Good thermal insulation***
- ***Easy to handle, install, and clean***
- ***Cost effective sound treatment***
- ***High quality finish***
- ***Fire rated***

Applications

CMS Plan Room Wall Lining Panels provide an effective means of controlling reverberation time and reflected sound in plant rooms. They have an aesthetically pleasing appearance and are typically suitable for industrial applications such as engine enclosures, test cells and workshops

Installation Service

In addition to supply of this product CMS Acoustic Solutions offers a competitively-priced installation service anywhere in the UK. Use of our service ensures that installation is performed to the highest standards by tradesmen fully experienced in the specialist skills of fitting acoustic materials correctly. For further details contact our technical team on 01925 577711.

Description

Plantroom Wall Lining Panels consist of borosilicate mineral fibres impregnated with a suitable resin binder faced with Type E alkali glass cloth.

Physical Information

Dimensions

Thickness (mm)	Weight (kg/m^2)	Sheet Size (mm)
25	2.5	1200 x 600
50	5.0	1200 x 600
75	7.5	1200 x 600
100	10.0	1200 x 600

The above sizes and weights are nominal

Fire Performance

The borosilicate mineral fibres impregnated with a suitable resin binder core and its facing Type E alkali glass cloth are non combustible when tested to BS 476: Part 4.

When tested to BS 476: Part 6 & 7 the system will comply with a Class "0 Surface Spread Of Flame.

Resistance to Vibration

When tested in accordance with BS 2972 the liner (all thickness) is free from fibre fall out and delamination.

Toxicity and Oxygen Index

The finished liner has passed the test in NES 713 (toxic) and NES 714 (oxygen)

Water Resistance

The borosilicate mineral fibres repel water due to the presence of water repellent additives. Moisture condensing from the air within the core is less than 0.02% by volume at 95% relative humidity.

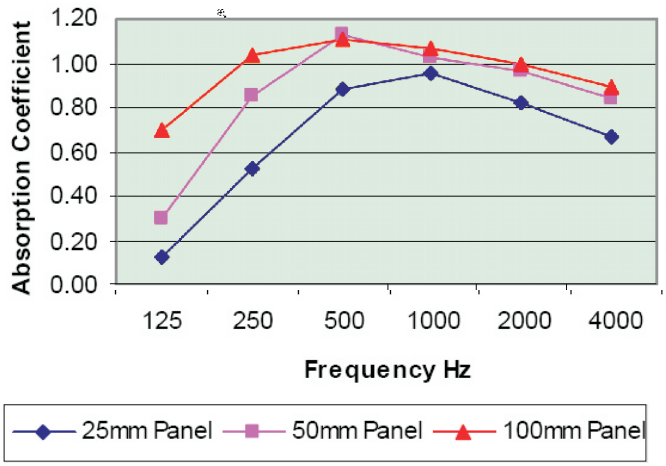
Acoustic Performance

The noise absorption co-efficient is expressed as a factor between 0 and 1.0. The more sound that a material absorbs, the higher the noise absorption co-efficient.

The noise absorption co-efficient for our Plant Room Wall Lining Panels, as tested to BS 3638:1987 is:

Thickness	Frequency						
	125	250	500	1k	2k	4k	NRC
25mm	0.12	0.52	0.88	0.95	0.82	0.67	0.80
50mm	0.30	0.85	1.13	1.03	0.96	0.84	0.99
100mm	0.70	1.04	1.11	1.07	0.99	0.89	1.05

See overleaf for performance graph.



Thermal Conductivity

When tested in accordance with BS 874

Thickness (mm)	Thermal Conductivity W/mC at 50C
25	0.038
50	0.039
75	0.040
100	0.040

Installation Guidelines

CMS has many years experience manufacturing and supplying wall panels, and often the site limitations or restrictions require a non-standard means of supporting the panels to be developed. If you have any concerns concerning installation, please do not hesitate to discuss your requirements with our engineers.

The most common methods of installation methods are:

1.Using a template mark the wall with the hole centres to the same centres as the panels (see in the pattern shown in Diagram A. Apply adhesive to each pin and push on to the wall where marked, ensuring excess adhesive flows through the perforations.

2. For ceiling applications or where the panels are to be used in a plant room exposed to return air, perforated spindle pins are again bonded to the existing plastered wall and applied to 90% of the wall/ceiling surface.

In each case, the wall surface should be sound and level. It is important to keep hands clean when working with the panels, or wear gloves to avoid soiling the panel.

Installation

The pins and button washers are supplied loose with the Wall Lining panels. in the pattern shown in Diagram A

2. Allow the adhesive to cure.

3. Randomly test the bond strength of the glued pins prior to installing the Plant Room Absorption Panels.

4 Push the panels on and apply the self locking washers.

5. Where bespoke size panels are required, peel back the Type E Alkali Glass Cloth facing; cutting the acoustic insulation to the correct size and laminate the Type E Alkali Glass Cloth facing with general purpose adhesive overlapping the rear of the panel.

Diagram A

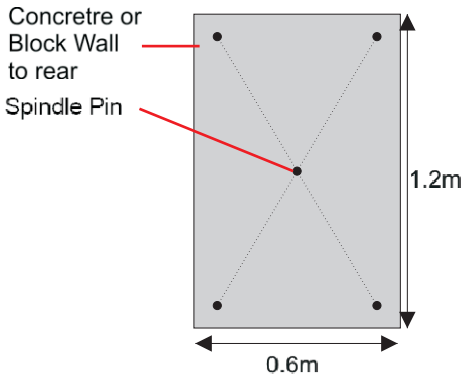
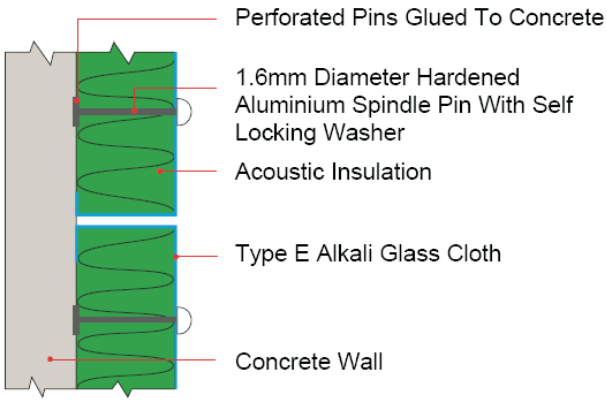


Diagram B



vacuum cleaner Do not use water to clean the panels.

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Web: www.cmsacoustics.co.uk

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Southern Office: Dugard House, Peartree Road, Colchester CO30UL
Tel: 01206 216690 Fax: 01206 577954

Appendix B

Background Noise Measurements for 55 Loundoun Road, London, NW8.

Address	Time	Time	Measurment Time	LAeq	LAE	LAmax	LAmin	LA01	LA10	LA50	LA90
1	16 September 2010	12:23:26	0:15:00	62	92	84	60	66	63	61	61
2	16 September 2010	12:38:26	0:15:00	63	93	80	60	73	64	62	61
3	16 September 2010	12:53:26	0:15:00	62	91	75	58	65	63	61	60
4	16 September 2010	13:08:26	0:15:00	60	90	68	58	63	62	60	59
5	16 September 2010	13:23:26	0:15:00	60	90	67	58	64	61	60	59
6	16 September 2010	13:38:26	0:15:00	61	91	71	58	65	62	61	60
7	16 September 2010	13:53:26	0:15:00	60	90	72	58	65	62	60	59
8	16 September 2010	14:08:26	0:15:00	62	91	81	58	68	62	61	60
9	16 September 2010	14:23:26	0:15:00	61	90	69	58	64	62	60	59
10	16 September 2010	14:38:26	0:15:00	61	90	75	58	65	62	60	59
11	16 September 2010	14:53:26	0:15:00	61	91	73	58	66	63	61	59
12	16 September 2010	15:08:26	0:15:00	61	91	78	58	64	63	61	59
13	16 September 2010	15:23:26	0:15:00	61	91	75	58	68	64	60	59
14	16 September 2010	15:38:26	0:15:00	61	90	76	58	67	62	60	59
15	16 September 2010	15:53:26	0:15:00	62	91	76	59	66	63	61	60
16	16 September 2010	16:08:26	0:15:00	61	91	76	58	66	62	61	60
17	16 September 2010	16:23:26	0:15:00	61	91	76	58	67	63	61	60
18	16 September 2010	16:38:26	0:15:00	61	91	77	58	68	63	60	59
19	16 September 2010	16:53:26	0:15:00	61	91	75	58	69	63	60	59
20	16 September 2010	17:08:26	0:15:00	62	92	93	58	68	63	60	59
21	16 September 2010	17:23:26	0:15:00	61	91	72	58	67	62	60	59
22	16 September 2010	17:38:26	0:15:00	61	91	78	58	68	62	60	59
23	16 September 2010	17:53:26	0:15:00	60	90	79	58	64	62	60	59
24	16 September 2010	18:08:26	0:15:00	60	90	67	58	64	61	60	59
25	16 September 2010	18:23:26	0:15:00	63	93	91	58	68	63	61	59
26	16 September 2010	18:38:26	0:15:00	61	90	68	58	65	62	60	59
27	16 September 2010	18:53:26	0:15:00	61	90	75	58	67	62	60	59
28	16 September 2010	19:08:26	0:15:00	60	90	76	46	69	62	59	51
29	16 September 2010	19:23:26	0:15:00	56	86	68	46	65	59	55	50
30	16 September 2010	19:38:26	0:15:00	58	88	74	47	67	61	56	51
31	16 September 2010	19:53:26	0:15:00	58	88	82	45	68	60	54	50
32	16 September 2010	20:08:26	0:15:00	57	86	85	45	64	59	53	49
33	16 September 2010	20:23:26	0:15:00	55	85	70	45	63	58	53	49
34	16 September 2010	20:38:26	0:15:00	54	83	69	45	62	57	51	47
35	16 September 2010	20:53:26	0:15:00	55	85	71	46	64	59	52	49
36	16 September 2010	21:08:26	0:15:00	56	86	71	45	66	60	52	48
37	16 September 2010	21:23:26	0:15:00	56	85	80	44	64	58	51	47
38	16 September 2010	21:38:26	0:15:00	52	82	66	45	61	56	50	47
39	16 September 2010	21:53:26	0:15:00	54	84	76	44	63	58	51	46
40	16 September 2010	22:08:26	0:15:00	52	82	74	44	60	56	49	47
41	16 September 2010	22:23:26	0:15:00	55	84	84	44	62	57	51	47
42	16 September 2010	22:38:26	0:15:00	53	82	65	44	61	56	50	46
43	16 September 2010	22:53:26	0:15:00	52	81	66	43	60	55	48	45
44	16 September 2010	23:08:26	0:15:00	53	83	67	43	62	57	49	45
45	16 September 2010	23:23:26	0:15:00	52	81	68	43	59	56	48	45
46	16 September 2010	23:38:26	0:15:00	52	82	70	43	63	56	48	45

Background Noise Measurements for 55 Loundoun Road, London, NW8.

47	16 September 2010	23:53:26	0:15:00	52	81	68	42	64	53	47	45
48	17 September 2010	00:08:26	0:15:00	51	81	65	42	61	56	46	44
49	17 September 2010	00:23:26	0:15:00	51	81	66	42	61	55	46	44
50	17 September 2010	00:38:26	0:15:00	50	80	65	42	62	52	46	44
51	17 September 2010	00:53:26	0:15:00	48	78	62	42	57	50	46	44
52	17 September 2010	01:08:26	0:15:00	48	77	61	41	57	50	45	43
53	17 September 2010	01:23:26	0:15:00	45	75	60	41	56	47	44	42
54	17 September 2010	01:38:26	0:15:00	50	80	64	41	59	55	45	43
55	17 September 2010	01:53:26	0:15:00	44	74	56	40	52	46	43	42
56	17 September 2010	02:08:26	0:15:00	47	77	65	40	59	51	43	42
57	17 September 2010	02:23:26	0:15:00	49	79	67	40	63	46	42	41
58	17 September 2010	02:38:26	0:15:00	43	73	58	40	52	44	42	41
59	17 September 2010	02:53:26	0:15:00	47	77	62	39	60	50	42	41
60	17 September 2010	03:08:26	0:15:00	44	74	55	40	53	46	42	41
61	17 September 2010	03:23:26	0:15:00	45	74	63	40	56	44	42	41
62	17 September 2010	03:38:26	0:15:00	48	78	66	39	62	48	43	42
63	17 September 2010	03:53:26	0:15:00	43	73	56	40	52	44	42	41
64	17 September 2010	04:08:26	0:15:00	46	75	62	40	57	46	43	41
65	17 September 2010	04:23:26	0:15:00	47	76	61	40	57	49	43	41
66	17 September 2010	04:38:26	0:15:00	47	76	67	40	58	48	43	42
67	17 September 2010	04:53:26	0:15:00	45	75	69	40	51	46	43	42
68	17 September 2010	05:08:26	0:15:00	47	76	62	40	57	46	43	42
69	17 September 2010	05:23:26	0:15:00	50	79	65	42	59	54	45	43
70	17 September 2010	05:38:26	0:15:00	48	77	61	42	55	51	45	44
71	17 September 2010	05:53:26	0:15:00	50	80	63	43	60	54	46	**45**
72	17 September 2010	06:08:26	0:15:00	50	79	70	43	60	52	46	**45**
73	17 September 2010	06:23:26	0:15:00	53	83	68	44	64	56	49	46
74	17 September 2010	06:38:26	0:15:00	55	84	77	45	67	56	49	47
75	17 September 2010	06:53:26	0:15:00	53	83	65	45	62	57	50	47
76	17 September 2010	07:08:26	0:15:00	59	89	77	46	70	61	56	50
77	17 September 2010	07:23:26	0:15:00	60	90	76	57	64	61	59	58
78	17 September 2010	07:38:26	0:15:00	63	93	81	58	75	62	59	59
79	17 September 2010	07:53:26	0:15:00	60	89	75	47	66	61	59	53
80	17 September 2010	08:08:26	0:15:00	59	89	74	48	64	61	59	55
81	17 September 2010	08:23:26	0:15:00	61	91	72	49	68	63	60	59
82	17 September 2010	08:38:26	0:15:00	61	90	76	58	67	62	60	59
83	17 September 2010	08:53:26	0:15:00	60	90	74	57	63	61	60	59
84	17 September 2010	09:08:26	0:15:00	61	91	78	58	70	62	60	59
85	17 September 2010	09:23:26	0:15:00	60	90	72	58	65	62	60	59
86	17 September 2010	09:38:26	0:15:00	61	90	74	58	67	62	60	59
87	17 September 2010	09:53:26	0:15:00	61	90	75	58	69	62	60	59
88	17 September 2010	10:08:26	0:15:00	61	91	74	58	68	63	60	59
89	17 September 2010	10:23:26	0:15:00	62	92	79	58	69	64	61	59
90	17 September 2010	10:38:26	0:15:00	61	90	72	58	68	62	60	59
91	17 September 2010	10:53:26	0:15:00	62	91	86	58	69	63	60	59
92	17 September 2010	11:08:26	0:15:00	60	90	74	58	64	62	60	59
93	17 September 2010	11:23:26	0:01:15	63	82	80	58	75	64	61	59

Appendix C

ACOUSTICS PLUS

CONTRACT TITLE: 55 Loudoun Road, London, NW8
SOUND SOURCE: Plant room supply fans
MAKE & TYPE: Flakt Woods 50JM Aerofoil fan

			OCTAVE BAND CENTRE FREQUENCY (Hz)								
OVERALL Lw			63	125	250	500	1k	2k	4k	8k	dBA
1											
2		UNIT Lw	79	83	80	80	78	74	71	65	82
3											
4	STRAIGHT DUCT - Rectangular unlined										
5	LENGTH (m)	SIZE (mm)									
6			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
7			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
8			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
9			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
10			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	BENDS & TAKE OFFS										
12	NO.	TYPE SIZE (mm)									
13			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
16			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
17			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
18			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
19	OTHER ATTENUATION										
20	Unspecified Attenuator		17	26	38	48	61	61	51	39	
21											
22											
23											
24	END REFLECTION SIZE (mm)										
25	1260x1880		2	0	0	0	0	0	0	0	
26											
27	**Lw LEAVING SYSTEM**		60	57	42	32	17	13	20	26	
28											
29	DISTANCE TO LISTENER (m)	5	-25	-25	-25	-25	-25	-25	-25	-25	
30	DIRECTIVITY OUTLET		6	7	8	9	9	9	9	9	
31											
32	**DIRECT Lp**		41	39	25	16	1	-3	4	10	25

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA@ 3 m**
Inlet*	71	75	72	72	70	66	63	57	80	54
Outlet*	73	77	73	72	70	66	64	58	81	54
Breakout*	63	59	51	49	45	38	42	34	65	31

* Lw dB re 10^{-12} W ** dBA re $2x10^{-5}$ Pa

ACOUSTICS PLUS

CONTRACT TITLE: 55 Loudoun Road, London, NW8
SOUND SOURCE: Plant room exhaust fans
MAKE & TYPE: Flakt Woods 50JM Aerofoil fan

			OCTAVE BAND CENTRE FREQUENCY (Hz)								
OVERALL Lw			63	125	250	500	1k	2k	4k	8k	dBA
1											
2		UNIT Lw	81	85	81	80	78	74	72	66	83
3											
4	STRAIGHT DUCT - Rectangular unlined										
5	LENGTH (m)	SIZE (mm)									
6			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
7			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
8			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
9			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
10			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	BENDS & TAKE OFFS										
12	NO.	TYPE SIZE (mm)									
13			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
16			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
17			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
18			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
19	OTHER ATTENUATION										
20	Unspecified Attenuator		17	26	38	48	61	61	51	39	
21											
22											
23											
24	END REFLECTION SIZE (mm)										
25	3750x2100		0	0	0	0	0	0	0	0	
26											
27	**Lw LEAVING SYSTEM**		64	59	43	32	17	13	21	27	
28											
29	DISTANCE TO LISTENER (m)	2	-17	-17	-17	-17	-17	-17	-17	-17	
30	DIRECTIVITY OUTLET		6	7	8	8	9	9	9	9	
31											
32	**DIRECT Lp**		53	49	34	23	9	5	13	19	34

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA@ 3 m**
Inlet*	71	75	72	72	70	66	63	57	80	54
Outlet*	73	77	73	72	70	66	64	58	81	54
Breakout*	63	59	51	49	45	38	42	34	65	31

* Lw dB re 10^{-12} W ** dBA re $2x10^{-5}$ Pa