KUT

PLANNING BRIEF

for the

COMFORT COOLING SERVICES

at

6 LINCOLN'S INN FIELDS
LONDON
WC2A 3BP

RFB/SQ/CMW/5997
November 2012
Issue No.1

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KUT

PLANNING BRIEF
for
MECHANICAL AND ELECTRICAL SERVICES
at
6 LINCOLN'S INN FIELDS
LONDON
WC2A 3BP

INDEX

1. THE PROJECT

The project comprises a large six storey mid-terrace private property at Lincoln's Inn Fields, occupied as one single residential dwelling arranged over Lower Ground to Third Floors.

The main Roof, located above the Third Floor, consists of 2No. pitched sections with a central lead valley orientated East to West. It is to be noted that the valley is not visible from either the rear or the front elevations of the property, and therefore similarly is not visible from Lincoln's Inn Fields itself.

2. SCOPE OF ENGINEERING WORKS

The engineering works referred to in this report will cover the air conditioning which is primarily used for comfort cooling, as well as the associated acoustic treatment.

3. COMFORT COOLING

The primary heat source to the building is a wet system as heated by a gas-fired boiler arrangement. Whilst the air conditioning can provide supplementary space heating by virtue of its heat pump cycle in this instance it will be used primarily for comfort cooling purposes.

Comfort cooling is to be provided to all principal rooms throughout the building in order to provide a comfortable environment for the occupants within, typically with a room temperature set point of 23ºC dry bulb.

The comfort cooling is to consist of 3No. inverter driven mini-VRF (variable refrigerant flow) heat pump systems, with 3No. roof mounted condensers connected to associated fan coil units concealed internally behind joinery/architectural casings. The fan coil units will be designed to provide the required cooling duty whilst set at a low fan speed, and they will be provided with discreet access for maintenance which will be sympathetic to the building fabric and period of the property.

The refrigerant pipework to the indoor units will be distributed within ceiling/floor voids as required.

4. ACOUSTICS

An acoustic survey has been undertaken by the Acoustic Consultants Acoustic Plus, pleased refer to the appended report.

The Acoustic Report includes the background noise levels recorded at site, and relates the noise data for the comfort cooling condensers within the proposed acoustic enclosures to the requirements of the Local Authority.

APPENDIX A

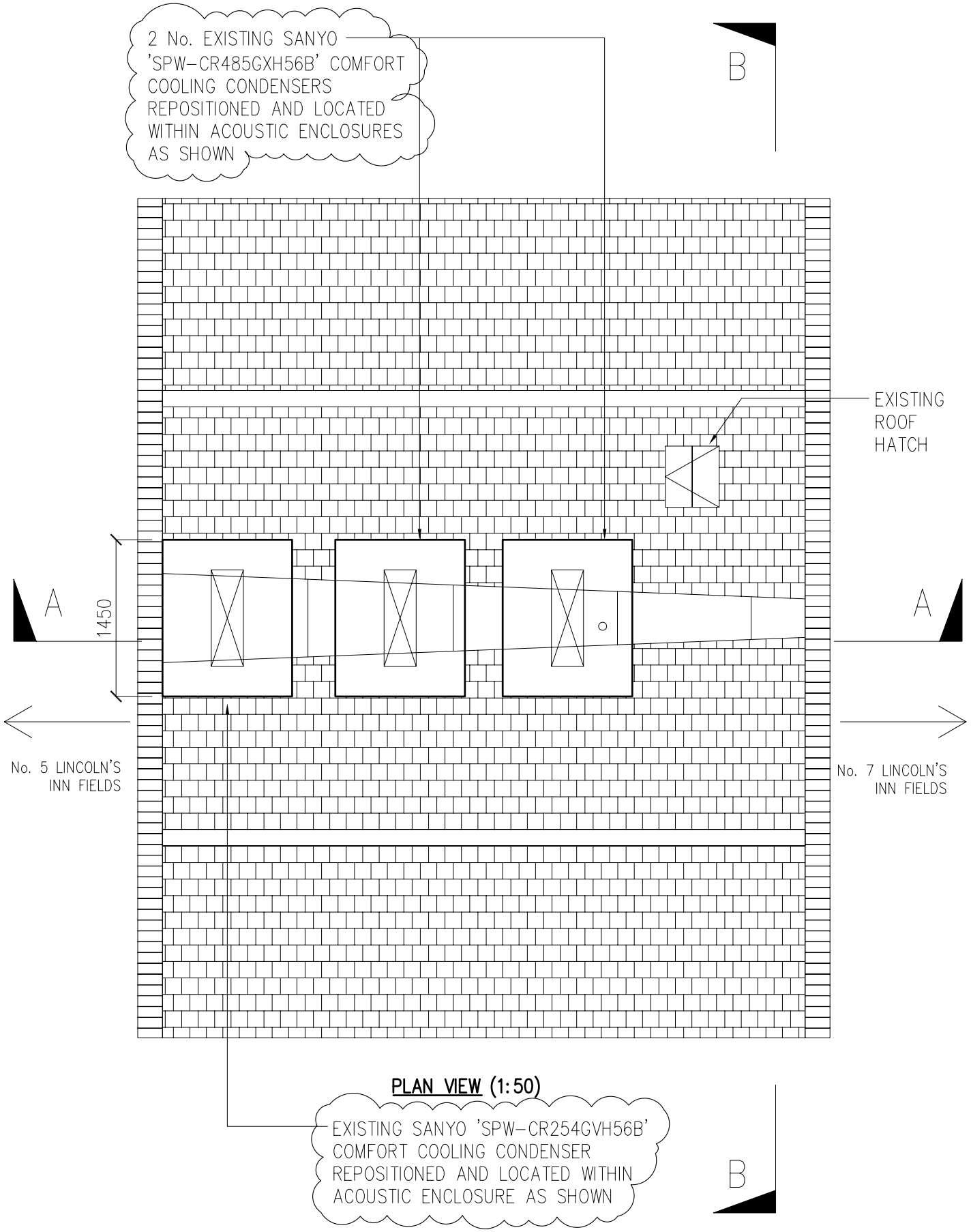
COMFORT COOLING EQUIPMENT SCHEDULE

Roof-mounted comfort cooling condensers:

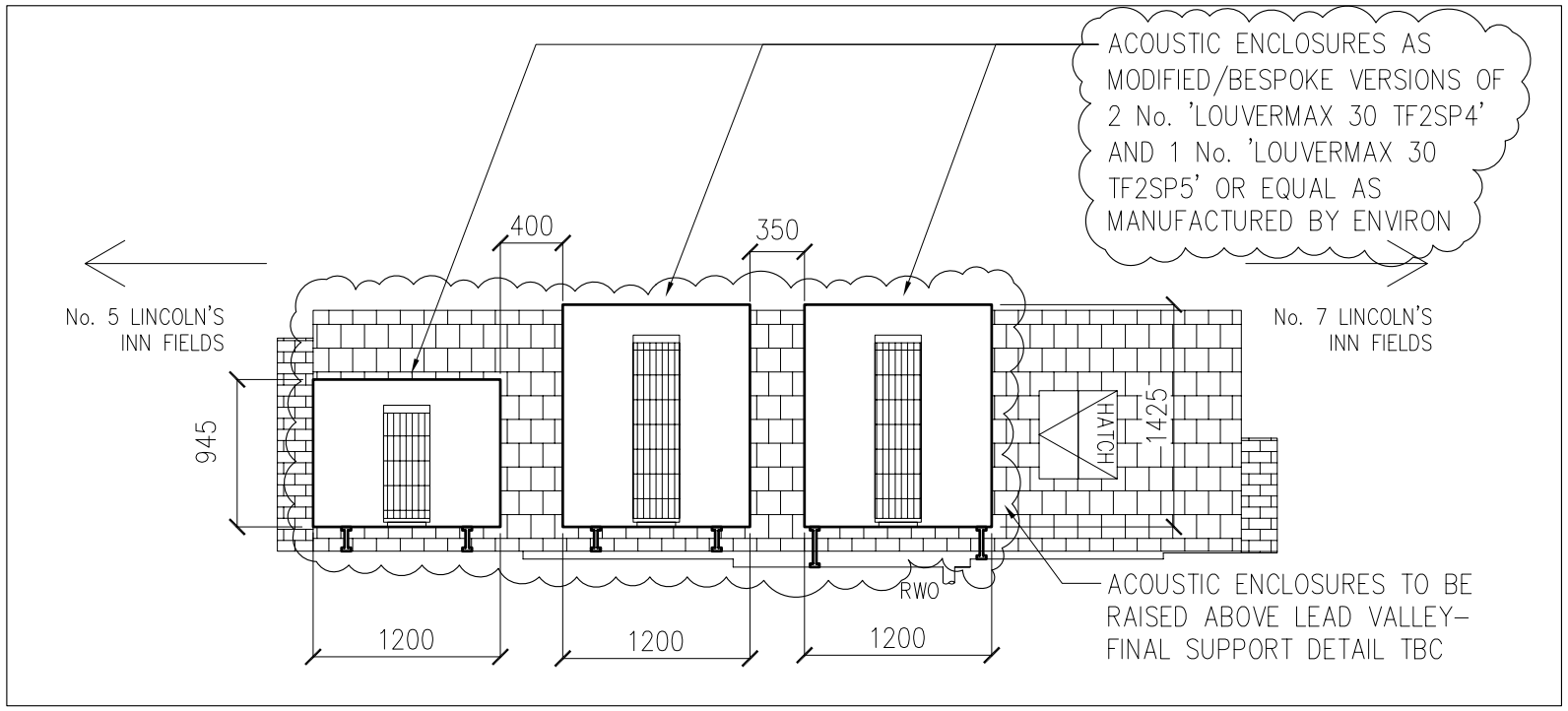
- 2No. Sanyo SPW-CR485GXH56B mini-VRF heat pump condensers
- 1No. Sanyo SPW-CR254GVH56B mini-VRF heat pump condenser

APPENDIX B

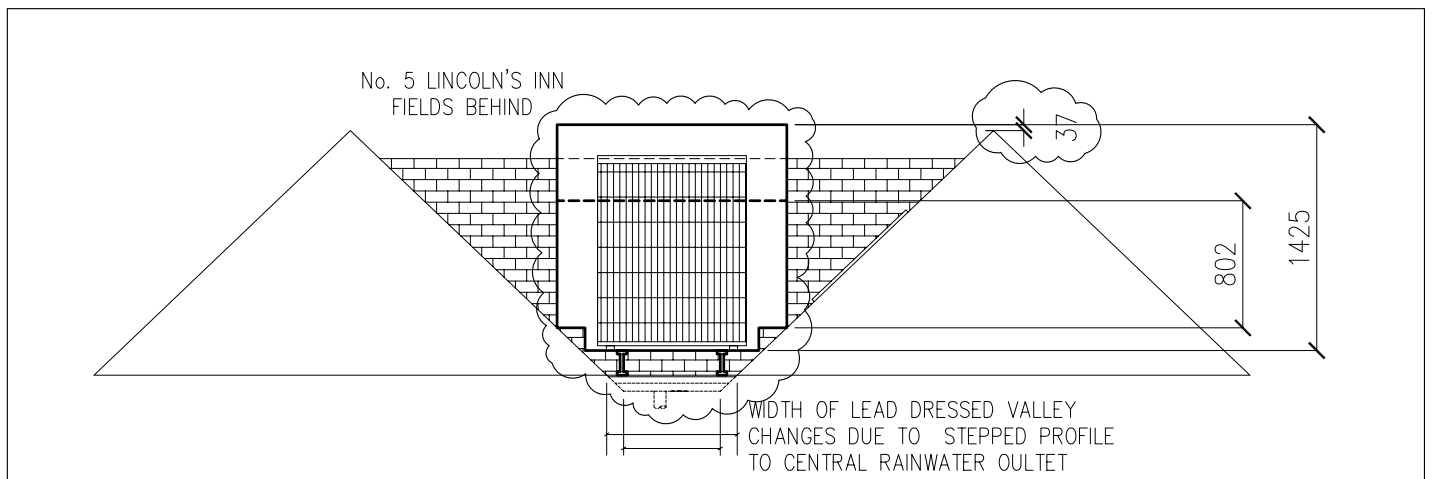
PROPOSED COMFORT COOLING CONDENSER LAYOUT



PLAN VIEW (1:50)



SECTION AA (1:50)



SECTION BB (1:50)

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Description

ROOF PLAN - PROPOSED COMFORT COOLING CONDENSER LAYOUT

ref./date	REVISIONS
P2 06.12.12	PRELIMINARY ISSUE ENCLOSURES DIMS' AMENDED

Scale A3@1:50 | Drawn GS | Date Nov 2012 | Checked

Project

6 LINCOLN'S INN FIELDS

Project No.	Services	Dwg No.	Rev.
5997	M	SK2	P2

APPENDIX C

ACOUSTICS PLUS ENVIRONMENTAL NOISE ASSESSMENT

Noise & Vibration Consultants
4 Mulberry Place, Pinnell Road, London, SE9 6AJ
Tel: **020 8859 0303** Fax: 020 8859 1211
Email: **info@acousticsplus.co.uk** Web: www.acousticsplus.co.uk

ACOUSTICS PLUS

Retention of Mechanical Plant

6 Lincolns Inn Field, London, WC2A 3BP

Environmental Noise Assessment

Author: Andy Dodd B.Sc. (Hons) AMIOA
Consultant

Doc Ref: 102328.ad Issue3

Company Registration Number: 4304440
VAT Registration Number: 788 2610 94

Environmental Noise Assessment Proposed Installation of Mechanical Plant	
Project Address:	6 Lincolns Inn Field London WC2A 3BP
Project Reference:	102328

Issue/Revision Record			
Issue:	**Date:**	**Remarks:**	**Author:**
1	02/11/2012	First Issue	Andy Dodd
2	29/11/2012	Second Issue	Andy Dodd
3	04/12/2012	Third Issue	Andy Dodd

	Signature:	Print:	Title:	Date:
Author:		**Andy Dodd**	**Consultant**	**04/12/2012**
Reviewer:		**Phil Huffer**	**Principal Consultant**	**04/12/2012**

1. INTRODUCTION

1.1 Acoustics Plus Ltd (APL) is an independent firm of multi-disciplinary acoustic engineers. APL is engaged by both private and public sector clients. 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 M&E Consultant, The Kut Partnership, to consider and advise upon the noise implications of retaining an installation of mechanical plant.

1.3 It is understood that the property features a climate control system. The external condenser units associated with this system are located on the roof area of the site:

1.4 It is understood the Local Planning Authority (LPA) require further information on noise levels from the installation in order to fully assess the noise impact upon the surrounding neighbourhood. 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 6 Lincolns Inn Field, London, WC2A 3BP.

2.2 The property is a five storey mid-terrace house overlooking the north side of Lincoln's Inn Fields and backing onto Whetstone Park.

2.3 The roof of the main building at the front of the site comprises a double hip roof with the valley running east/west. The three air conditioning units shown in the photograph below all face north and the photo is taken looking westwards.

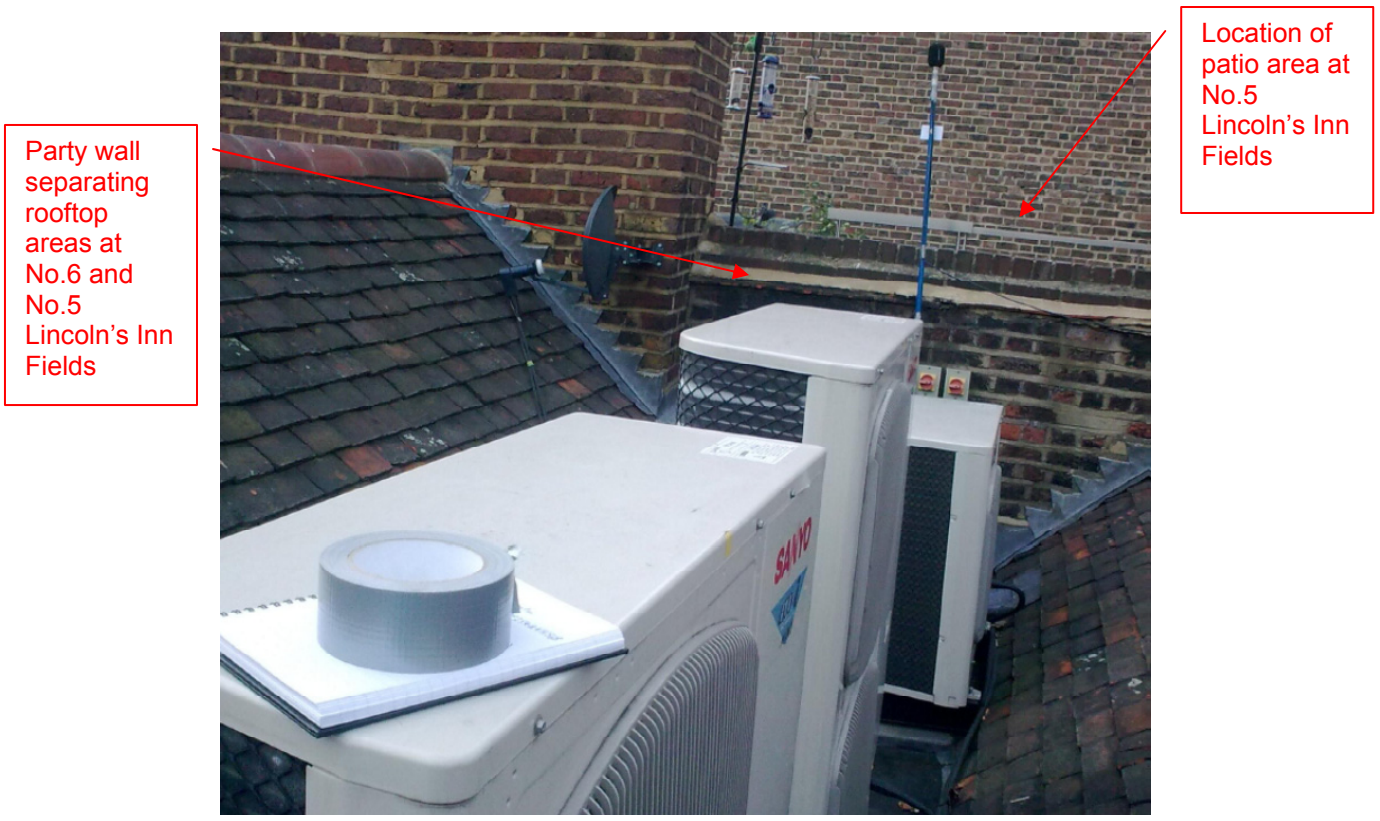
2.4 The nearest noise sensitive façade to the installed units is a flat rooftop patio area located at 5 Lincoln's Inn Fields with no windows in the vicinity of the air conditioning units at 6 Lincoln's Inn Fields.

2.5 The distance to the nearest noise sensitive amenity area in relation to the installed mechanical plant was determined from a drawing provided by The KUT Partnership and reported to be between 1m and 2.4m.

3. NOISE OUTLINE

3.1 In order to produce an environmental noise assessment, consideration must be given to the locality of the installation.

3.2 Measurements of background noise were obtained over a 24 hour period at a location deemed representative of background noise levels experienced at the nearest noise sensitive patio. Measurements were obtained at the line of the party wall separating the roof area of 6 Lincoln's Inn Field and the flat roof patio area of 5 Lincoln's Inn Field. The location of the measurement position can be seen in the photo below:



3.3 The particulars of the measurement exercise are recorded below:

Date:	7th – 8th March 2012
Location:	Roof level of 6 Lincoln's Inn Fields
Weather:	Light wind, no precipitation.

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

L_{90} percentile level (dB re 20μPa) at 60 minute intervals

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

3.6 For the sake of clarity, the lowest measured background noise over the anticipated operational hours of the mechanical plant is highlighted. As the mechanical plant will be utilised by residential accommodation, it is anticipated that the operational hours will be on a demand basis during any given 24hr period but as the nearest noise sensitive consideration is for a outside amenity space, the daytime hours between 07:00 and 23:00 will be considered as being noise sensitive.

3.7 The noise level of the proposed units was established from the data sheets provided (Appendix A) as follows:

(a) 1No. Sanyo SPW-CR254GVH56B L_p 49dBA @ 1m
(b) 2No.Sanyo SPW-CR485GXH56B L_p 51dBA @ 1m (each)

3.8 Octave band information for the condenser units was not available from the manufacturer; calculations were made using the published broadband noise output.

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

3.10 The relevant planning policy for the retention of the mechanical plant installation is Policy DP28 of the Council's Local Development Framework; noise limits not to be exceeded are set out in Table E of DP28 which is reproduced as Table 1 below:

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 façade.	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 façade.	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	55dBL_{Aeq}

Table 1

3.11 With regard to the noise impact of retaining the installation of mechanical plant, limiting plant noise emissions to 10dB below background noise levels at the nearest noise sensitive amenity area would fulfil the requirements of the LPA.

4. EQUIPMENT

4.1 All measurements were obtained using the following equipment:

- 01dB-Stell Solo data logging sound level meter (Solo 3)
  Serial No 10712
- 01dB-Stell PRE21S microphone preamplifier
  Serial No. 11447
- 01dB-METRAVIB CAL 21 sound calibrator (CAL21 C)
  Serial No. 51031263

4.2 The relevant equipment carries full and current traceable calibration. 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 the climate control system, consideration has been given to noise egress from the roof mounted condenser units.

5.2 A prediction exercise was undertaken. The calculation exercise utilised information provided by Sanyo HVAC (copy of the data sheets are provided in Appendix A).

5.3 The total attenuation was calculated by considering distance attenuation from the location of the units to the noise sensitive amenity space. Given the location of the units against one reflecting plane (roof), a correction factor of +3dB was applied.

5.4 Noise leaving each condenser unit was propagated to the noise sensitive patio using point source propagation. The distance from the location of the units to the noise sensitive amenity area was determined from measurements obtained from a sketch provided by the Kut Partnership and reported to be between 1m - 2.4m

5.5 The calculation exercise provided the following results:

Source	L_p dBA
1No. Sanyo SPW-CR485GXH56B	51
Correction	+3
Distance attenuation	-8 [$20Log_{10}(2.4)$]
Level at noise sensitive amenity space	**46** [51+3-8]

Table 2

Source	L_p dBA
1No. Sanyo SPW-CR485GXH56B	51
Correction	+3
Distance attenuation	-4 [$20Log_{10}(1.6)$]
Level at noise sensitive amenity space	**50** [51+3-4]

Table 3

Source	L_p dBA
1No. Sanyo SPW-CR254GVH56B	49
Correction	+3
Distance attenuation	-0 [$20Log_{10}(1)$]
Level at noise sensitive amenity space	**52** [52+3-0]

Table 4

Source(s)	L_p dBA
All units combined at noise sensitive amenity space	**55** [$10Log\ (10^{4.6}+10^{5.0}+10^{5.2})$]

Table 5

5.6 In order to comply with the requirements of the LPA, any noise from the retained use of three air condensing units should not exceed a level of 36 dBA (10dB below the lowest measured background noise during daytime hours (07:00 to 23:00) when the outside amenity space may be used.

5.7 The lowest measured background noise was $L_{A90,60min}$ 46dB that occurred during the periods 22:00hrs and 23:00hrs on 7th March 2012.

6. CONCLUSION

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

6.2 Given the location of the condensing units, consideration could be given to locating the units within an Environ acoustic enclosure, the egress of noise from the condensing units through the acoustic enclosure to the noise sensitive façade adjacent to the site has been considered. The distances from the proposed acoustic enclosures to the noise sensitive amenity area were determined as 1m, 2m and 3m. The location of the proposed acoustic enclosures is detailed in diagram 1 below and the full layout proposal drawings are shown in Appendix C:

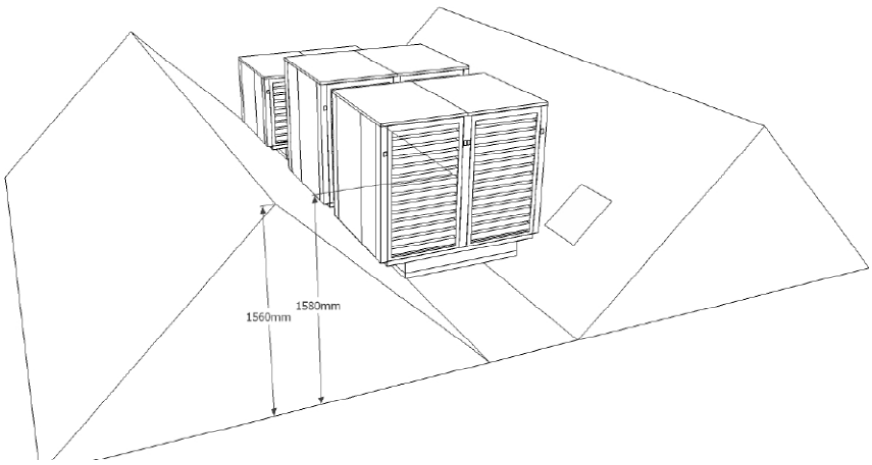


Diagram1

6.3 The total attenuation was calculated by applying a correction factor of +3dB to account for the reflective plane from the location of the enclosed units (roof) within the valley of roof area of the site.

6.4 In considering the propagation of noise from the condensers, consideration was given to stated performance of the acoustic enclosures provided by Environ:

environlouvermax30 TF2SP5 **26 November 2012**

Acoustic enclosures for Split AC/CU units with Low Air Flow

CUSTOMER:	SITE / LOCATION / REFERENCE
KUT	6 Lincoln Inn Fields

ORIGINAL EQUIPMENT MANUFACTURERS PUBLISHED DATA

MAKE, MODEL, DIMENSIONS, AIR FLOW & SOUND PRESSURE LEVEL @1.0M FREE FIELD

MAKE	MODEL	AIR IN	AIR OUT
Sanyo	SPW CR254GXH56B	Rear & 1 Side	Front

WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)	AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)
940	340	780	0.95	1	49

INNER CUBE DIMENSION		
1400	1150	870
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
0.95	1.0	49
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)

ENCLOSURE DETAIL		
1450	1200	945
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
1.0	1.0	29
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)

INLET AIRWAYS		
525	25	18
WIDTH (MM)	HEIGHT (MM)	3

DESIGN CRITERIA		
OK	OK	OK
UNIT SIZE	OUTLET	INLET

OUTLET AIRWAYS		
525	25	18
WIDTH (MM)	HEIGHT (MM)	NO.

AIRFLOW INFORMATION		
19	4.0	4.0
PD (NM^{-2})	OUTLET (MS^{-1})	INLET (MS^{-1})

Select Inlet & Outlet Duct Sizes to Ensure Airflows are kept Below 6.0m/s

QUOTE INFORMATION	WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
INLET AIRWAY			
OUTLET AIRWAY			
EXTERNAL SIZE	1450	1200	945
NOISE LEVEL @ 1 M	29	SPL dB(A) SOUND PRESSURE	

CUSTOMER:	SITE / LOCATION / REFERENCE
KUT	6 Lincoln Inn Fields

ORIGINAL EQUIPMENT MANUFACTURERS PUBLISHED DATA

MAKE, MODEL, DIMENSIONS, AIR FLOW & SOUND PRESSURE LEVEL @1.0M FREE FIELD

MAKE	MODEL	AIR IN	AIR OUT
Sanyo	SPW CR485GXH56B	Rear & 1 Side	Front

WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)	AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)
940	340	1230	1.67	1	51

INNER CUBE DIMENSION		
1400	1150	1350
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
1.67	1.0	51
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)

ENCLOSURE DETAIL		
1450	1200	1425
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
1.7	1.0	31
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)

INLET AIRWAYS		
525	25	30
WIDTH (MM)	HEIGHT (MM)	3

DESIGN CRITERIA		
OK	OK	OK
UNIT SIZE	OUTLET	INLET

OUTLET AIRWAYS		
525	25	30
WIDTH (MM)	HEIGHT (MM)	NO.

AIRFLOW INFORMATION		
21	4.2	4.2
PD (NM^{-2})	OUTLET (MS^{-1})	INLET (MS^{-1})

Select Inlet & Outlet Duct Sizes to Ensure Airflows are kept Below 6.0m/s

QUOTE INFORMATION	WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
INLET AIRWAY			
OUTLET AIRWAY			
EXTERNAL SIZE	1450	1200	1425
NOISE LEVEL @ 1 M	31	SPL dB(A) SOUND PRESSURE	

6.5 The mitigation calculation exercise can be shown as follows:

Source	L_p dBA
1No. Sanyo SPW-CR254GVH56B within enclosure	29
Correction – reflecting plane	+3
Distance attenuation	-0 [$20Log_{10}(1)$]
Level at noise sensitive amenity space	**32** [29+3-0]

Table 6

Source	L_p dBA
1No. Sanyo SPW-CR485GXH56B within enclosure	31
Correction – reflecting plane	+3
Distance attenuation	-6 [$20Log_{10}(2)$]
Level at noise sensitive amenity space	**28** [31+3-6]

Table 7

Source	L_p dBA
1No. Sanyo SPW-CR485GXH56B within enclosure	31
Correction – reflecting plane	+3
Distance attenuation	- 10 [$20Log_{10}(3)$]
Level at noise sensitive amenity space	**24** [31+3-10]

Table 8

Source(s)	L_p dBA
All units combined at noise sensitive amenity space	**34** [$10Log\ (10^{3.2}+10^{2.8}+10^{2.4})$]

Table 9

6.6 In order to comply with the requirements of the LPA, any noise from the retained use of three air condensing units should not exceed a level of 36 dBA (10dB below the lowest measured background noise during daytime hours (07:00 to 23:00) when the outside amenity space may be used.

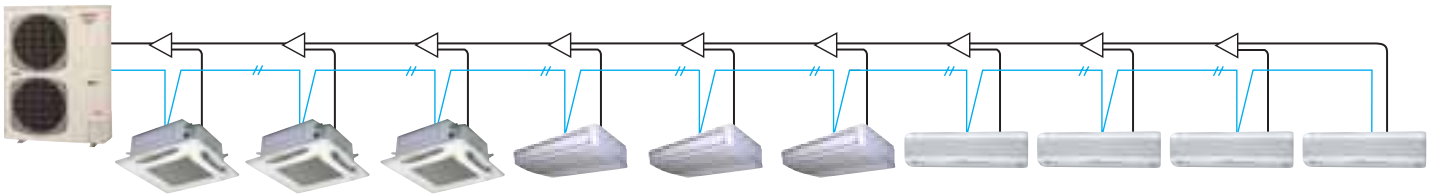
6.7 The lowest considered background noise was $L_{A90,60min}$ 46dB that occurred during the periods 22:00hrs and 23:00hrs on 7th March 2012.

6.8 Alternative providers of ready made acoustic enclosures could also be considered but the acoustic performance of any alternative enclosure or louvre should be checked before installing.

6.9 By utilising the considered mitigation measure solution suggested, the expected noise level at the nearest noise sensitive façade will comply with the requirements imposed by the LPA.

Appendix A

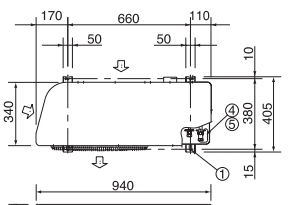
Up to 10 indoor units per system



HP				4		5		6	
Model name				SPW-CR365GXH56B/SPW-CR365GXH8B		SPW-CR485GXH56B/SPW-CR485GXH8B		SPW-CR605GXH56B/SPW-CR605GXH8B	
Power supply				230V, 1 phase, 50/60Hz/400, 3 phase, 50/60Hz					
Cooling capacity			kW	11.20		14.00		15.50	
Heating capacity			kW	12.50		16.00		17.60	
EER cooling				4.06		3.66		3.39	
COP heating				4.34		4.10		3.84	
Electric rating	Cooling	Running current/AMPs	A	14.1/4.52		19.9/6.13		23.4/7.19	
		Power input	kW	2.76		3.83		4.57	
	Heating	Running current/AMPs	A	14.1/4.52		19.9/6.13		23.4/7.19	
		Power input	kW	2.88		3.90		4.58	
Recommended fuse size (motor rated)				16	16	16	16	16	16
Dimensions (H/W/D)			mm	1230x940x340					
Net weight			kg	104					
Air circulation			m^3/min	100					
Refrigerant amount at shipment			kg	3.5					
Piping connection		Gas	Inches	5/8		5/8		3/4	
		Liquid	Inches	3/8		3/8		3/8	
Operating sound normal mode			dB(A)	51.0		51.0		52.0	
Quiet mode			dB(A)	48.0		48.0		49.0	
Maximum number of indoor units				6		8		9	

Dimensions

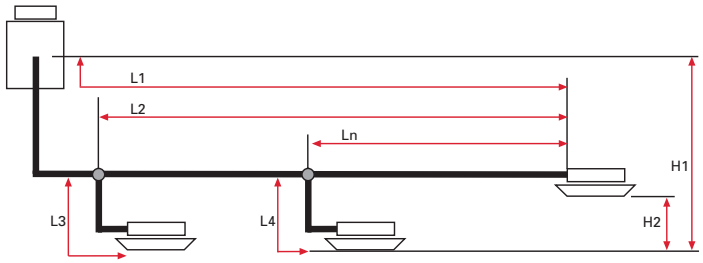
Dimension : mm



①	Hole for anchor bolt (4-R6.6) / Anchor bolt M10
②	Refrigerant tube joint (liquid line tube) Flare connection 3/8 in
③	Refrigerant tube joint (liquid line tube) Flare connection 3/8 in and 3/4 in for the larger model
④	Refrigerant tubing inlet (knock-out hole)
⑤	Power supply unit (knock-out hole ø38, ø29, ø19, ø16mm)

Flexible pipework design

Category	Item	Description		Max length (m)
Allowable pipework length	L1	Maximum pipe run	Actual pipe length	150
			Equivalent pipe length	175
	L2- L3	Difference between maximum length and minimum length from the first distribution joint		40
	L3 L4 Ln	Maximum length of each distribution point		30
	L1+L3+L4	Maximum total pipe run length		200
Allowable height difference	H1	When outdoor installed higher		50
		When outdoor installed lower		40
	H2			15



Rating Conditions: Cooling Indoor 27°C DB 19°C WB Outdoor 35°C DB 24°C WB Heating Indoor 20°C DB Outdoor 7°C DB 6°C WB

OUTDOOR UNIT

- High efficient operation is achieved by using DC inverter technology on twin-rotary compresoor & fan motor for all units.
- Wide capacity range from 2HP to 10HP with 4 types of systems.

Elite line up ~ High efficient performance

HP		2	3	4	5	6
Class		18	25	36	48	60
Elite PAC i DC Inverter Unit appearance						
1 phase model (220-240V, 50/60Hz)		SPW-C186VEH	SPW-C256VEH	SPW-C366VEH	SPW-C486VEH	SPW-C606VEH
Dimension (H x L x D)	mm	569 x 790 x 285	780 x 940 x 340	1330 x 940 x 340	1330 x 940 x 340	1330 x 940 x 340
Weight	kg	41	54	90	95	95
Power input (Cool/Heat)	kW	1.26 / 1.41	1.91 / 2.12	2.43 / 2.74	3.47 / 3.57	4.27 / 4.44
Operating sound (SPL) (Cool/Heat)	dB(A)	46 / 47	46 / 48	52 / 53	53 / 54	54 / 56
Max. tubing length	m	40	50	70	70	70
Tubing size	mm	6.35 / 12.7	9.52 / 15.88	9.52 / 15.88	9.52 / 15.88	9.52 / 15.88

Standard line up ~ Standard performance with Single & Three phase power supply

HP		2	3	4	5	6
Class		18	25	36	48	60
PAC i DC Inverter Unit appearance						
1 phase model (220-240V, 50/60Hz)		SPW-CR184GVH56B	SPW-CR254GVH56B	SPW-CR364GVH56B	SPW-CR484GVH56C	SPW-CR604GVH56C
3 phase model (380-415V, 50Hz)		——	SPW-CR254GVH8B	SPW-CR364GVH8B	SPW-CR484GVH8B	SPW-CR604GVH8B
Dimension (H x L x D)	mm	565 x 790 x 285	780 x 940 x 340	780 x 940 x 340	1230 x 940 x 340	1230 x 940 x 340
Weight	kg	40	58	65	97(1ph) / 100(3ph)	97(1ph) / 100(3ph)
Power input (Cool/Heat)	kW	1.41 / 1.40	2.09 / 2.04	3.05 / 2.90	3.76 / 3.74	4.43 / 4.59
Operating sound (SPL) (Cool/Heat)	dB(A)	47 / 49	47 / 49	51 / 52	52 / 53	54 / 56
Max. tubing length	m	40	50	50	50	50
Tubing size	mm	6.35 / 12.7	9.52 / 15.88	9.52 / 15.88	9.52 / 15.88	9.52 / 15.88

Classic line up ~ Compact & Light weight / Big line up ~ Compact & Comfort

HP		3	4	5	5	6
Class		25	36	48	48	60
Classic PAC i DC Inverter Unit appearance					Big PAC i DC Inverter	
					3 phase model (380-415V, 50Hz)	
1 phase model (220-240V, 50/60Hz)		SPW-C256VH	SPW-C366VH	SPW-C486VH	SPW-C706VH8	SPW-C906VH8
Dimension (H x L x D)	mm	569 x 790 x 285	780 x 940 x 340	910 x 940 x 340	1526 x 940 x 340	1526 x 940 x 340
Weight	kg	41	58	71	118	128
Power input (Cool/Heat)	kW	2.15 / 2.31	3.33 / 3.33	4.35 / 4.13	5.94 / 5.84	7.61 / 7.31
Operating sound (SPL) (Cool/Heat)	dB(A)	48 / 50	50 / 52	51 / 54	57 / 57	57 / 58
Max. tubing length	m	50	50	50	100	100
Tubing size	mm	9.52 / 15.88	9.52 / 15.88	9.52 / 15.88	9.52 / 25.4	12.7 / 25.4

*Electric specification data show the value only for the outdoor unit in the case of 4way cassette combination.

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SELECTION MATRIX

environlouvermax30 TF2SP5

26 November 2012

Acoustic enclosures for Split AC/CU units with Low Air Flow

CUSTOMER:	SITE / LOCATION / REFERENCE
KUT	6 Lincoln Inn Fields

ORIGINAL EQUIPMENT MANUFACTURERS PUBLISHED DATA

MAKE, MODEL, DIMENSIONS, AIR FLOW & SOUND PRESSURE LEVEL @1.0M FREE FIELD

MAKE	MODEL	AIR IN	AIR OUT
Sanyo	SPW CR254GXH56B	Rear & 1 Side	Front

WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)	AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)
940	340	780	0.95	1	49

INNER CUBE DIMENSION		
1400	1150	870
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
0.95	1.0	49
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)

ENCLOSURE DETAIL		
1450	1200	945
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
1.0	1.0	29
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)

INLET AIRWAYS		
525	25	18
WIDTH (MM)	HEIGHT (MM)	3

DESIGN CRITERIA		
OK	OK	OK
UNIT SIZE	OUTLET	INLET

OUTLET AIRWAYS		
525	25	18
WIDTH (MM)	HEIGHT (MM)	NO.

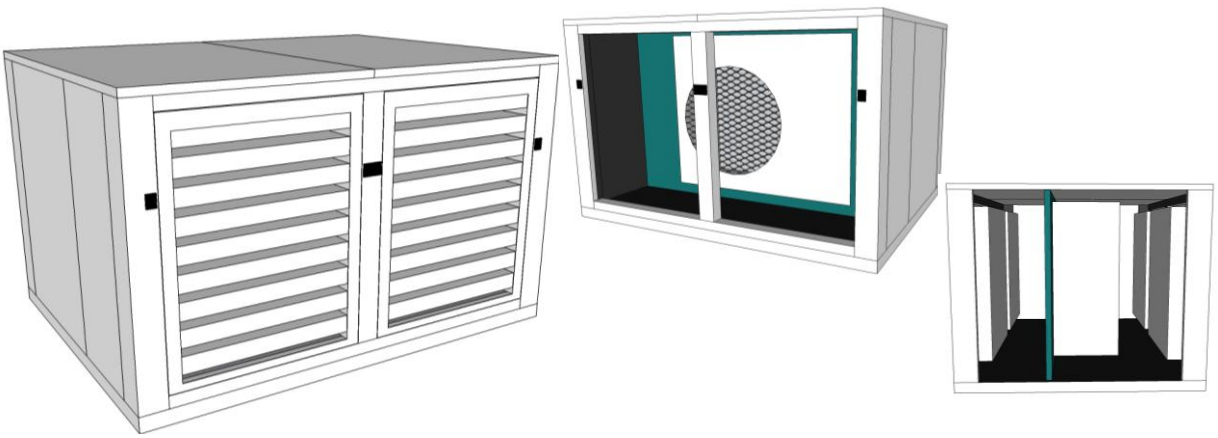
AIRFLOW INFORMATION		
19	4.0	4.0
PD (NM^{-2})	OUTLET (MS^{-1})	INLET (MS^{-1})

Select Inlet & Outlet Duct Sizes to Ensure Airflows are kept Below 6.0m/s

QUOTE INFORMATION	WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
INLET AIRWAY			
OUTLET AIRWAY			
EXTERNAL SIZE	1450	1200	945
NOISE LEVEL @ 1 M	29	SPL dB(A) SOUND PRESSURE	

NOTES CONCERNING ENCLOSURE DESIGN

Internal Plenum Seal to stop air recirculation
LouverMax Panels Removable for Maintenance/Service Access
Door Mullions Removable for CDM Access Compliance
Estimated Air Flow



environ™ Acoustic Enclosures

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SELECTION MATRIX

environlouvermax30 TF2SP4

26 November 2012

Acoustic enclosures for Split AC/CU units with Low Air Flow

CUSTOMER:	SITE / LOCATION / REFERENCE
KUT	6 Lincoln Inn Fields

ORIGINAL EQUIPMENT MANUFACTURERS PUBLISHED DATA

MAKE, MODEL, DIMENSIONS, AIR FLOW & SOUND PRESSURE LEVEL @1.0M FREE FIELD

MAKE	MODEL	AIR IN	AIR OUT
Sanyo	SPW CR485GXH56B	Rear & 1 Side	Front

WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)	AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)
940	340	1230	1.67	1	51

INNER CUBE DIMENSION		
1400	1150	1350
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
1.67	1.0	51
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)

ENCLOSURE DETAIL		
1450	1200	1425
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
1.7	1.0	31
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)

INLET AIRWAYS		
525	25	30
WIDTH (MM)	HEIGHT (MM)	3

DESIGN CRITERIA		
OK	OK	OK
UNIT SIZE	OUTLET	INLET

OUTLET AIRWAYS		
525	25	30
WIDTH (MM)	HEIGHT (MM)	NO.

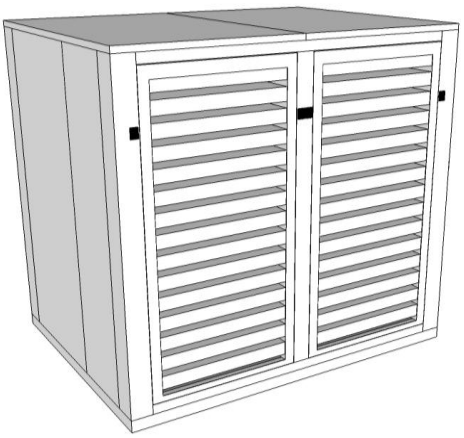
AIRFLOW INFORMATION		
21	4.2	4.2
PD (NM^{-2})	OUTLET (MS^{-1})	INLET (MS^{-1})

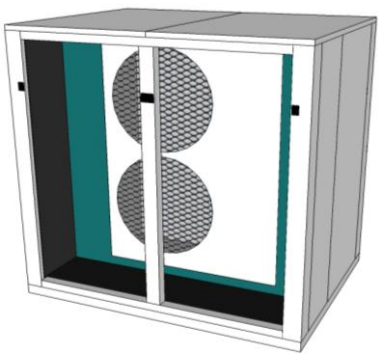
Select Inlet & Outlet Duct Sizes to Ensure Airflows are kept Below 6.0m/s

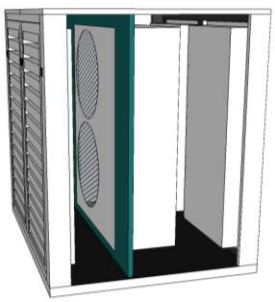
QUOTE INFORMATION	WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
INLET AIRWAY			
OUTLET AIRWAY			
EXTERNAL SIZE	1450	1200	1425
NOISE LEVEL @ 1 M	31	SPL dB(A) SOUND PRESSURE	

NOTES CONCERNING ENCLOSURE DESIGN

Internal Plenum Seal to stop air recirculation
LouverMax Panels Removable for Maintenance/Service Access
Door Mullions Removable for CDM Access Compliance





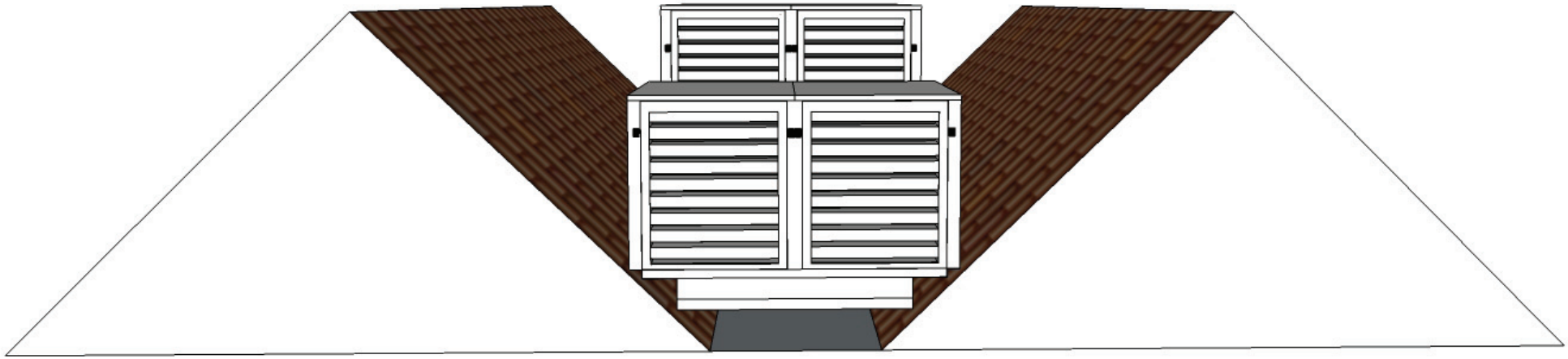


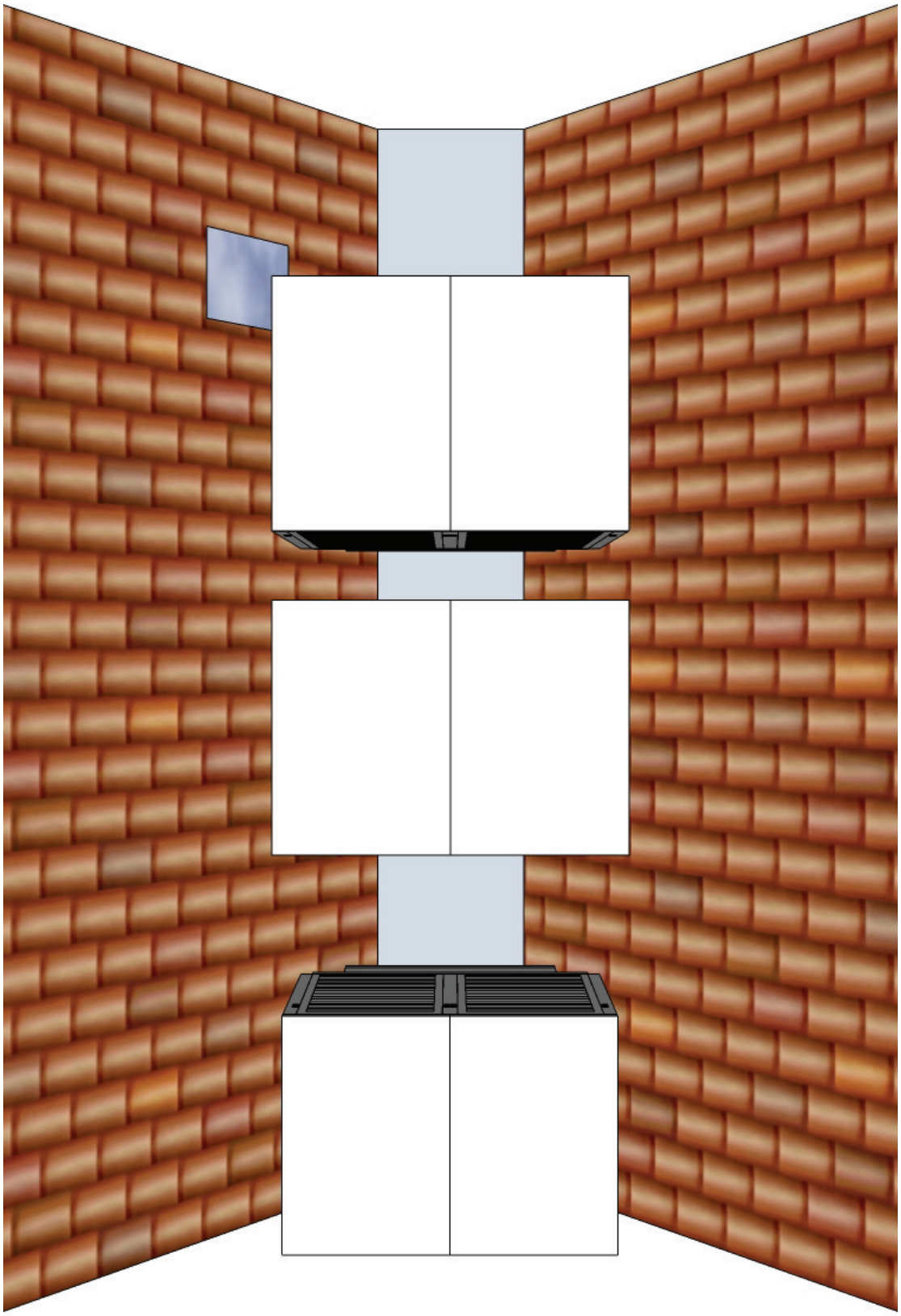
Appendix B

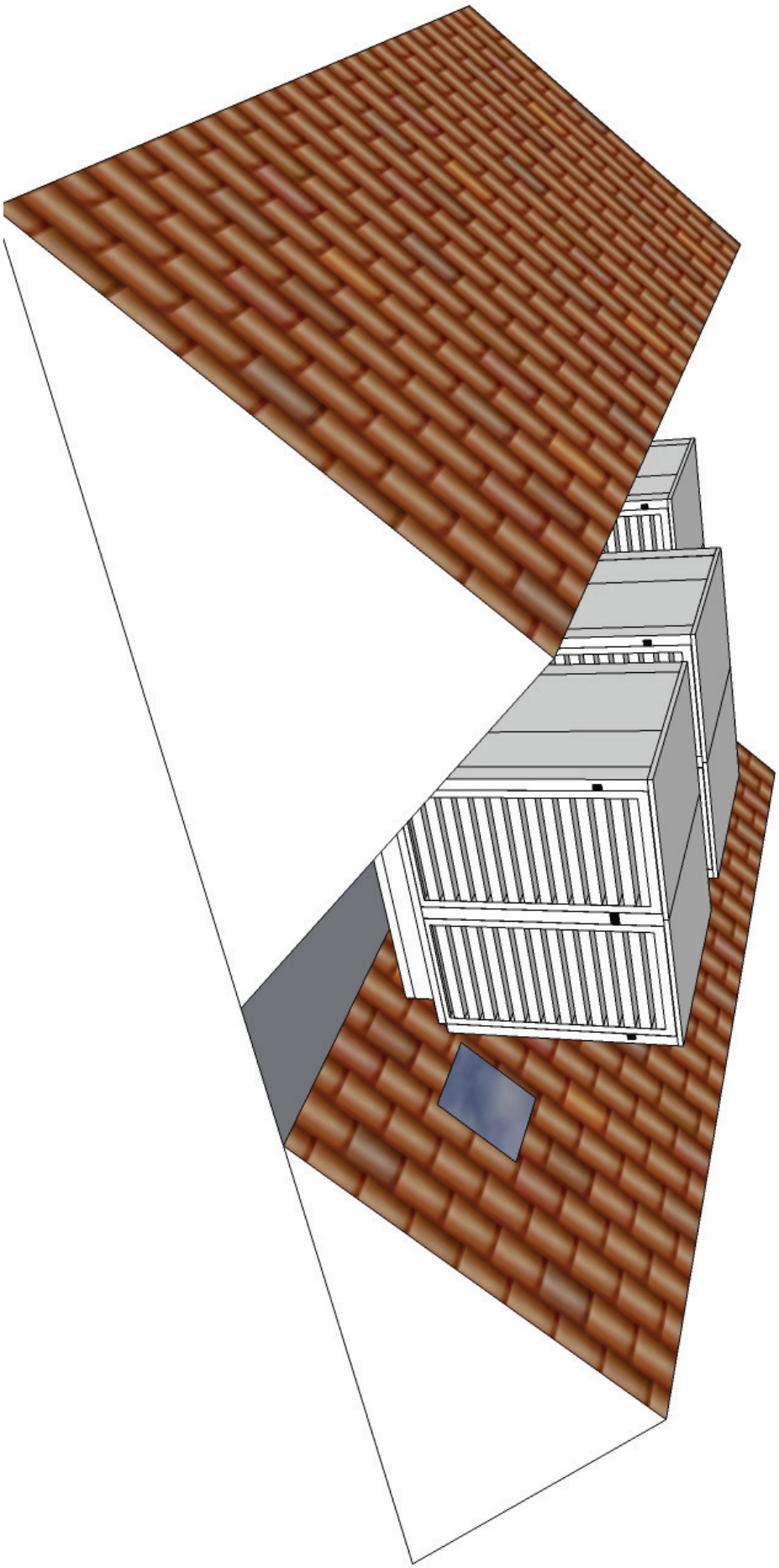
Background noise measurements at roof of 6 Lincoln's Inn Fields, London, WC2A3BP

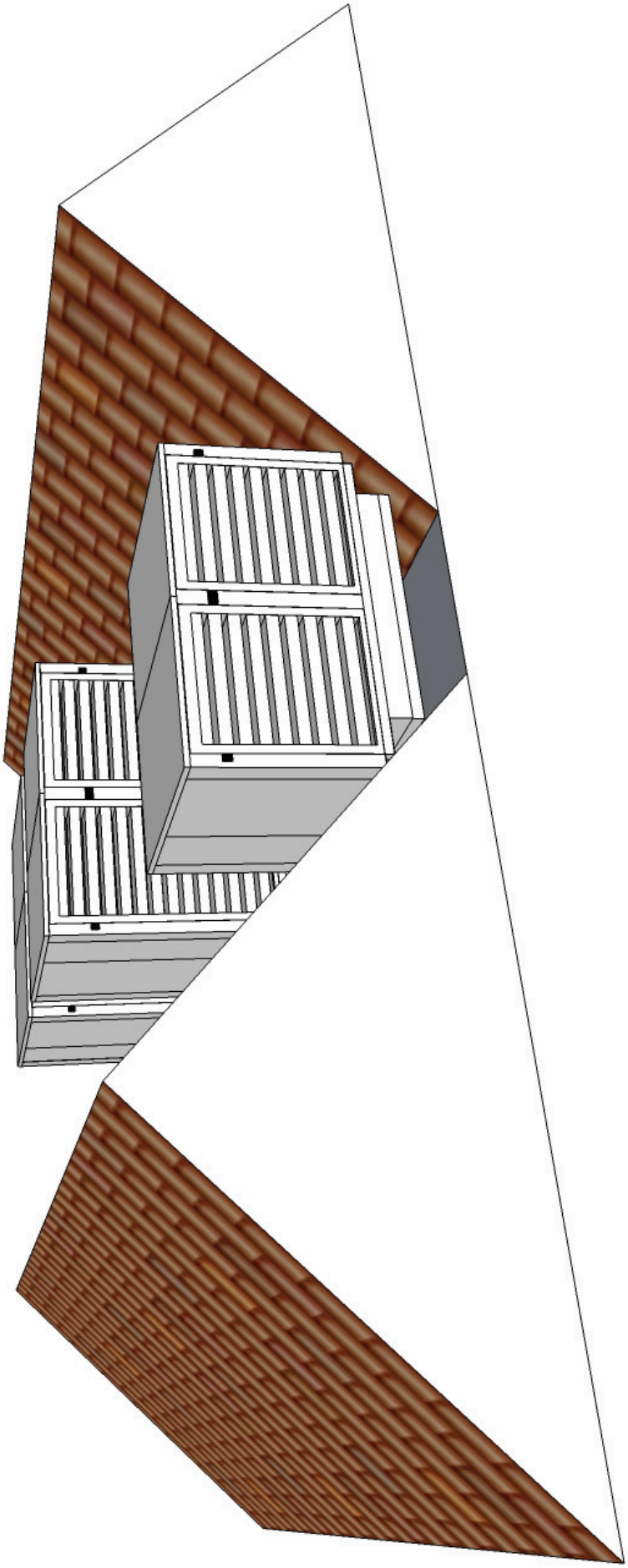
Date	Start	Laeq,1h	LAFmax	Lamin	LA90,1h	LA50,1h	LA10,1h
07/03/2012	17:00	55	69	49	51	54	58
07/03/2012	18:00	52	68	47	49	51	54
07/03/2012	19:00	50	63	47	48	50	52
07/03/2012	20:00	50	65	46	47	49	51
07/03/2012	21:00	50	70	46	47	48	50
07/03/2012	22:00	52	78	45	**46**	47	50
07/03/2012	23:00	47	61	43	45	46	48
08/03/2012	00:00	46	56	44	45	46	47
08/03/2012	01:00	46	70	44	**44**	45	46
08/03/2012	02:00	45	58	43	44	45	46
08/03/2012	03:00	47	60	44	44	45	48
08/03/2012	04:00	48	67	44	45	47	51
08/03/2012	05:00	50	70	46	47	48	51
08/03/2012	06:00	51	74	46	48	49	52
08/03/2012	07:00	55	74	48	50	53	57
08/03/2012	08:00	58	76	50	53	55	59
08/03/2012	09:00	59	76	51	54	57	62
08/03/2012	10:00	57	73	48	52	54	59
08/03/2012	11:00	55	76	49	51	53	57
08/03/2012	12:00	56	72	50	52	55	59
08/03/2012	13:00	56	71	49	52	54	58
08/03/2012	14:00	54	72	48	50	52	57
08/03/2012	15:00	55	72	48	51	53	57
08/03/2012	16:00	58	78	49	52	54	60

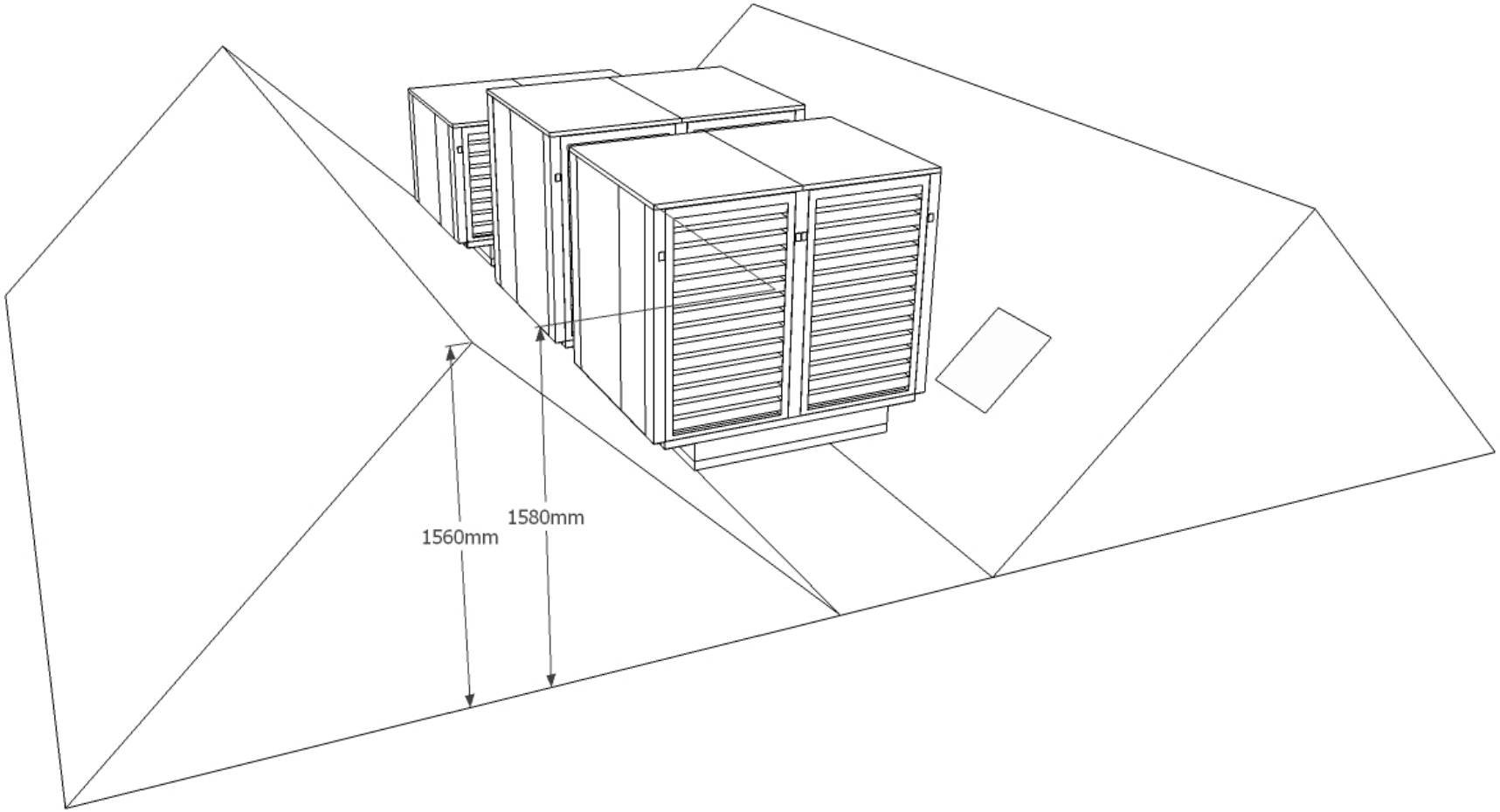
Appendix C










1560mm
1580mm