Project: J 01604
AC Noise Impact Assessment:
116 – 134 Bayham Street

Consultants: Sound Planning Ltd
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Client: Paul Knapfield

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Signed:

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CONTENTS

1.0 BACKGROUND

1.1 Planning permission is sought for the relocation of existing external AC equipment.

1.2 The external AC units are to be relocated to the floor above increasing the distance away from the nearest noise sensitive residential receivers to adjacent properties.

1.3 The development location falls under the jurisdiction of The London Borough of Camden (LBC); LBC has specific requirements for applications of this nature:

1.3.1 Disturbance from plant and machinery[1]

The Council will only grant planning permission for plant or machinery, including ventilation or air handling equipment, if it can be operated without causing a loss to local amenity and does not exceed the thresholds set out in Appendix 1 - Noise and Vibration (Table E)[2].

1.4 Planning Application - Requirements[3]:

In determining whether a proposal may be acceptable, the Council will require planning applications to include details of all proposed plant and machinery associated with a development, including an acoustic report. This may require close co-operation between an environmental or air handling engineer and the architect to agree an acceptable design solution for the particular premises and uses for which the system is designed.

1.5 The air conditioning systems serve commercial offices within the building but may be operational at any time during a 24 hour period.

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[1] London Borough of Camden Replacement Unitary Development Plan Adopted June 2006.
[2] See paragraph 2.1 ASSESSMENT CRITERIA.
[3] London Borough of Camden Replacement Unitary Development Plan Adopted June 2006 – SD8 – Disturbance.

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2.0 ASSESSMENT CRITERIA

2.1 Camden Replacement Unitary Development Plan (UDP)

2.1.1 *The Council will only grant planning permission for plant or machinery, including ventilation or air handling equipment, if it can be operated without causing a loss to local amenity and does not exceed the thresholds set out in Appendix 1 - Noise and Vibration (Table E).*

2.1.2 Noise levels from plant and machinery at which planning permission will <u>not</u> be granted[4].

Noise description and location of measurement	Period	Time (hours)	Noise Level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000 - 2400	5dB(A) $< L_{A90}$
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) $< L_{A90}$
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) $< L_{A90}$
Noise at 1 metre external to a sensitive façade where $L_{A90} > 60$dB	Day, evening and night	0000 - 2400	55dB L_{Aeq}

[4] Camden Replacement Unitary Development Plan. Appendix 1 – Noise and Vibration Thresholds.

3.0 METHODOLOGY

3.1 Background Noise Assessment

3.1.1 The background noise assessment was conducted over a 24 hour period from 15:45 hours Monday 21st October to 16:45 hours Tuesday 22nd October, 2013.

3.1.2 Measurements were undertaken in accordance with BS 7445[5] and BS 4142[6]. The sound level meter was Type 1 – details provided in 3.3.1.

3.1.3 The microphone was positioned on a 1st floor gantry to the rear of the building screened from the road in a position representative of the nearest residential windows. Se APPENDIX 4 – Site Photographs.

3.1.4 The A-weighted L_{90}, L_{eq} and L_{max} parameters were measured using the Fast (F) setting, and logged periodically every 5 minutes.

3.1.5 The nearest windows belong to residential dwellings to the adjacent buildings.

3.2 Equipment Noise Assessment

3.2.1 All calculations will utilise the manufacturers' sound power level (SWL) data.

3.2.2 The noise level at the nearest noise sensitive receivers (NSR's) will be calculated using the formula: $SPL_{receiver} = SWL – 20log_r – 11 + DI$[7].

Where 'r' = radius; SPL = Sound Pressure Level; *SWL = Sound Power Level*

3.2.3 Directionality corrections can be estimated by comparing fd/c with the angle of the noise source to the receiver[8].

3.2.4 Screening effects are based on Maekawa's formula, where the expected insertion loss the barrier is the function of the Fresnel number $(2.\delta/\lambda)$[9].

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[5] British Standard 7445-1: 2003 – *Description and measurement of environmental noise.* © BSI 1997. ISBN 0 580 19736 0.

[6] British Standard 4142: 1997 – *Method for rating industrial noise affecting mixed residential and industrial areas*. © BSI 1997. ISBN 0 580 28300 3.

[7] DI = Directivity Index.

[8] f = frequency; d = duct opening (m); and c = speed of sound 344m/s. Reference: Watson et al. *The Little Red Book of Acoustics*. BTA 2007.

[9] Attenborough, K. et al. *Predicting Outdoor Sound*. Copyright Taylor & Francis Group 2007.

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3.2.5 The resultant (combined) sound pressure level (SPL) will be compared to the measured background noise level in accordance with The London Borough of Camden's Unitary Development Plan.

3.3 Instrumentation

3.3.1 Sound Level Measurement Equipment

Equipment	Make	Model	Class	Serial Number	UKAS Calibration
SLM	Casella	CEL 490	1	128950	4877 (4/4/13)
Field Calibrator	Casella	CEL 110/1	1	077948	4875 (4/4/13)

3.3.2 The Sound Level Meter (SLM's) was field calibrated before and after the on-site noise assessments. No deviation was detected (1kHz). UKAS accredited calibration certificates are available on request.

3.3.3 Other Equipment

Equipment	Make	Model	Class	Serial Number	UKAS Calibration
Environmental Tripod					
Wind/Weather Shield					
Laser Measurer	Leica	Disto A5		1073750838	
Digital Camera	Sony				
Battery Kit	Casella				

4.0 RESULTS

4.1 Lowest Measured Background Noise Levels[10]

4.1.1 Office Hours 07:00 – 18:00: 46 dB L_{A90}

4.1.2 Daytime 07:00 – 23:00: 44 dB L_{A90}

4.1.3 Night Time 23:00 – 07:00: 40 dB L_{A90}

4.2 Manufacturer's Sound Pressure Level (SPL) Data

AREA	Manufacturer	Model	SPL @ 1m dB(A)	Notes
1 (NW)	Daikin	RXS60	49	
		RXS60	49	
		RY71	49	
		RZQ71	49	
		RZQ100	51	
		RSX8	57	
		RSX10	57	
		RSX10	57	
		RXYQ10	58	
		RXYQ10	58	
		Combined	65.1	
2 (SE)	Daikin	RXYQ18	63	
	Airedale	C11	60	40 dB(A) @ 10m
		C11	60	40 dB(A) @ 10m
		C11	60	40 dB(A) @ 10m
		C11	60	40 dB(A) @ 10m
		Combined	67.8	
TOTAL		**Area 1 + 2**	**70**	

[10] See APPENDIX 6 for full results.

5.0 CRIERIA ASSESSMENT

5.1 All external plant is to be relocated centrally within the new roof (1 floor higher); the plant will be equidistant between residential receivers at a minimum distance of 35m.

5.2 Noise Calculation

Combined Plant Level (1m):	70 dB L_{Aeq}
Distance Correction (35m):	70 – 20 log (35/1)
	= 39 dB L_{Aeq}
Screening Effect (Building):	-5 dB
Level at Residential Receivers:	34 dB L_{Aeq}
Lowest Background (night):	40 dB L_{A90}
Excess:	- 6 dB

6.0 NOISE MITIGATION

6.1 The proposed plant area is to be surrounded by an acoustic louvre screen – See APPENDIX 7 & 8.

6.2 Acoustic Louvre Screen

The acoustic louvre screen will provide a minimum (line of sight) noise reduction of 5 dB[11]; and acoustic louvre with a transmission loss of ≥ 15 dB R_w will not compromise this noise reduction.

6.3 The introduction of an acoustic louvre screen will result in a worst case (All plant switched on to full capacity during the quietest period during the night) of 11 dB below background.

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[11] The noise reduction provided depends on the path difference created – currently unknown. The actual noise reduction provided by the screen will exceed 5 dB if greater than 'line of sight'.

7.0 CONCLUSIONS

7.1 The lowest measured background level during the 24 hour monitoring period was 40 dB L_{A90} (night time).

7.2 The proposed combined plant noise level (all plant operational) at the new location without an acoustic louvre screen at the nearest residential window is 34 dB L_{Aeq}; 6 dB below the lowest measured night time background noise level.

7.3 Introduction of the proposed acoustic louvre screen results in a noise level at the nearest residential receivers of no higher than 29 dB L_{Aeq} – 11 dB below the lowest night time background noise level.

7.4 The proposed relocation including acoustic louvre screening should be granted permission in accordance with Camden's Replacement Unitary Development Plan – APPENDIX 1 – Noise and Vibration (Table E).

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APPENDIX 1

Glossary of Acoustic Terms

The Decibel, dB

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 2 x 10^{-5} pascals) and the threshold of pain is around 120 dB. The sound energy radiated by a source can also be expressed in decibels. The sound power is a measure of the total sound energy radiated by a source per second, in watts. The sound power level, L_w is expressed in decibels, referenced to 10^{-12} watts.

Frequency, Hz

Frequency is analogous to musical pitch. It depends upon the rate of vibration of the air molecules that transmit the sound and is measure as the number of cycles per second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is normally divided up into discrete bands. The most commonly used bands are octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency, and one-third octave bands, in which each octave band is divided into three. The bands are described by their centre frequency value and the ranges which are typically used for building acoustics purposes are 63 Hz to 4 kHz (octave bands) and 100 Hz to 3150 Hz (one-third octave bands).

Noise Rating

The Noise Rating (NR) system is a set of octave band sound pressure level curves used for specifying limiting values for building services noise. The Noise Criteria (NC) and Preferred Noise Criteria (PNC) systems are similar.

A-weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).

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Noise Descriptors

Where noise levels vary with time, it is necessary to express the results of a measurement over a period of time in statistical terms. Some commonly used descriptors follow.

$L_{Aeq, T}$ *The most widely applicable unit is the equivalent continuous A-weighted sound pressure level ($L_{Aeq, T}$). It is an energy average and is defined as the level of a notional sound which (over a defined period of time, T) would deliver the same A-weighted sound energy as the actual fluctuating sound.*

L_{AE} *Where the overall noise level over a given period is made up of individual noise events, the $L_{Aeq, T}$ can be predicted by measuring the noise of the individual noise events using the sound exposure level, L_{AE} (or SEL or L_{AX}). It is defined as the level that, if maintained constant for a period of one second, would deliver the same A-weighted sound energy as the actual noise event.*

L_{A1} *The level exceeded for 1% of the time is sometimes used to represent typical noise maxima.*

L_{A10} *The level exceeded for 10% of the time is often used to describe road traffic noise.*

L_{A90} *The level exceeded for 90% of the time is normally used to describe background noise.*

Sound Transmission Descriptors

D_{nT} Standardised level difference

$D_{nT, w}$ Weighted standardised level difference

L_1 The average sound pressure level in the source room

L_2 The average sound pressure level in the receiving room

T Reverberation time (receiving room)

T_0 Reference reverberation time = 0.5s

C_{tr} Adaption spectrum which takes account for low to medium speed road/rail/air traffic; disco music; and factory noise (medium to low frequency noise).

C Adaptation spectrum which takes account of domestic activities including speech, music, radio and television.

Frequency Analysis

Octave Band	*A band of frequencies the upper limit of which is twice the lower limit. They are known by their centre frequency, e.g., 63, 125, 250, 500, 1000, 2000 Hz…*
One Third Octave	*The logarithmic frequency interval between a lower frequency f_2, when f_2/f_1 equals $2^{1/3}$ apart. Frequencies include: 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000Hz.*

Sound Transmission in the Open Air

Most sources of sound can be characterised as a single point in space. The sound energy radiated is proportional to the surface area of a sphere centred on the point. The area of a sphere is proportional to the square of the radius, so the sound energy is inversely proportional to the square of the radius. This is the inverse square law.

In decibel terms, every time the distance from a point source is doubled, the sound pressure level is reduced by 6 dB. Road traffic noise is a notable exception to this rule, as it approximates to a line source, which is represented by the line of the road. The sound energy radiated is inversely proportional to the area of a cylinder centred on the line. In decibel terms, every time the distance from a line source is doubled, the sound pressure level is reduced by 3 dB.

Factors Affecting Sound Transmission in the Open Air

Reflection

When sound waves encounter a hard surface, such as concrete, brickwork, glass, timber or plasterboard, it is reflected from it. As a result, the sound pressure level measured immediately in front of a building façade is approximately 3 dB higher than it would be in the absence of the façade.

Screening and Diffraction

If a solid screen is introduced between a source and receiver, interrupting the sound path, a reduction in sound level is experienced. This reduction is limited, however, by diffraction of the sound energy at the edges of the screen. Screens can provide valuable noise attenuation however. For example, a timber boarded fence built next to a motorway can reduce noise levels on the land beyond, typically by around 10 dB(A). The best results are obtained when a screen is situated close to the source or close to the receiver.

Meteorological Effects

Temperature and wind gradients affect noise transmission, especially over large distances. The wind effects range from increasing the level by typically 2 dB downwind, to reducing it by typically 10 dB upwind – or even more in extreme conditions. Temperature and wind gradient are variable and difficult to predict.

APPENDIX 2

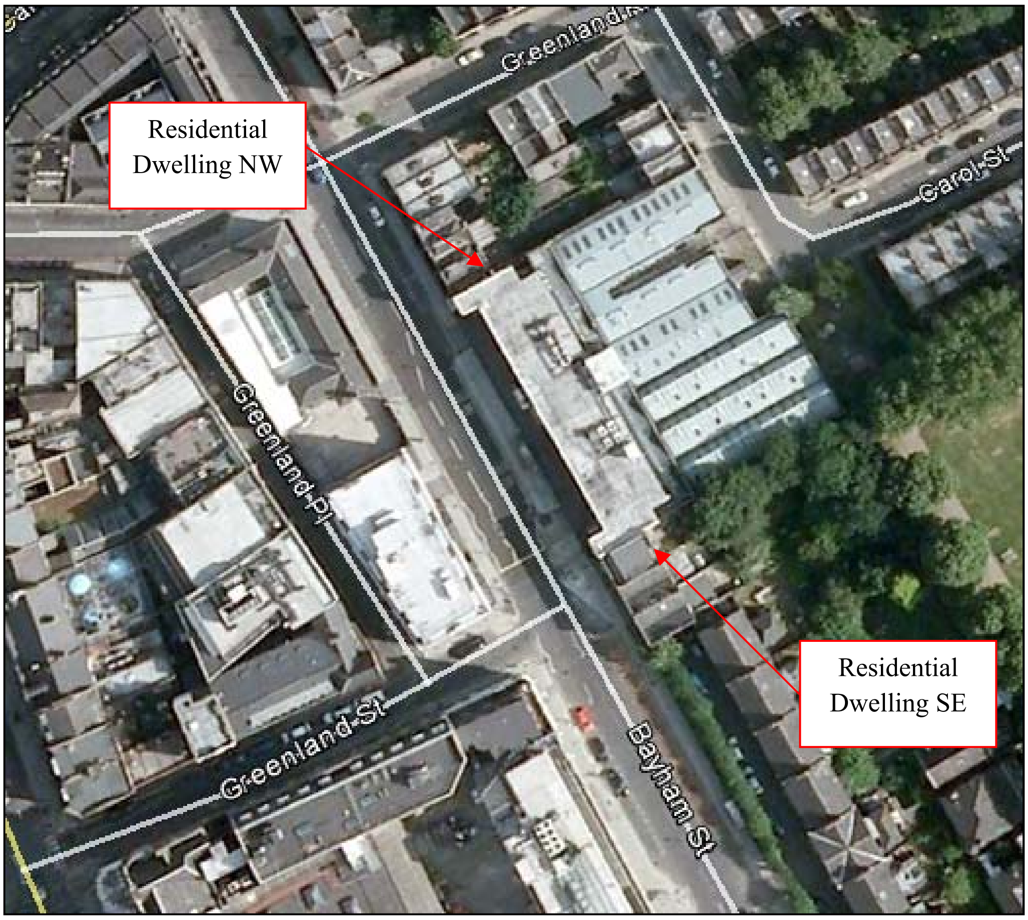
Site Location

116 – 134 Bayham Street, Camden

Existing Plant Location (Roof)

APPENDIX 3

Noise Sensitive Receivers



APPENDIX 4

Site Photographs

Microphone Position/Background Monitoring

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Site Photographs

Residential Receivers to NW

Roof Plant (NW)

Site Photographs

Roof Plant (SE)

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APPENDIX 5

Sound Data Sheets

RY71

Heat pump

Model			Indoor unit	FDYB35KAVE	FDYB50KAVE	FDYB60KAVE	FDYB71KAVE
			Outdoor unit	RY35FV1A	RY50GAV1A	RY60GAV1A	RY71LUV1, Y1
Power Supply				VE: 1 phase, 220-240 V/220 V, 50/60 Hz V1: 1 phase, 220-240 V, 50 Hz		VE: 1 phase, 220-240 V/220 V, 50/60 Hz V1: 1 phase, 220-240 V, 50 Hz Y1: 3 phase, 380-415 V, 50 Hz	
Cooling capacity (*1) (1)/(2)			kW	3.79/3.75	5.27/5.20	6.24/6.15	7.8/7.7
			Btu/h	12,900/12,800	18,000/17,800	21,300/21,000	26,600/26,200
			kcal/h	3,260/3,230	4,530/4,470	5,370/5,290	6,700/6,600
Heating capacity (*2)			kW	4.22	5.80	7.0	7.9
			Btu/h	14,400	19,800	23,900	27,000
			kcal/h	3,630	4,990	6,020	6,800
Power consumption	Cooling (*1) (1)/(2)		kW	1.51/1.50	2.01/2.00	2.38/2.36	3.08/3.08 (V1)/3.06/3.06 (Y1)
	Heating (*2)		kW	1.33	1.78	2.29	2.91 (V1)/2.88 (Y1)
Indoor unit	Air flow rate (H/L)		m³/min	13/11		18/15	
			cfm	460/388		635/529	
	Fan	Driving system		Direct drive (2 speed)			
	Sound level (H/L)		dBA	41/38		43/40	
	Dimensions (HxWxD)		mm	260x900x580		260x1,300x580	
	Weight		kg	22	23	31	
	Operation range	Cooling	°CWB	14 to 23			12 to 25
		Heating	°CDB	15 to 28			15 to 27
Outdoor unit	Compressor			Hermetically sealed rotary type			Hermetically sealed scroll type
	Motor output		kW	1.3	1.7	2.2	2.24
	Refrigerant Charge (R22)		kg	1.12 (Charged for 10 m)	1.55 (Charged for 10 m)	1.75 (Charged for 5 m)	2.8 (Charged for 30 m)
	Sound level (Cooling/ Heating) (*3)		dBA	47/48	49/49	54/54	48/49
	Dimensions (HxWxD)		mm	540x750x270	685x800x300	685x880x350	770x900x320
	Weight		kg	41	51	75	73 (V1), 72 (Y1)
	Operation range	Cooling	°CDB	19.4 to 46			-5 to 46
		Heating	°CWB	-10 to 15.5			-10 to 15
Piping connections	Liquid		mm	ϕ6.4 (Flare)			ϕ9.5 (Flare)
	Gas		mm	ϕ12.7 (Flare)	ϕ15.9 (Flare)		
	Drain	Indoor unit		3/4B			
		Outdoor unit	mm	ϕ18.0 (Hole)			ϕ26.0 (Hole)
Max. piping length			m	20	30		50 (Equivalent length 70 m)
Max. Installation level difference			m	15			30
Heat insulation				Both liquid and gas pipes			

Notes: (*1). Nominal cooling capacities are based on the following conditions:
(1)Return air temperature: 27°CDB, 19.5°CWB Outdoor temperature: 35°CDB Equivalent ref. piping: 5 m (Horizontal)
(2)Return air temperature: 27°CDB, 19.0°CWB Outdoor temperature: 35°CDB Equivalent ref. piping: 5 m (Horizontal).(RY71LU is 7.5 m)
(*2). Nominal heating capacities are based on the following conditions:
Return air temperature: 20°CDB, Outdoor temperature: 7°CDB, 6°CWB Equivalent ref. piping: 5 m (Horizontal).(RY71LU is 7.5 m)
(*3). Sound level is anechoic chamber conversion value, measured under JIS conditions. During actual operation, these values are normally somewhat higher as a result of ambient conditions.
(*4). With return chamber.
• The above performance data based on the power supply of 220 V (380 V).
• The power consumption shown above is that of the outdoor unit only. The power consumption of the indoor unit varies according to setup conditions, so refer to the engineering data to obtain the relevant figure.
(*5). Capacities show gross capacities which do not include a deduction for evaporator fan motor heat.

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AC Noise Levels

RZQ71 and RZQ100

2-2 TECHNICAL SPECIFICATIONS				RZQ71C7V1B	RZQ100C7V1B	RZQ125C7V1B	RZQ140C7V1B
Casing	Colour			Ivory White			
	Material			Paintable galvanized steel plate			
Dimensions	Unit	Height	mm	770	1170	1170	1170
		Width	mm	900	900	900	900
		Depth	mm	320	320	320	320
	Packing	Height	mm	900	1349	1349	1349
		Width	mm	980	980	980	980
		Depth	mm	420	420	420	420
Weight	Unit		kg	67	103	103	103
	Packed Unit		kg	71	114	114	114
Heat Exchanger	Dimensions	Length	mm	857	857	857	857
		Nr of Rows		2	2	2	2
		Fin Pitch	mm	1.4	1.4	1.4	1.4
		Nr of Passes		8	10	10	10
		Face Area	m²	0.641	0.98	0.98	0.98
		Nr of Stages		34	52	52	52
	Tube type			Hi-XSS(8)			
	Fin	Type		WF fin			
		Treatment		Anti-corrosion treatment (PE)			
Fan	Type			Propeller			
	Discharge direction			Horizontal			
	Quantity			1	2	2	2
	Air Flow Rate (nominal at 230V)	Cooling	m³/min	52	96	100	97
		Heating	m³/min	52	75	88	88
	Motor	Quantity		1	2	2	2
		Model		KFD-325-70-8A	Brushless DC Motor		
Motor	Speed (nominal)	Steps		8	8	8	8
		Cooling (Standard)	rpm	800	800	850	830
		Heating (Standard)	rpm	745	640	740	740
Fan	Motor	Output	W	70	70	70	70
Compressor	Quantity			1	1	1	1
	Motor	Model		2YC63DXD	JT100G-VD	JT100G-VD	JT100G-VD
		Type		Hermetically sealed swing compressor	Hermetically sealed scroll compressor		
		Motor Output	W	1,700	2,200	2,200	2,200
		Crankcase Heater	W		33	33	33
		Starting Method		Inverter driven			
Operation Range	Cooling	Min	°CDB	-15.0	-15.0	-15.0	-15.0
		Max	°CDB	50.0	50.0	50.0	50.0
	Heating	Min	°CWB	-20.0	-20.0	-20.0	-20.0
		Max	°CWB	15.5	15.5	15.5	15.5
Sound Level (nominal)	Cooling	Sound Power	dBA	63	65	66	67
		Sound Pressure (Standard)	dBA	47	49	50	50
	Heating	Sound Pressure (Standard)	dBA	49	51	52	52
Sound Level (Night quiet)	Sound Pressure		dBA	43	45	45	46

AC Noise Levels

RXYQ10 and RXYQ18

1-1 Technical Specifications					RXYQ5P9W1B	RXYQ8P9W1B	RXYQ10P9W1B	RXYQ12P9W1B	RXYQ14P9W1B	RXYQ16P9W1B	RXYQ18P9W1B
Sound power level	Cooling	Nom.		dBA	72	78		80			83
Sound pressure level	Cooling	Nom.		dBA	54	57	58	60			63
Compressor	Quantity				1		2		3		
	Model				Inverter						
	Type				Hermetically sealed scroll compressor						
	Speed			rpm	6,300	7,980	6,300				7,980
	Output			W	2,800	3,800	1,200	2,800	300	1,400	3,000
	Crankcase heater			W	33						
Compressor 2	Model				-		ON - OFF				
	Type				-		Hermetically sealed scroll compressor				
	Speed			rpm	-		2,900				
	Output			W	-		4,500				
	Crankcase heater			W	-		33				
Compressor 3	Model				-				ON - OFF		
	Type				-				Hermetically sealed scroll compressor		
	Speed			rpm	-				2,900		
	Output			W	-				4,500		
	Crankcase heater			W	-				33		
Operation range	Cooling	Min.~Max.		°CDB	-5.0~43.0						
	Heating	Min.~Max.		°CWB	-20~15						
Refrigerant	Type				R-410A						
	Charge			kg	6.2	7.7	8.4	8.6	11.3	11.5	11.7
	Control				Electronic expansion valve						
	Circuits	Quantity			1						
	Total refrigerant charge in the system	Max.		kg	-						
Refrigerant oil	Type				Synthetic (ether) oil						
	Charged volume			l	1.7	2.1	4.3		6.6		6.7
Piping connections	Liquid	Type			Braze connection						
		OD		mm	9.52			12.7			15.9
	Gas	Type			Braze connection						
		OD		mm	15.9	19.1	22.2	28.6			
	Heat insulation				Both liquid and gas pipes						
	Piping length	OU - IU	Max.	m	165						
		After branch	Max.	m	90 (14)						
	Total piping length	System	Actual	m	1,000						
	Level difference	OU - IU	Outdoor unit in highest position	m	50						
			Indoor unit in highest position	m	40						
		IU - IU	Max.	m	15						
Defrost method					Reversed cycle						
Defrost control					Sensor for outdoor heat exchanger temperature						
Safety devices	Item	01			High pressure switch						
		02			Fan driver overload protector						
		03			Overcurrent relay						
		04			Inverter overload protector						
		05			PC board fuse						
PED	Category				Category II						
APF					5.0 (21)	5.4 (21)	5 (21)	4.6 (21)		4.4 (21)	4.2 (21)

AC Noise Levels

RSX8 and RSX10

SPECIFICATIONS

RSX(Y)P-L7W1			5	8	10
Cooling capacity		kW	14.0	22.4	28.0
Heating capacity*		kW	16.0	25.0	31.5
Nominal input	Cooling	kW	4.58	6.99	8.97
	Heating*	kW	5.10	8.33	10.24
COP	Cooling		> 3.1	> 3.2	> 3.1
	Heating*		> 3.2	> 3.2	> 3.2
Dimensions	HxWxD	mm	1,440x635x690	1,220x1,280x690	1,440x1,280x690
Weight		kg	142	225	246
Air flow rate		m^3/min	90	168	190
Sound pressure level		dBA	54	57	57
Refrigerant amount		kg	5.6	8.6	9.6
Piping connections	Liquid	mm	Ø 9.5 flare con.	Ø 12.7 flare connection	
	Gas	mm	Ø 19.1 brazing con.	Ø 28.6 brazing con.	
Maximum piping length		m	120	120	120

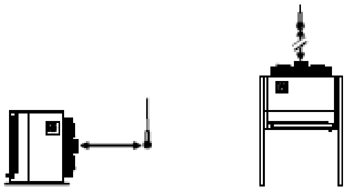
* for heat pump model only

ACCESSORIES

RSX(Y)P-L7W1	5	8	10
Cool/Heat selector	KRC19-26A		
Fixing wiring plate	KKSAJ26A(E)		
Fixing box	KJB111A		
Refnet header	KHRP26K11H (max. 4 branches)	KHRP26K18H (max. 8 branches)	
		KHRP26K37H (max. 8 branches)	
Refnet joint	KHRP26K11T	KHRP26K18T, KHRP26K37T	

AC Noise Levels

Airedale C11



SOUND DATA

Standard Condenser Fan – Horizontal

	Sound Measurement		Overall dB(A)	Frequency (Hz) dB 63	125	250	500	1000	2000	4000	8000
C11HI-H	Power	dB(A)	67	56	58	63	64	63	61	55	47
	Pressure	@ 10m	39	28	30	35	36	35	33	27	19
C15HI-H	Power	dB(A)	70	59	61	66	67	66	64	58	50
	Pressure	@ 10m	42	31	33	38	39	38	36	30	22
C20HI-H	Power	dB(A)	79	78	87	76	73	74	70	62	55
	Pressure	@ 10m	51	50	59	48	45	46	42	34	27
C25HI-H	Power	dB(A)	79	78	87	76	73	74	70	62	55
	Pressure	@ 10m	51	50	59	48	45	46	42	34	27
C35HI-H	Power	dB(A)	79	78	87	76	73	74	70	62	55
	Pressure	@ 10m	51	50	59	48	45	46	42	34	27
C45HI-H	Power	dB(A)	82	81	90	79	76	77	73	65	61
	Pressure	@ 10m	54	53	62	51	48	49	45	37	33
CS50H	Power	dB(A)	81	84	89	77	77	76	73	66	65
	Pressure	@ 10m	53	56	61	49	49	48	45	38	37
CS65H	Power	dB(A)	81	84	89	77	77	76	73	66	65
	Pressure	@ 10m	53	56	61	49	49	48	45	38	37
CS80H	Power	dB(A)	83	80	89	80	77	79	75	68	67
	Pressure	@ 10m	55	52	61	52	49	51	47	40	39
CS105H	Power	dB(A)	83	80	89	80	77	79	75	68	67
	Pressure	@ 10m	55	52	61	52	49	51	47	40	39

Standard Condenser Fan – Vertical

	Sound Measurement		Overall dB(A)	Frequency (Hz) dB 63	125	250	500	1000	2000	4000	8000
C11HI-V	Power	dB(A)	68	53	61	63	64	64	62	56	48
	Pressure	@ 10m	40	25	33	35	36	36	34	28	20
C15HI-V	Power	dB(A)	71	56	64	66	67	67	65	59	51
	Pressure	@ 10m	43	28	36	38	39	39	37	31	23
C20HI-V	Power	dB(A)	80	75	92	76	73	75	71	63	56
	Pressure	@ 10m	52	47	64	48	45	47	43	35	28
C25HI-V	Power	dB(A)	80	75	92	76	73	75	71	63	56
	Pressure	@ 10m	52	47	64	48	45	47	43	35	28
C35HI-V	Power	dB(A)	80	75	92	76	73	75	71	63	56
	Pressure	@ 10m	52	47	64	48	45	47	43	35	28
C45HI-V	Power	dB(A)	83	78	95	79	76	78	74	66	62
	Pressure	@ 10m	55	50	67	51	48	50	46	38	34
CS50V	Power	dB(A)	83	81	93	77	77	78	74	68	67
	Pressure	@ 10m	55	53	65	49	49	50	46	40	39
CS65V	Power	dB(A)	83	81	93	77	77	78	74	68	67
	Pressure	@ 10m	55	53	65	49	49	50	46	40	39
CS80V	Power	dB(A)	84	76	93	80	78	81	76	70	69
	Pressure	@ 10m	56	48	65	52	50	53	48	42	41
CS105V	Power	dB(A)	84	76	93	80	78	81	76	70	69
	Pressure	@ 10m	56	48	65	52	50	53	48	42	41

1 Figures quoted using standard condenser fan(s) running at full speed under normal operating conditions.

APPENDIX 6

Background Noise Measurements

Period	Date	Time	L_{Fmax}	L_{Fmin}	L_{eq}	L_{F90}
			dB, (A)	dB, (A)	dB, (A)	dB, (A)
1	21/10/2013	15:45:00	84.4	47.1	57.9	49
2	21/10/2013	15:50:00	69	46	51.8	48
3	21/10/2013	15:55:00	73.8	47.1	54.4	48.5
4	21/10/2013	16:00:00	71.1	47.6	55.7	49.5
5	21/10/2013	16:05:00	69.3	46.7	55.1	49
6	21/10/2013	16:10:00	80.7	50.8	64	53.5
7	21/10/2013	16:15:00	90.6	46.9	79.5	51
8	21/10/2013	16:20:00	73.1	47.6	54.8	49
9	21/10/2013	16:25:00	75.2	47.1	61.1	49
10	21/10/2013	16:30:00	77.8	46.4	59	48.5
11	21/10/2013	16:35:00	75	47.1	58.9	49.5
12	21/10/2013	16:40:00	74	48.8	56.9	50.5
13	21/10/2013	16:45:00	71.5	46.2	53.1	50
14	21/10/2013	16:50:00	57	45.7	49.9	48
15	21/10/2013	16:55:00	88.8	48.8	78.8	53.5
16	21/10/2013	17:00:00	82.7	44.3	66.8	45.5
17	21/10/2013	17:05:00	72.5	44.6	50.7	46
18	21/10/2013	17:10:00	56.6	44.4	48.3	46
19	21/10/2013	17:15:00	59.3	45.2	49.5	46.5
20	21/10/2013	17:20:00	73.6	45.7	51.7	47.5
21	21/10/2013	17:25:00	59.7	44.7	48.9	46.5
22	21/10/2013	17:30:00	72.5	45.7	52.1	47.5
23	21/10/2013	17:35:00	62.2	45.3	51.8	47
24	21/10/2013	17:40:00	63.6	46.3	50.5	47.5
25	21/10/2013	17:45:00	56.1	44.2	49.3	47
26	21/10/2013	17:50:00	55	45.1	48.5	46.5
27	21/10/2013	17:55:00	64.5	44.8	51.8	47.5
28	21/10/2013	18:00:00	61.7	45.9	51	48
29	21/10/2013	18:05:00	61.9	44.6	50.2	46
30	21/10/2013	18:10:00	62.4	44.8	50.4	47
31	21/10/2013	18:15:00	62.3	45.5	49.5	47
32	21/10/2013	18:20:00	79.3	44.3	51.1	46.5
33	21/10/2013	18:25:00	67.4	43.6	48.8	46
34	21/10/2013	18:30:00	59.3	45.5	49.9	47.5
35	21/10/2013	18:35:00	63.9	44	50.1	46
36	21/10/2013	18:40:00	83.6	46.5	54.5	48.5
37	21/10/2013	18:45:00	59.9	45.4	50.8	47
38	21/10/2013	18:50:00	57.5	43.9	49.2	46
39	21/10/2013	18:55:00	72.2	46	51.5	47.5
40	21/10/2013	19:00:00	80.1	46	56.1	48
41	21/10/2013	19:05:00	62.3	45.3	49.4	47
42	21/10/2013	19:10:00	60.3	44.3	48.8	46.5
43	21/10/2013	19:15:00	54.1	42.9	48.8	45.5
44	21/10/2013	19:20:00	79.5	44.2	55.7	46.5
45	21/10/2013	19:25:00	63.9	45	50.1	46.5

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46	21/10/2013	19:30:00	65.8	45.1	48.5	46.5
47	21/10/2013	19:35:00	62.4	44.5	50	46.5
48	21/10/2013	19:40:00	63.8	44.1	48	45.5
49	21/10/2013	19:45:00	54.7	44.2	48.7	46.5
50	21/10/2013	19:50:00	82.7	44.6	53.2	46
51	21/10/2013	19:55:00	56.2	44.1	48.6	46
52	21/10/2013	20:00:00	56.3	43.8	48.1	46.5
53	21/10/2013	20:05:00	57.1	44	48.7	46
54	21/10/2013	20:10:00	60.5	43.8	49.5	45.5
55	21/10/2013	20:15:00	78.8	45.4	55	48
56	21/10/2013	20:20:00	71.7	46.2	51.9	48
57	21/10/2013	20:25:00	60.7	44.2	50.3	46.5
58	21/10/2013	20:30:00	59.7	44.4	49.3	46
59	21/10/2013	20:35:00	66.8	44.7	50.9	46.5
60	21/10/2013	20:40:00	59.5	47	50.3	48
61	21/10/2013	20:45:00	54.8	47.8	50.2	49
62	21/10/2013	20:50:00	62.4	47	50.7	49
63	21/10/2013	20:55:00	62.5	48.5	52.2	50
64	21/10/2013	21:00:00	60.3	46.4	52.5	49
65	21/10/2013	21:05:00	61.4	42.9	50	45
66	21/10/2013	21:10:00	60.4	43	47.8	44.5
67	21/10/2013	21:15:00	62.4	44.8	50.5	47
68	21/10/2013	21:20:00	55.4	43.5	47.4	45
69	21/10/2013	21:25:00	53.9	43.3	47.9	45.5
70	21/10/2013	21:30:00	69.1	42.6	49.5	45.5
71	21/10/2013	21:35:00	57.8	42.6	48.5	45.5
72	21/10/2013	21:40:00	60	44.2	49.7	46
73	21/10/2013	21:45:00	61.7	44.5	50.5	46
74	21/10/2013	21:50:00	66.8	43.7	51.4	46.5
75	21/10/2013	21:55:00	56.7	43.5	48.8	45
76	21/10/2013	22:00:00	65.8	43	52.1	45
77	21/10/2013	22:05:00	57.1	44.3	49.2	46
78	21/10/2013	22:10:00	59	43.3	48.7	45.5
79	21/10/2013	22:15:00	73.3	46.3	57.7	48.5
80	21/10/2013	22:20:00	75.8	44.5	50.7	46
81	21/10/2013	22:25:00	58.3	45.6	50.7	47
82	21/10/2013	22:30:00	71.7	45.7	54.6	47
83	21/10/2013	22:35:00	56.4	42.6	47.8	45
84	21/10/2013	22:40:00	75.3	42.4	48.7	44
85	21/10/2013	22:45:00	70.8	42.7	54.2	45
86	21/10/2013	22:50:00	56.9	43.5	48.4	45
87	21/10/2013	22:55:00	68.7	43	55.5	46
88	21/10/2013	23:00:00	58.3	43.8	50.1	46.5
89	21/10/2013	23:05:00	74.8	43.3	49.5	46
90	21/10/2013	23:10:00	70.6	44.1	49.4	46
91	21/10/2013	23:15:00	53.7	43.2	48.1	45
92	21/10/2013	23:20:00	65	41.8	49	43.5
93	21/10/2013	23:25:00	52.1	42.9	46.9	44
94	21/10/2013	23:30:00	71	40.8	52.6	43.5
95	21/10/2013	23:35:00	56.3	41.2	46.5	43.5
96	21/10/2013	23:40:00	52	41.1	47.3	43
97	21/10/2013	23:45:00	53.1	41.7	47.1	43
98	21/10/2013	23:50:00	62.9	40.9	49.7	43
99	21/10/2013	23:55:00	60.6	42.5	47.7	44

100	21/10/2013	00:00:00	66.8	43.3	48.3	44.5
101	22/10/2013	00:05:00	64.2	43.3	47.9	44.5
102	22/10/2013	00:10:00	71.4	43.2	49.9	45
103	22/10/2013	00:15:00	56	41.8	46.9	44
104	22/10/2013	00:20:00	74.4	41.1	48.5	43
105	22/10/2013	00:25:00	52.2	42.6	46.4	44
106	22/10/2013	00:30:00	54.2	41.3	46.9	43.5
107	22/10/2013	00:35:00	69.7	41.1	52.9	43
108	22/10/2013	00:40:00	75.8	41.7	52	43.5
109	22/10/2013	00:45:00	51.1	41.6	45.4	43
110	22/10/2013	00:50:00	75.6	40.6	47	42.5
111	22/10/2013	00:55:00	55.9	40.4	44.5	42
112	22/10/2013	01:00:00	57.4	41.3	47.2	43
113	22/10/2013	01:05:00	52.1	41.4	45.6	43
114	22/10/2013	01:10:00	68.7	40.2	46.9	43.5
115	22/10/2013	01:15:00	53.7	38.9	44.5	40
116	22/10/2013	01:20:00	70.2	39.7	50.4	41.5
117	22/10/2013	01:25:00	61.4	39.7	44.9	41.5
118	22/10/2013	01:30:00	51.9	39	44.6	41
119	22/10/2013	01:35:00	52.7	40.4	44.8	42.5
120	22/10/2013	01:40:00	54.1	40.3	44.7	41.5
121	22/10/2013	01:45:00	76.3	41.2	48.6	42.5
122	22/10/2013	01:50:00	54.6	39.9	45.4	41
123	22/10/2013	01:55:00	56.1	39.9	46.5	42.5
124	22/10/2013	02:00:00	57.2	40.9	46.2	43.5
125	22/10/2013	02:05:00	56.8	40	46.1	42
126	22/10/2013	02:10:00	77.7	40.8	49.2	43.5
127	22/10/2013	02:15:00	51	38.6	44.1	40.5
128	22/10/2013	02:20:00	53.3	40.7	46.3	43
129	22/10/2013	02:25:00	74.1	39.9	47.7	41.5
130	22/10/2013	02:30:00	56.5	39.7	45.7	41
131	22/10/2013	02:35:00	49.1	39.6	43.4	40.5
132	22/10/2013	02:40:00	49.8	38.3	43.9	40
133	22/10/2013	02:45:00	55.8	39.8	46.2	42
134	22/10/2013	02:50:00	51.6	38.9	44.6	40.5
135	22/10/2013	02:55:00	58.2	41.4	46	43
136	22/10/2013	03:00:00	57.1	41.4	45.7	43
137	22/10/2013	03:05:00	49.9	39.9	43.9	41
138	22/10/2013	03:10:00	52.4	39.8	45.2	41
139	22/10/2013	03:15:00	47.9	39.6	43.3	41
140	22/10/2013	03:20:00	54	40.8	44.9	42
141	22/10/2013	03:25:00	49.1	40	44.3	42
142	22/10/2013	03:30:00	51.5	40.4	44.1	42
143	22/10/2013	03:35:00	51.5	40.2	45	42
144	22/10/2013	03:40:00	56.4	39.8	45.4	42
145	22/10/2013	03:45:00	72.8	39.8	46.5	41.5
146	22/10/2013	03:50:00	67.9	39.1	45.7	41.5
147	22/10/2013	03:55:00	49.1	39	43.2	40.5
148	22/10/2013	04:00:00	53.8	39.1	44.7	41
149	22/10/2013	04:05:00	53.1	39.5	44.6	40.5
150	22/10/2013	04:10:00	52.9	40.8	45.4	42
151	22/10/2013	04:15:00	49.7	38.7	43.3	40.5
152	22/10/2013	04:20:00	53.8	39.2	45	41
153	22/10/2013	04:25:00	53.7	39.2	44.8	41

154	22/10/2013	04:30:00	52.5	40.5	45.8	42
155	22/10/2013	04:35:00	48.8	39.2	43.5	41
156	22/10/2013	04:40:00	49.9	41.1	44.7	43
157	22/10/2013	04:45:00	52.7	40	45	41.5
158	22/10/2013	04:50:00	51.1	40.8	45.7	43
159	22/10/2013	04:55:00	52.1	40.9	46.4	43.5
160	22/10/2013	05:00:00	70.4	40.1	48.1	42
161	22/10/2013	05:05:00	52.1	41.9	45.8	43
162	22/10/2013	05:10:00	53.4	41.6	45.1	43
163	22/10/2013	05:15:00	68.3	41.1	46.7	43
164	22/10/2013	05:20:00	54.4	41.1	46.1	43
165	22/10/2013	05:25:00	54.2	42	48	45
166	22/10/2013	05:30:00	65.4	41.5	46.3	43
167	22/10/2013	05:35:00	72.6	42.2	48.5	44
168	22/10/2013	05:40:00	52.1	41.9	46.5	44
169	22/10/2013	05:45:00	67	42.7	48.9	45
170	22/10/2013	05:50:00	57.3	43.6	49.6	46
171	22/10/2013	05:55:00	52	42.9	47.5	44.5
172	22/10/2013	06:00:00	63.2	44.4	50.8	46.5
173	22/10/2013	06:05:00	57.1	43.2	48	45
174	22/10/2013	06:10:00	73.2	42.9	49.7	44.5
175	22/10/2013	06:15:00	56.2	43.7	49.3	46.5
176	22/10/2013	06:20:00	64.9	44.7	52	47
177	22/10/2013	06:25:00	66.9	45.2	50.7	47.5
178	22/10/2013	06:30:00	79.6	46.4	51.6	48
179	22/10/2013	06:35:00	75	45.7	51.2	48
180	22/10/2013	06:40:00	68.9	44.1	49.8	46.5
181	22/10/2013	06:45:00	60.2	45.4	49.9	47
182	22/10/2013	06:50:00	71.8	46	52.2	48.5
183	22/10/2013	06:55:00	67.8	46.3	50.6	48
184	22/10/2013	07:00:00	59.7	46.9	51.7	48.5
185	22/10/2013	07:05:00	59.7	46.5	50.8	49
186	22/10/2013	07:10:00	74.8	45.7	51.8	48
187	22/10/2013	07:15:00	61.1	45.9	50.9	48
188	22/10/2013	07:20:00	65.2	46.1	52.1	48
189	22/10/2013	07:25:00	60	45.5	49.6	47.5
190	22/10/2013	07:30:00	57.2	46.3	50.5	48.5
191	22/10/2013	07:35:00	77.1	46.6	52.6	48.5
192	22/10/2013	07:40:00	62.6	47.1	51.9	49
193	22/10/2013	07:45:00	76.1	46.5	51.8	48.5
194	22/10/2013	07:50:00	62.9	45.6	51.4	49
195	22/10/2013	07:55:00	69.9	47.2	52.6	49
196	22/10/2013	08:00:00	72.4	47.2	52	49.5
197	22/10/2013	08:05:00	63.1	47.5	50.9	49
198	22/10/2013	08:10:00	64.7	47.1	52	49.5
199	22/10/2013	08:15:00	57.2	48.5	51.4	50
200	22/10/2013	08:20:00	57.7	47.2	50.9	49
201	22/10/2013	08:25:00	57.2	48.4	51.8	50
202	22/10/2013	08:30:00	58.2	47	51.1	49
203	22/10/2013	08:35:00	61.7	46.5	51.6	48.5
204	22/10/2013	08:40:00	73.5	47.4	51.5	49.5
205	22/10/2013	08:45:00	61.4	47.5	51.4	49.5
206	22/10/2013	08:50:00	57.1	48.2	50.9	49.5
207	22/10/2013	08:55:00	79.4	48.1	54	50

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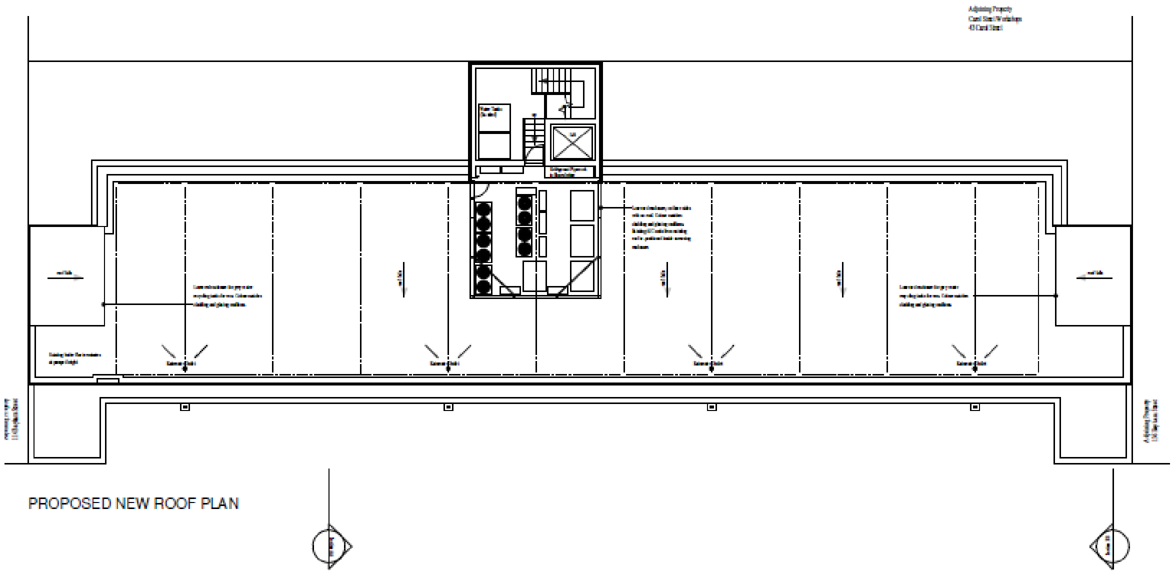
208	22/10/2013	09:00:00	78.6	47	54.6	49.5
209	22/10/2013	09:05:00	72.5	48.2	52.3	49.5
210	22/10/2013	09:10:00	67.3	47.8	51.6	49.5
211	22/10/2013	09:15:00	66.9	48.1	52.1	50
212	22/10/2013	09:20:00	64.4	47.9	52.1	49.5
213	22/10/2013	09:25:00	78.7	47.6	57.1	48.5
214	22/10/2013	09:30:00	63.4	47.8	52	49.5
215	22/10/2013	09:35:00	63.4	47.2	51.6	49
216	22/10/2013	09:40:00	66.1	47.9	51.4	49.5
217	22/10/2013	09:45:00	72.2	47.8	51.9	49.5
218	22/10/2013	09:50:00	71.4	48.5	53.3	49.5
219	22/10/2013	09:55:00	60	48.1	50.8	49.5
220	22/10/2013	10:00:00	62.5	48	51.7	49.5
221	22/10/2013	10:05:00	67.2	47.6	52.8	49
222	22/10/2013	10:10:00	76.4	46.3	51	48
223	22/10/2013	10:15:00	77.2	49.8	56.2	51.5
224	22/10/2013	10:20:00	79.3	48	56.8	50
225	22/10/2013	10:25:00	62.2	47.2	50.8	48.5
226	22/10/2013	10:30:00	55.9	46.6	50.6	49
227	22/10/2013	10:35:00	69.3	47.7	53.7	49.5
228	22/10/2013	10:40:00	76.9	47.3	51.5	49
229	22/10/2013	10:45:00	62.8	47.8	51.3	49.5
230	22/10/2013	10:50:00	75.1	47.5	51.6	49
231	22/10/2013	10:55:00	67.6	48.4	51.5	49.5
232	22/10/2013	11:00:00	81.9	48	58.2	49.5
233	22/10/2013	11:05:00	78.3	48.4	61.5	51
234	22/10/2013	11:10:00	71.9	47.8	57.2	49.5
235	22/10/2013	11:15:00	63.8	47.3	51.4	49
236	22/10/2013	11:20:00	83.6	48.3	58.9	50.5
237	22/10/2013	11:25:00	61.5	47.4	52	48.5
238	22/10/2013	11:30:00	73.3	47.8	52.7	49.5
239	22/10/2013	11:35:00	64.1	48.1	52.8	49.5
240	22/10/2013	11:40:00	56.8	47.1	50.5	48.5
241	22/10/2013	11:45:00	63	45.8	51	49
242	22/10/2013	11:50:00	73.7	47.2	53.3	49
243	22/10/2013	11:55:00	62.9	48.8	51.8	50
244	22/10/2013	12:00:00	74.2	48.7	55.7	51
245	22/10/2013	12:05:00	74.8	50.2	54.4	51.5
246	22/10/2013	12:10:00	79.6	49.9	55.8	51.5
247	22/10/2013	12:15:00	58.8	49.6	52.7	51
248	22/10/2013	12:20:00	78.5	49.9	53.3	51
249	22/10/2013	12:25:00	66.9	50.3	52.8	51.5
250	22/10/2013	12:30:00	62.2	50.3	52.4	51.5
251	22/10/2013	12:35:00	76.9	50.3	54	51.5
252	22/10/2013	12:40:00	79.8	51.5	57.6	52.5
253	22/10/2013	12:45:00	70.3	48.6	52.1	50
254	22/10/2013	12:50:00	58.6	47.3	51.2	49
255	22/10/2013	12:55:00	66.2	45.9	50.2	47.5
256	22/10/2013	13:00:00	62.8	46.3	50.3	48
257	22/10/2013	13:05:00	74.4	46	52.4	48.5
258	22/10/2013	13:10:00	76.8	46.7	52.3	48.5
259	22/10/2013	13:15:00	66.5	46.1	49.5	47
260	22/10/2013	13:20:00	64.3	46.2	50.7	48
261	22/10/2013	13:25:00	76.7	46.5	51.4	48.5

262	22/10/2013	13:30:00	63.8	46.2	52.2	47.5
263	22/10/2013	13:35:00	56.1	45.7	49.7	47.5
264	22/10/2013	13:40:00	60.7	45.6	51	47.5
265	22/10/2013	13:45:00	59.1	45.8	50.4	47.5
266	22/10/2013	13:50:00	61.2	46.4	50.8	48
267	22/10/2013	13:55:00	57	46.5	50.1	48
268	22/10/2013	14:00:00	59.4	47.6	51.9	49.5
269	22/10/2013	14:05:00	70	46.9	55.3	48.5
270	22/10/2013	14:10:00	65.7	46.2	51.2	48
271	22/10/2013	14:15:00	56.8	45.9	49.4	47.5
272	22/10/2013	14:20:00	59.6	45.7	50.1	47.5
273	22/10/2013	14:25:00	62.6	45.7	49.5	47.5
274	22/10/2013	14:30:00	64.9	45.3	49.4	47
275	22/10/2013	14:35:00	57.3	45.8	49.2	47.5
276	22/10/2013	14:40:00	78.5	45.2	52	48
277	22/10/2013	14:45:00	71.4	44.6	53.6	47
278	22/10/2013	14:50:00	61.9	44.9	49.9	47
279	22/10/2013	14:55:00	68.2	45.1	50.4	47
280	22/10/2013	15:00:00	63.3	45.6	52.6	49
281	22/10/2013	15:05:00	66.9	46.8	50.7	48
282	22/10/2013	15:10:00	63.5	45.4	50.6	48.5
283	22/10/2013	15:15:00	63.1	47	51.2	49
284	22/10/2013	15:20:00	78	47	53.9	49
285	22/10/2013	15:25:00	67.9	46.5	53.5	49.5
286	22/10/2013	15:30:00	60.4	47.2	51.3	48.5
287	22/10/2013	15:35:00	69.2	46.5	51.5	49.5
288	22/10/2013	15:40:00	63.5	46.5	52.5	49.5
289	22/10/2013	15:45:00	60.3	44.9	51.3	48.5
290	22/10/2013	15:50:00	62.9	46.5	51.5	48.5
291	22/10/2013	15:55:00	62.6	47	50.8	48.5
292	22/10/2013	16:00:00	60.4	46.9	50.8	49
293	22/10/2013	16:05:00	61	47.6	52.4	49
294	22/10/2013	16:10:00	77.5	46.4	57.6	49
295	22/10/2013	16:15:00	78.9	47.6	55.8	50
296	22/10/2013	16:20:00	74.2	48.6	57.1	50
297	22/10/2013	16:25:00	75.2	46.4	52.2	48.5
298	22/10/2013	16:30:00	74.5	47.2	57.3	49
299	22/10/2013	16:35:00	73.8	48.1	57.7	50
300	22/10/2013	16:40:00	70.9	48.5	56.4	51.5

APPENDIX 7

Proposed Roof Layout



APPENDIX 8

Acoustic Louvre SRI

Laboratory measurements of airborne sound insulation of building elements
Octave bands
ISO 140-3 (1995)

Client: Sound Planning Limited
48 Windermere Way
Farnham
Surrey
GU9 0DE

Object: "Chevron Blade 300mm" Louvre

Size (m^2): 1.01
Thickness (mm): 300
Mass per unit area (kg/m^2): 46.2

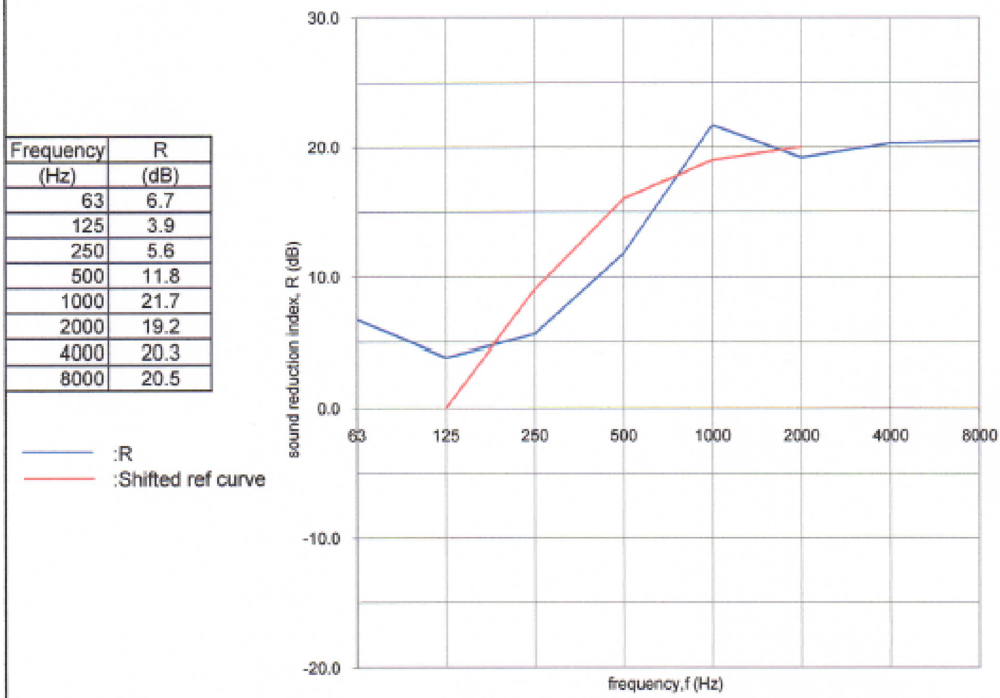
Source room:		Receiving room:	
Volume (m^3):	136	Volume (m^3):	217
Temperature [°C]:	20.4	Temperature [°C]:	19.2
Humidity [%]:	35.9	Humidity [%]:	36.3

Rating according to ISO 717-1 (1996):

R_W 16 dB

f range (Hz)	125-2000	63-4000
C (dB)	-1	-1
C_{tr} (dB)	-4	-4

Frequency (Hz)	R (dB)
63	6.7
125	3.9
250	5.6
500	11.8
1000	21.7
2000	19.2
4000	20.3
8000	20.5



Test reference No.: 254-171
Date: 21/02/2011

University of Salford, School of Computing, Science & Engineering
Signature:

SSV1