

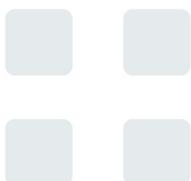
**Proposed Installation of
Mechanical Plant**

**5 Templewood Avenue,
London, NW3 7UY**

Environmental Noise Assessment

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Environmental Noise Assessment Proposed Installation of Mechanical Plant	
Project Address:	5 Templewood Avenue London NW3 7UY
Project Reference:	103231

Issue/Revision Record			
Issue:	Date:	Remarks:	Author:
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	Signature:	Print:	Title:	Date:
Author:		Phil Huffer	Principal Consultant	10/10/2016
Reviewer:		Andy Dodd	Senior Consultant	10/10/2016

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 a corporate member of The Institute of Acoustics (IOA).
- 1.2 APL has been instructed by the Applicant's architect, Brod Wight Architects, to consider and advise upon the noise implications of a proposed installation of a climate control system.
- 1.3 The climate control system will consist of 6No. external condenser units that will be located in external areas around the property. Other items of plant will also be considered.
- 1.4 It is understood the Local Planning Authority (LPA) require further information on noise levels from the proposed 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 5 Templewood Avenue. The site and its surroundings can be seen in Figures 1 to 8. A site location plan is shown below.

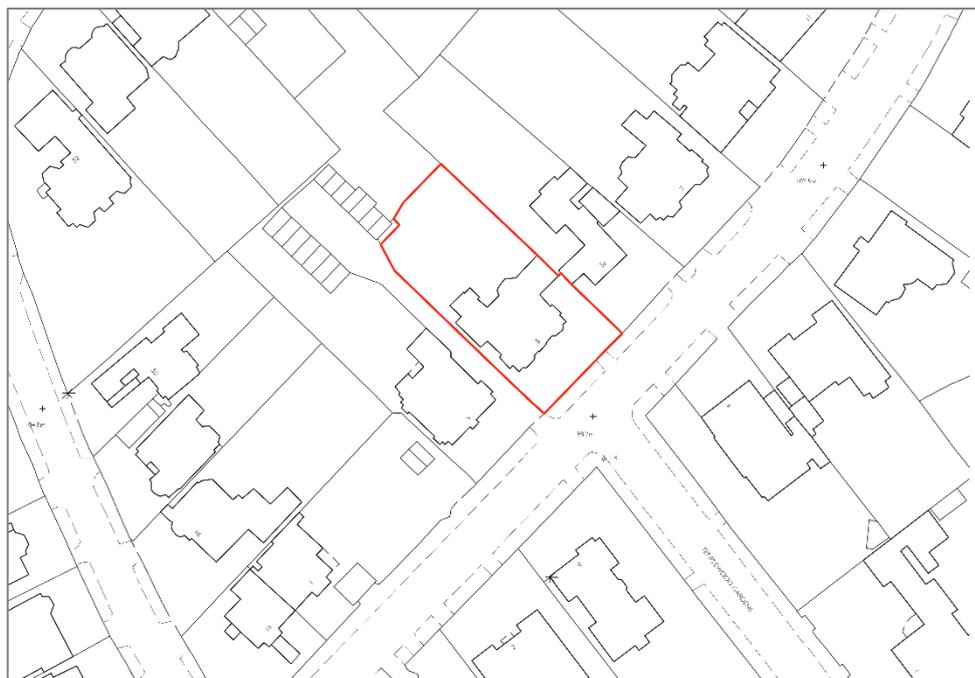


Diagram 1 - Site location plan

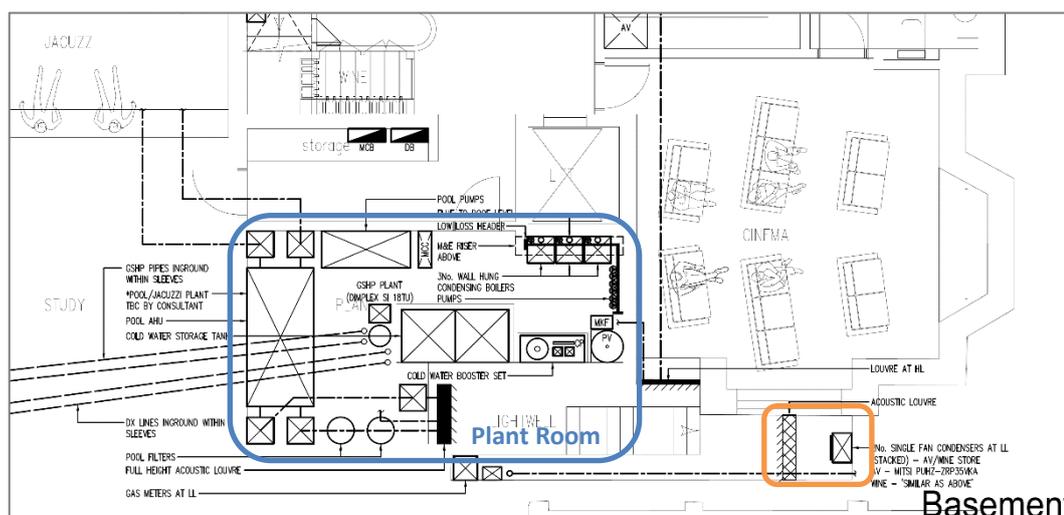


Diagram 4 – Plant Area B

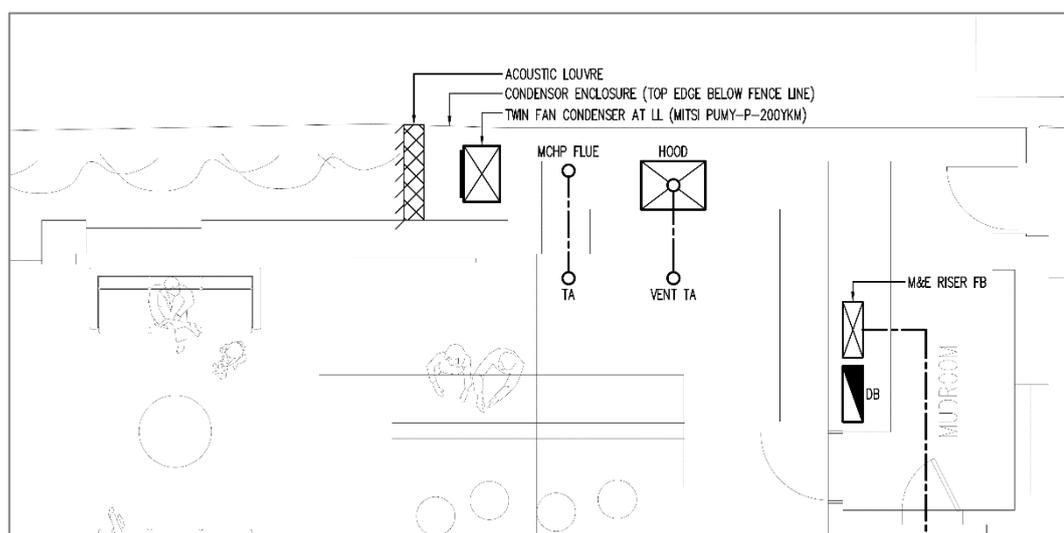


Diagram 5 – Plant Area C

- 2.4 The nearest noise sensitive façade to Plant Area A belongs to the rear ground floor windows of the flat located at 5 Templewood Avenue. Of the 3No. condenser units located at the end of the rear garden, 1No. provides heating to the flat whilst the other 2No. provide cooling to the house. The distance from this noise sensitive façade to the location of the proposed condenser units was determined from scaled drawings and determined to be approximately 20m.
- 2.5 The nearest noise sensitive façade to Plant Area B belongs to the ground floor windows of the flat located at 5 Templewood Avenue. The plant room associated with the house is also ventilated into the basement lightwell. The distance from this noise sensitive façade to the location of the proposed condenser units was determined from scaled drawings and determined to be approximately 5.5m.
- 2.6 The nearest noise sensitive façade to Plant Area C belongs to the ground floor windows of the adjacent property located at 5A Templewood Avenue. The distance from this noise sensitive façade to the location of the proposed condenser unit was determined from scaled drawings and determined to be approximately 6m.

- 2.7 The proposed items of plant have been identified by the mechanical consultant involved with the project (ME7) as follows:

Plant Area A

2No. Mitsubishi PUMY-P200 (house)
1No. Viessmann Vitocal 242-S (flat)

Plant Area B

2No. Mitsubishi PUHZ-ZRP35KVA (house)

Plant Area C

1No. Mitsubishi PUMY-P200 (house)

- 2.8 Information in regard of the mechanical plant for the plant room has been provided by ME7 Ltd. The units are itemised below. The equipment schedule is indicative and will be formalised during the detailed design stage of the project.

Plant Room

1No. Dimplex SI 18TU
Swimming pool AHU (equipment to be confirmed)
Cold water booster kit
Condensing boilers
Pumps

- 2.9 The noise data for plant area A, B and C was obtained from published data from the manufacturer (a copy of the data sheets is provided in Appendix A). It is anticipated that the enclosures will be formed using masonry structures and ventilated through acoustic louvred panels. It is the intention to line the condenser enclosures with an acoustically absorbent material to minimise the creation of reverberant sound.

3. EQUIPMENT

- 3.1 All background noise measurements were obtained using the following equipment:

- Svantek Class 1 Sound Level Meter Type 958A
Serial No. 45530
- Rion Calibrator Type NC-74 Class 1
Serial No. 00410215

- 3.2 The relevant equipment carries full and current traceable calibration. The equipment, where necessary, was calibrated prior to and after the measurements were carried out.

4. NOISE OUTLINE

- 4.1 In order to produce an environmental noise assessment, consideration must be given to the prevailing background noise in the locality of the installation.
- 4.2 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 façade. The measurements obtained during the exercise were undertaken in the rear garden of 5 Templewood Avenue. The main source of ambient noise was traffic noise along Templewood Avenue. The ambient noise climate throughout the day and night period was considered to be particularly low for an urban area.
- 4.3 The particulars of the measurement exercise are recorded below. The weather conditions were considered appropriate to monitor environmental noise.

Date: 9th – 10th September 2016
 Start Time: 12:10 hrs
 Location: rear garden, 5 Templewood Avenue, London, NW3

Weather conditions

Date	Wind speed	Precipitation	Temp
09/09/16	7 km/h	0mm	20 °C
10/09/16	11 km/h	0mm	20 °C

- 4.4 Minimum background and average noise levels are shown in Table 1 below:

WHO period	Lowest L _{A90,15min}	Average L _{Aeq,T}
07:00-19:00hrs	37	45
19:00-23:00hrs	38	44
23:00-07:00hrs	31	41

Table 1

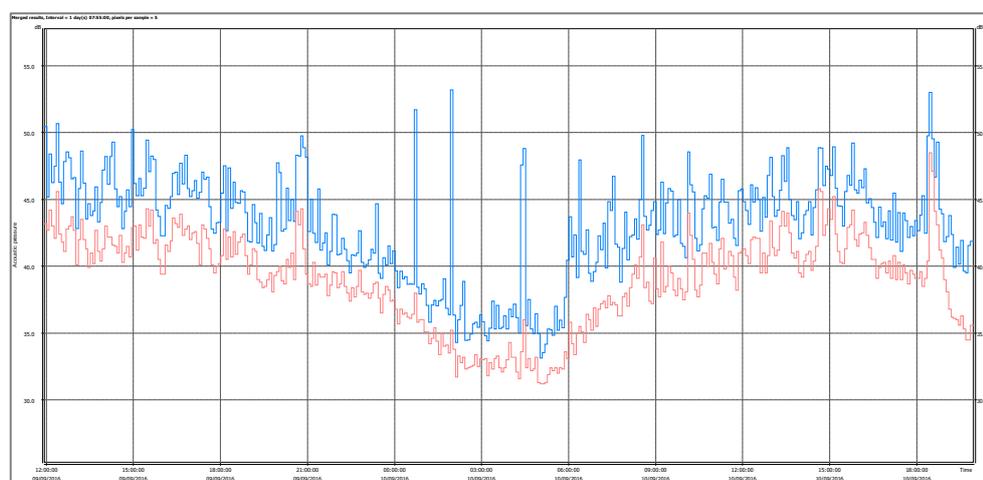


Diagram 6 – Level vs Time history

5. DESIGN CRITERIA

- 5.1 Information regarding the noise levels not to be exceeded by the proposed installation was extracted from the LPA (London Borough of Camden) Local Development Framework 2010-2025 Section DP28 Noise and Vibration.

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 1m 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 1m external to a sensitive façade	Day, evening and night	0000-2400	10dB(A)<LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1m external to a sensitive façade	Day, evening and night	0000-2400	10dB(A)<LA90
Noise at 1m external to a sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dB(A) LAeq

- 5.2 It is not expected that the proposed plant will generate distinguishable discrete continuous notes. The octave band data sheet shows no such characteristic. As the proposed plant will be utilised for residential use, the anticipated operational hours are at any time. The plant noise emission criteria that should not be exceeded is therefore based on 5dB(A)<LA90 and is shown in Table 2.

Daytime (07:00-19:00hrs)	Evening (19:00-23:00hrs)	Night (23:00-07:00hrs)
LAeq 40dB	LAeq 39dB	LAeq 26dB

Table 2

6. CALCULATIONS

- 6.1 In order to predict the noise impact of the climate control system, consideration has been given to noise egress from the mechanical plant to the nearest noise sensitive façade.
- 6.2 In considering the propagation of noise from the condensers, consideration was given to their location within a fully enclosed construction, attenuation through the acoustic louvre and point source propagation to the nearest noise sensitive window. The following formulas were utilised:

$$L_p = L_w + 10\log_{10}T - 10\log_{10}V + 14$$

Where L_p is the reverberant sound pressure level in the enclosure
 L_w is the sound power level of the condenser unit
 T is the enclosure reverberation time, s
 V is the enclosure volume, m³

$$L_{p_2} = L_{p_1} - R - 6$$

Where L_{p_2} is the sound pressure level close to the enclosure on the outside
 L_{p_1} is the reverberant sound pressure level in the enclosure
 R is the sound reduction index of the louvre

Plant Area A

- 6.3 The calculation exercise provided the following results.

Cooling Mode	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
PUMY-P200 L _w 2No.	79	73	68	67	66	60	54	49	70
Reverberant L _p in enclosure	74	68	63	62	61	55	49	44	64
Acoustic louvre SS150	4	4	6	8	11	11	11	10	
Level outside of enclosure	64	58	51	48	44	38	32	28	50
Distance attenuation	-26	-26	-26	-26	-26	-26	-26	-26	
Reflecting planes	0	0	0	0	0	0	0	0	
Façade level	37	31	24	21	17	11	5	1	24

Table 3 – Plant Area A

- 6.4 In order to comply with the requirements of the LPA, any noise from the proposed installation of mechanical plant in 'Plant Area A' should not exceed the following levels (based on achieving 5dB below the lowest measured background noise over the operational hours of the plant at 1m from the nearest noise sensitive façade):

- (a) 40 dBA during the daytime period
 (b) 39 dBA during the evening period
 (c) 26 dBA during the evening period

- 6.5 The calculated noise impact is 24dBA.

Plant Area B

6.6 The calculation exercise provided the following results.

Cooling Mode	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
PUHZ-ZRP35VKA L _w 2No.	64	58	57	56	53	50	42	37	58
Reverberant L _p in enclosure	60	54	53	52	49	46	38	33	54
Acoustic louvre SS300	6	6	9	13	21	20	16	13	
Level outside of enclosure	48	42	38	33	22	20	16	14	34
Distance attenuation	-15	-15	-15	-15	-15	-15	-15	-15	
Reflecting planes (x2)	6	6	6	6	6	6	6	6	
Façade level	39	33	29	24	13	11	7	5	25

Table 4 – Plant Area B

6.7 In order to comply with the requirements of the LPA, any noise from the proposed installation of mechanical plant in 'Plant Area B' should not exceed the following levels (based on achieving 5dB below the lowest measured background noise over the operational hours of the plant at 1m from the nearest noise sensitive façade):

- (a) 40 dBA during the daytime period
- (b) 39 dBA during the evening period
- (c) 26 dBA during the evening period

6.8 The calculated noise impact is 25dBA.

Plant Area C

6.9 A correction to account for building edge diffraction of -5dB was assumed. This was extracted from the Department of Energy and Climate Change Planning Standard MCS020.

6.10 The planning standard MCS020 states the following (Note 5):

*"Note 5: Barriers between the heat pump and the assessment position (STEP 5)
 A correction should be made for attenuation due to barriers between the air source heat pump and an assessment position. A correction will be necessary if an installer is unable to see an assessment position from the top edge of the air source heat pump. Use the following instructions to determine whether a correction is appropriate:*

- *For a solid barrier (e.g. a brick wall or a fence) that completely obscures an installer's vision of an assessment position from the top edge of the air source heat pump attenuation of -10 dB may be assumed.*
- *Where a solid barrier completely obscures an installer's vision of an assessment position from the top or side edges of the air source heat pump, but moving a maximum distance of 25 cm in any direction to the air source heat pump allows an assessment position to be seen, attenuation of -5 dB may be assumed.*
- *If it is possible for an installer to see any part of an assessment position from the top or side edges of the air source heat pump no attenuation may be assumed. "*

6.11 The calculation exercise provided the following results.

Cooling Mode	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
PUMY-P200 L _w 1No.	76	70	65	64	63	57	51	46	67
Reverberant L _p in enclosure	72	66	61	60	59	53	47	42	63
Acoustic louvre SS300	6	6	9	13	21	20	16	13	
Level outside of enclosure	60	54	46	41	32	27	25	23	43
Distance attenuation	-16	-16	-16	-16	-16	-16	-16	-16	
Building edge diffraction	-5	-5	-5	-5	-5	-5	-5	-5	
Reflecting planes (x1)	3	3	3	3	3	3	3	3	
Façade level	42	36	28	23	14	9	7	5	26

Table 5 – Plant Area C

6.12 In order to comply with the requirements of the LPA, any noise from the proposed installation of mechanical plant in 'Plant Area C' should not exceed the following levels (based on achieving 5dB below the lowest measured background noise over the operational hours of the plant at 1m from the nearest noise sensitive façade):

- (a) 40 dBA during the daytime period
- (b) 39 dBA during the evening period
- (c) 26 dBA during the evening period

6.13 The calculated noise impact is 26dBA.

Basement Plant Room

6.14 The calculation exercise can be shown as follows. The plant selection is indicative.

All plant room equipment	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Dimplex SI 18TU	68	56	54	47	39	37	36	38	50
Grundfos Magna 3D	61	49	47	40	32	30	29	31	43
Water booster set	72	60	58	51	43	42	40	42	55
TOTAL plant room noise	74	62	60	53	45	43	42	44	56
TOTAL plant room noise L _w	85	73	71	64	56	54	53	55	67
Reverberant level in plantroom	70	58	56	49	41	40	38	40	53
Acoustic louvre SH300	7	7	10	17	29	30	27	21	
Distance attenuation	-10	-10	-10	-10	-10	-10	-10	-10	
Level at façade	48	36	31	17	0	0	0	4	26

Table 6 – Basement Plant Room

6.15 For the purposes of the calculations shown in Table 6, it has been assumed that the Water Booster sets will be contained within proprietary enclosures affording 10dB attenuation.

Swimming Pool AHU

- 6.16 Throughout the calculation exercise, guidance and formula were extracted from the publication *“Noise Control in Building Services”* (published by SRL).
- 6.17 The ductwork system attenuation was calculated by considering the attenuation of sound energy produced by each component of the ductwork system. As the swimming pool ventilation system has not yet been specified, an air handling unit from a similar project was utilised. This AHU featured in line attenuation on the atmosphere duct runs to reduce the in duct sound power level.
- 6.18 Noise leaving the ductwork system at the fresh air intake and exhaust air was propagated to the nearest noise sensitive façade using point source propagation. The calculation exercise (attached as Appendix B) provided the following noise impact:

	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Pool fresh air	7	14	10	6	6	6	6	6	13
Pool exhaust	6	13	8	6	6	6	6	6	13
Combined Level at nearest façade @ 2m	9	17	12	9	9	9	9	9	16

Table 7 – Swimming pool AHU

- 6.19 In order to comply with the requirements of the LPA, any noise from the proposed installation of the mechanical plant should not exceed a level of 26 dBA (5dB below the lowest measured background noise over the operational hours of the swimming pool AHU).
- 6.20 The calculated noise impact is 16dBA.

7. CONCLUSION

7.1 The foregoing assessment indicates that the proposed installation can meet the requirements imposed by the LPA. Mitigation measures to reduce the level of noise are included in the scheme. Lest there be any misunderstanding, the mitigation measures included in this report are as follows:

- (a) *All condenser enclosures and the plant room to be lined with a plant room wall lining system (such as CMS plant room wall liners) to ensure the noise within the enclosures is not increased due to reverberant sound;*
- (b) *Ventilation to plant room enclosure A through Caice Acoustic Louvre SS150;*
- (c) *Ventilation to plant room enclosure B through Caice Acoustic Louvre SS300;*
- (d) *Ventilation to plant room enclosure C through Caice Acoustic Louvre SS300;*
- (e) *Ventilation to plant room through Caice Acoustic Louvre SH300;*
- (f) *The swimming pool AHU within this document features in line attenuation on atmosphere supply and exhaust ducts;*
- (g) *The water booster set is located within an acoustic enclosure.*

7.2 If an alternative supplier or manufacturer of equipment is chosen, the acoustic performance should be checked prior to installation to ensure that the installation will still meet the requirements imposed by the LPA.

Figures

5 Templewood Avenue, London, NW3



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



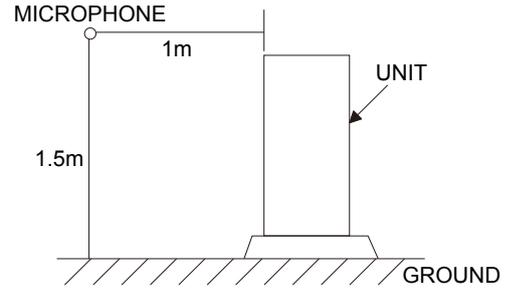
Figure 7



Figure 8

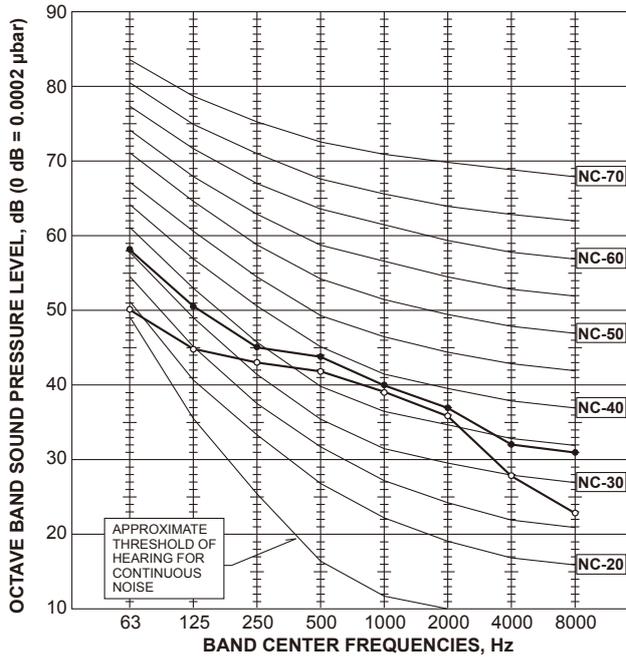
Appendix A

6-3. NOISE CRITERION CURVES



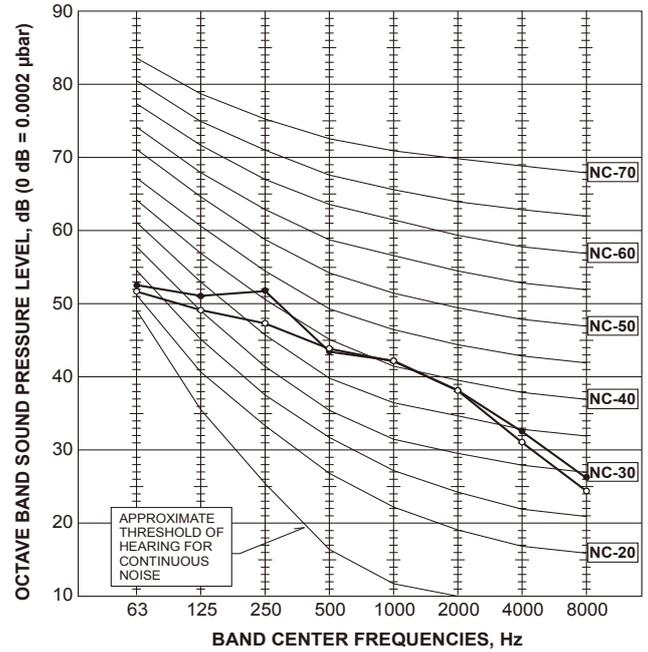
PUHZ-ZRP35VKA
 PUHZ-ZRP35VKAR1(-ER/-ET)
 PUHZ-ZRP50VKA
 PUHZ-ZRP50VKAR1(-ER/-ET)

MODE	SPL(dB)	LINE
COOLING	44	○—○
HEATING	46	●—●



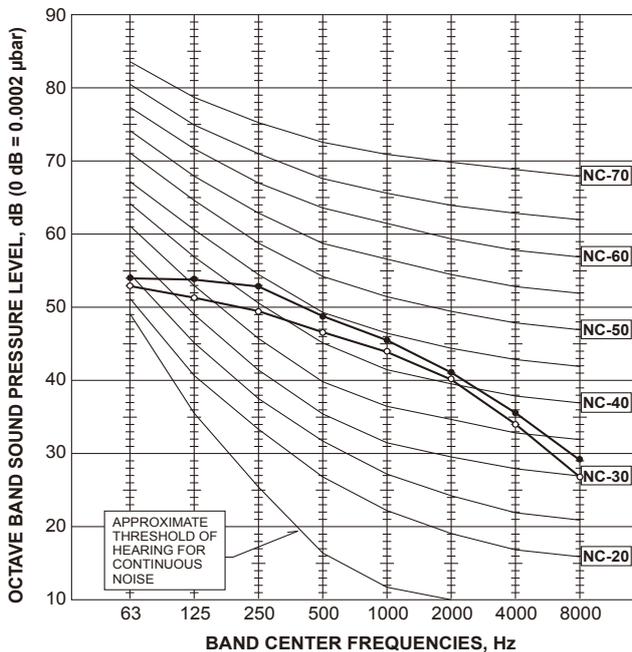
PUHZ-ZRP60VHA
 PUHZ-ZRP60VHAR1(-ER/-ET)
 PUHZ-ZRP71VHA
 PUHZ-ZRP71VHAR1(-ER/-ET)

MODE	SPL(dB)	LINE
COOLING	47	○—○
HEATING	48	●—●



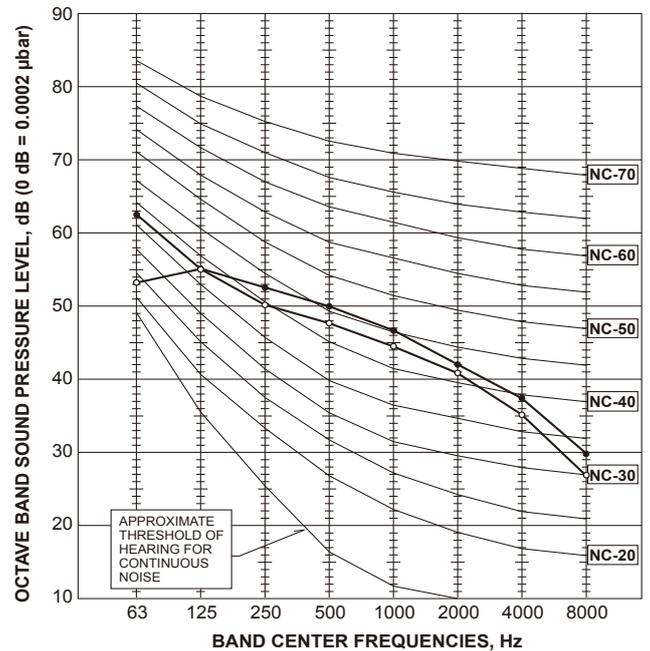
PUHZ-ZRP100VKA
 PUHZ-ZRP100YKA
 PUHZ-ZRP100YKAR1

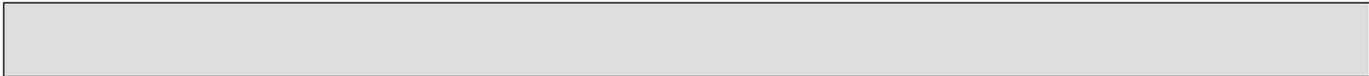
MODE	SPL(dB)	LINE
COOLING	49	○—○
HEATING	51	●—●



PUHZ-ZRP125/140VKA
 PUHZ-ZRP125/140YKA
 PUHZ-ZRP125/140YKAR1

MODE	SPL(dB)	LINE
COOLING	50	○—○
HEATING	52	●—●

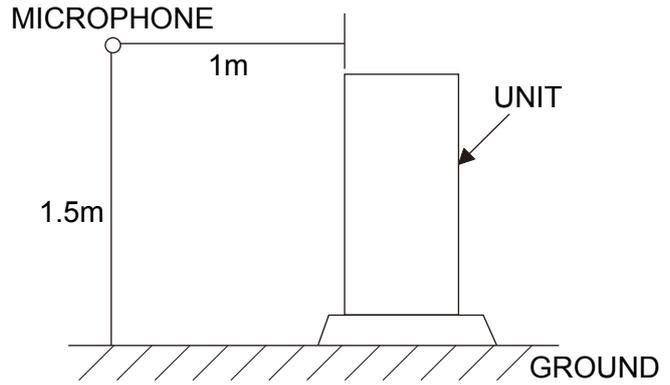
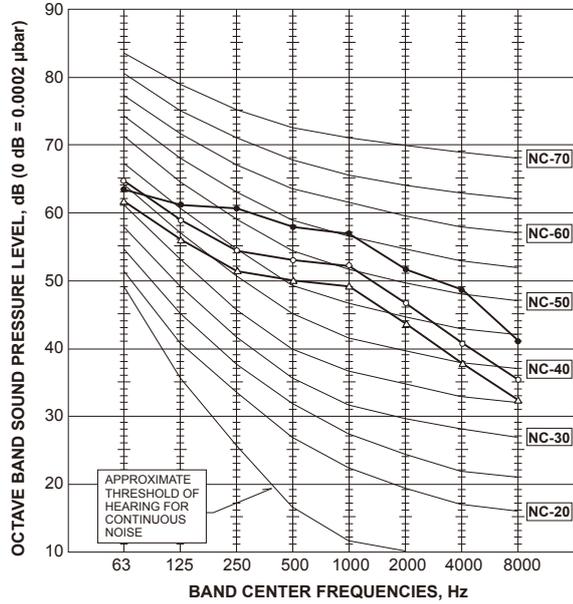




4-5. NOISE CRITERION CURVES

PUMY-P200YKM
PUMY-P200YKM-BS

MODE	SPL(dB)	LINE
COOLING	56	○—○
HEATING	61	●—●
COOLING SILENT MODE	53	△—△



Device information	SI 18TU
Design	
- Heat source	Brine
- Model	Universal design
- Regulation	WPM EconPlus, integrated
- Thermal energy metering	Integrated
- Installation location	Indoors
- Performance levels	1
Operating limits	
- Max. flow temperature 7)	62 °C +2 K
- Lower operating limit heat source (heating operation) / Upper operating limit heat source (heating operation)	-5 / 25 °C
- Antifreeze	Monoethylenglycol
- Minimum brine concentrate	25 %
Flow / sound	
- Max. heating water flow rate / Pressure drop	3 m³/h / 18000 Pa
- Minimum heating water flow rate / Pressure drop	1,5 m³/h / 4500 Pa
- Heat source flow (min.) / Pressure drop evaporator EN 14511	4,3 m³/h / 21500 Pa
- Sound power level device	50 dB (A)
- Sound pressure level in 1 m (indoors) 2)	38 dB (A)
Dimensions/weight and filling quantities	
- Dimensions (W x H x D) 3)	650 x 845 x 665 mm
- Weight	163 kg
- Thread type, heating connection / Connection heating	G / 1 ¼ inch
- Thread type, heat source connection / Heat source connection	G / 1 ½ inch
- Refrigerant / Amount of refrigerant	R410A / 5,2 kg
- Oil type / Oil quantity	Polyolester (POE) / 1,9 l
Electrical connection	
- Rated voltage / Fuse protection	3/PE ~400 V, 50 Hz / C 16 A
- Control voltage / Control voltage fuse protection	1/N/PE ~230 V, 50 Hz / C 13 A
- Degree of protection	IP 21
- Initial current limiter	Yes
- Starting current with soft starter	28 A
- Nominal power consumption according to EN 14511 at B0/W35 / Maximum electric power consumption 1)	3,72 / 7,2 kW
- Nominal current at B0/W35 / Nominal current cos phi	6,71 A / 0,8
Complies with the European safety regulations	
Additional model features	
- Water in device protected against freezing 4)	Yes
- Permissible operating overpressure	3 bar

Heat output / coefficient of performance (COP) according to EN 14511: 1)

Heating compressor 1	W35	W45	W55
B-5	15,37 kW / 4,09	14,90 kW / 3,20	15,54 kW / 2,81
B0	17,50 kW / 4,70	17,00 kW / 3,60	16,50 kW / 2,90
B10	22,30 kW / 5,70	21,50 kW / 4,50	20,80 kW / 3,50
B25	28,97 kW / 7,48	28,68 kW / 5,94	28,52 kW / 4,76

Note:

- 1) This data indicates the size and capacity of the system according to EN 14511. For an analysis of the economic and energy efficiency of the system, the bivalence point and regulation should be taken into consideration. These specifications can only be achieved with clean heat exchangers. Information on maintenance, commissioning and operation can be found in the respective sections of the installation and operating instructions. The specified values have the following meaning, e.g. A7 / W35: Heat source temperature 7 °C and heating water flow temperature 35 °C.
- 2) The specified sound pressure level corresponds to the operating noise of the heat pump in heating operation with a flow temperature of 35°C. The specified sound pressure level represents the free sound area level. The measured value can deviate by up to 16 dB(A), depending on the installation location.
- 3) Please note that additional space is required for pipe connections, operation and maintenance.
- 4) The heat circulating pump and the heat pump manager must always be ready for operation.
- 7) Depending on the heat pump type and refrigerant used, the maximum flow temperatures in heating operation may be reduced when the outside temperature falls. Further information can be found in the operating limit diagram for the heat pump. If the supporting feet are used, the level can increase by up to 3 dB (A).

Heatstar Project Ref: P6725 11-Mar-2014

Project Title:

System specified : **Andromeda EC 500 Super Plus**

Mains Electricity: 3 ph-Neutral-Earth 400v / 50 Hz Protected supply or
1 ph-Neutral-Earth 230v / 50 Hz Protected supply

Supply rating : Three phase: 6 Amps/phase. or
Single phase 14 Amps.

F.L. Running current : Three phase: 3 Amps/phase. or
Single phase 5 Amps.

Protection required : RCD (30mA) / Short circuit (MCB) / local isolator switch.

Other wiring available : Volt free switch contact to request LTHW demand.

Air Flow Rating:

Supply/Return Air Flow:	1,000 M ³ /Hr.
Max. External Res.:	150 Pa
Exhaust/Fresh Air Flow:	44 M ³ /Hr.
Max. External Res.:	30 Pa

Linear Sound Power	Frequency Hz	Return air	Supply air	Fresh air	Exhaust air
<i>Lw dB :</i>	63	67.9	65.1	32.8	33.8
	125	69.1	66.2	33.1	34.8
	250	66.9	64.1	31.9	33.8
	500	67.9	65.1	32.2	34.5
	1000	65.1	62.3	30.8	33.1
	2000	66.9	64.1	31.7	34.1
	4000	64.3	61.5	30.5	32.7
	8000	55.4	52.6	26.2	28.0

Condensate Water Drain:

Max. rate of flow : 4.1 L/Hr.
Pipe connection : 22 mm PVC / compression
Trapping required : 100 mm Minimum height 'P' trap.

L.T.H.W. Supply: (From Fuel Boiler)

Rated Flow / Rtn temp :	(Closed circuit Flow/return)	70 / 50	°C
Supply output rating :	15 kW /	51,000	BTUs
Flow rate required :	0.18 L/Sec @	6.8 kPa	Internal Res.
Pump size for flow :	(Or equivalent duty model)	UPS 15-60	
Connection size / type:	28 mm Copper / Compression		
Other requirements :	Automatic by-pass valve.		

Pool Water Supply:

Connection size / type:	1.5 Inch PVC / Couplers on balanced by-pass.
Flow rate required :	1.5 L/Sec @ 0.4 kPa Internal Res.

Refrigerant Data : 1.2 kG of R407C : Hermetically sealed. E&OE

Appendix B

ACOUSTICS
PLUS

CONTRACT TITLE: 5 Templewood Avenue
SOUND SOURCE: Swimming Pool Air Handling Unit (Exhaust Air)
MAKE & TYPE: Heatstar Andromeda EC 500 Super Plus

OVERALL Lw	OCTAVE BAND CENTRE FREQUENCY (Hz)									dBA	
	63	125	250	500	1k	2k	4k	8k			
1											
2	UNIT Lw									40	
3											
4	STRAIGHT DUCT										
5	LENGTH (m)	SIZE (mm)									
6	5.00	500 x 500		4.10	3.30	1.65	0.80	0.80	0.80	0.80	
7				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	
9				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	
11	BENDS & TAKE OFFS										
12	NO.	TYPE	SIZE (mm)								
13	1	90°	500 x 500	0.00	0.00	6.00	8.00	4.00	3.00	3.00	
14				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	
16				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	
18				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
19	OTHER ATTENUATION										
20	Caice Acoustic louvre SH300			7	7	10	17	29	30	27	21
21											
22											
23											
24	END REFLECTION SIZE (mm)										
25	500mm			9	4	1	0	0	0	0	0
26											
27	Lw LEAVING SYSTEM										
28											
29	DISTANCE TO LISTENER (m)	2		-17	-17	-17	-17	-17	-17	-17	
30	DIRECTIVITY OUTLET										
31	REVERBERANT CORRECTION										
32	NOISE IMPACT									13	

ACOUSTICS
PLUS

CONTRACT TITLE: 5 Templewood Avenue
SOUND SOURCE: Swimming Pool Air Handling Unit (Fresh Air)
MAKE & TYPE: Heatstar Andromeda EC 500 Super Plus

OVERALL Lw	OCTAVE BAND CENTRE FREQUENCY (Hz)									dBA	
	63	125	250	500	1k	2k	4k	8k			
1											
2	UNIT Lw									38	
3											
4	STRAIGHT DUCT										
5	LENGTH (m)	SIZE (mm)		0.82	0.66	0.33	0.16	0.16	0.16	0.16	0.16
6	5.00	500 x 500		4.10	3.30	1.65	0.80	0.80	0.80	0.80	0.80
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)			6	8	4	3	3	3
13	1	90°	500 x 500	0.00	0.00	6.00	8.00	4.00	3.00	3.00	3.00
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	Caice Acoustic louvre SH300			7	7	10	17	29	30	27	21
21											
22											
23											
24	END REFLECTION SIZE (mm)										
25	500mm			9	4	1	0	0	0	0	0
26											
27	Lw LEAVING SYSTEM									1	
28											
29	DISTANCE TO LISTENER (m)	2									-17
30	DIRECTIVITY OUTLET									9	
31	REVERBERANT CORRECTION									6	
32	NOISE IMPACT									13	