

DOCUMENT REFERENCE: HA/AC488/V1

NOISE IMPACT ASSESSMENT:

2X AIR CONDITIONING CONDENSER UNITS

161 CAMDEN HIGH STREET, CAMDEN,
LONDON NW1 7JY



Our Ref HA/AC488/V1
Site Address 159-161 Camden High Street, Camden, London NW1 7JY
For DMG-SX Holdings Ltd
Client Address 3 New Mill Court, Swansea, Enterprise Park, Swansea SA7 9FG
Date of Report 4 January 2021
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This report has been prepared by Healthy Abode Limited t/a HA Acoustics with all reasonable expertise, care and diligence. The survey and report has been undertaken in accordance with accepted acoustic consultancy principles, it takes account of the services and terms and conditions agreed verbally and in writing between HA Acoustics and our client. Any information provided by third parties and referenced is considered to have undergone suitably thorough third-party checks to ensure accuracy. We can accept no liability for errors with a third-party data. This report is confidential to our client and therefore HA Acoustics accepts no responsibility whatsoever to third parties unless formally agreed in writing by HA Acoustics. Any such party relies upon the report at their own risk.

EXECUTIVE SUMMARY

- DMG-SX Holdings Ltd instructed Healthy Abode Ltd t/a as HA Acoustics to undertake a noise impact assessment for the proposed installation of 2x Air Conditioning Condenser Units at 159-161 Camden High Street, Camden, London NW1 7JY.
- HA Acoustics has undertaken an environmental noise survey at the site in order to determine prevailing background noise levels that are representative of the nearest noise sensitive receptor (NSR). The nearest NSR to the proposed plant installation is the rear façade of the residential property at first floor level within the site building, located approximately 12.5 metres from the proposed plant location.
- A baseline noise survey and assessment has been undertaken in line with the guidance contained in BS 4142: 2014 +A1: 2019, measurements being taken over continuous 15-minute periods.
- The unattended survey was conducted on Thursday 10th December 2020 and Friday 11th December 2020, at a fixed monitoring point, located at the rear of the site.
- The operation of the mechanical plant shall be as required, 12:00 – 23:00 hours Monday to Sundays, including bank holidays.
- The typical background noise level has been calculated at 48dB L_{A90,15mins}.
- Noise calculations of the proposed plant have been undertaken using all available details and plans provided by the client and obtaining manufacturers' specifications. The resultant sound pressure level has been calculated at the NSR at 31 dB(A).
- In accordance with BS 4142:2014 +A1: 2019 guidance, the noise impact from the operation of the proposed plant ***"is an indication of the specific sound source having a low impact"*** at the NSR.

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1. INTRODUCTION

- 1.1. DMG-SX Holdings Ltd instructed Healthy Abode Ltd t/a HA Acoustics to undertake a noise impact assessment at 159-161 Camden High Street, Camden, London NW1 7JX for submission as part of documentation to be provided to the Local Authority, London Borough of Camden Council.
- 1.2. 159-161 Camden High Street is proposing to install 2x Air Conditioning Condenser Units at the rear of the premises to service the commercial property, the noise from which could have the potential to affect existing noise sensitive properties nearby.
- 1.3. The purposes of this report are:
 - 1.3.1. To determine prevailing environmental noise levels affecting surrounding properties due to nearby noise sources (e.g. road traffic, commercial plant etc.);
 - 1.3.2. Based on the above, to present noise emission limits in accordance with the requirements of BS 4142: 2014 +A1: 2019, and
 - 1.3.3. To undertake an assessment to demonstrate compliance with the Local Authority noise requirements.

2. SITE DESCRIPTION

- 2.1 159-161 Camden High Street, Camden, London NW1 7JY (hereafter referred to as 'the site') is a commercial premises at ground floor level with residential premises located directly above.
- 2.2 The site is located on a busy high street, with commercial premises located on the ground floor of the neighbouring premises, residential premises are located above these commercial units. The site fronts onto Camden High Street to the east. Camden Town Underground Station is located approximately 135m to the north of the site. There is a car parking area and loading bay located to the rear of the site along Underhill Street, this area is associated with the neighbouring M&S Foodhall premises.
- 2.3 The nearest noise sensitive receptor (NSR) located to the proposed plant location is noted to be the rear façade of the residential dwellings located above the commercial property, at approximately 12.5 metres from the plant, with no line of sight. It can be confidently assumed that if the noise impact assessment indicates that the specific sound source has a low impact at this premises then it can be safely assumed it will be met at other properties of equal distance and/or those further away.
- 2.4 At the time of installation and collection of the monitoring equipment, the dominant noise sources emanated from road traffic, overhead airplane movements and some commercial and residential activity noise. These noise sources are considered normal to the site location. No significant abnormal noise sources were identifiable. It is considered that the measured noise levels are reasonable given the location of the measurement position.

3. ENVIRONMENTAL NOISE SURVEY METHODOLOGY

3.1 An unmanned environmental noise survey was undertaken at a single measurement location at the rear of the site. The survey was undertaken between 15:00 hours on the Thursday 10th December 2020 and 15:30 hours on Friday 11th December 2020.

3.2 The sound level meter (SLM) was positioned approximately 1 metres from the rear façade of the property and other walls/fence and mounted onto a tripod approximately 1.5 metres above ground level. The position is not considered to be 'free-field' therefore acoustic corrections of -3dB have been applied to the measurements. The position is considered to be representative of background noise levels at the nearest identified NSR. The monitoring position is identified in Appendix A.

3.3 The equipment used for the noise survey is summarised in Table 3.1.

Equipment	Description	Quantity	Serial Number
Svante 977	Class 1 automated logging sound level meter	1	69297
ACO Pacific 7052E	Class 1 ½" microphone	1	69364
Svante SV33A	Class 1 Calibrator	1	58815

Table 3.1 Description of Equipment used for Noise Survey

3.4 Ambient, background and maximum noise levels (L_{Aeq} , L_{A10} , L_{A90} and L_{AmaxF} respectively) were measured throughout the noise survey in consecutive 15-minute periods.

3.6 The noise survey and measurements were conducted, wherever possible, in accordance with BS7445-1:2003 '*Description and measurement of environmental noise. Guide to quantities and procedures*'. Measurements were made generally in accordance with ISO 1996-2:2007 '*Acoustics – Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels*'. Weather conditions were noted to be: cold to mild (approximately 7-11° Celsius), generally dry, with cloudy skies (approximately 50-80% cloud cover) and a light wind (<5m/s).

3.7 These weather conditions were checked against and confirmed by the use of the Met Office mobile application available on smart phone technology. These conditions were maintained throughout the whole survey period and are considered reasonable for undertaking environmental noise measurements. The noise monitoring equipment was calibrated before and after the noise survey period. No significant drift was recorded. Equipment calibration certificates can be provided upon request.

4. EXTERNAL NOISE EMISSION CRITERIA

4.1. National Planning Policy Framework

4.2. In March 2012, the National Planning Policy Framework (NPPF) came into force and was revised in February 2019. This document replaces a great many planning guidance documents, which previously informed the planning system in England.

4.3. The NPPF (2019) sets out the Government's economic, environmental and social planning policies for England and these policies articulate the Government's vision of sustainable development.

4.4. The Noise Policy Statement for England (NPSE) published 2010 applies to *'all forms of noise, including environmental noise, neighbour noise and neighbourhood noise'*.

4.5. Paragraph 180 of the NPPF (2019) considers noise, stating:

4.5.1. *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

- *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- *c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."*

4.6. National Planning Policy is guided by the NPPF. With regard to noise, the terms 'significant adverse impact' and 'other adverse impacts' are defined in the explanatory notes of the 'Noise Policy Statement for England' (NPSE). These state that there are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

- 'NOEL – No Observed Effect Level, this is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise, and

- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.

4.7. Extending these concepts for the purpose of this NPSE leads to the concept of SOAEL - significant observed adverse effect level. This is the level above which significant adverse effects on health and quality of life occur'. However, no specific noise limits for LOAEL and SOAEL have been defined. Therefore, guidance from other acoustic standards must be employed to determine suitable levels within the overall principal of the National Planning Policy Framework; such as BS 4142:2014.

4.8. Local Authority Criteria

4.9. The proposed site lies within the jurisdiction of the Local Authority, London Borough of Camden. An acoustic report is required to support a planning application as stipulated below (from Appendix 3: Noise thresholds - Camden Local Plan 2017):

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL _{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L _{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL _{Amax}

*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

**levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.

4.10. It is understood that the business will be operating Monday-Sunday, 12:00 – 23:00 hours. The noise criteria will therefore be set 10 dB below the typical background levels during operating hours. In this case the criteria to be met is a maximum rating noise level of 38dB L_{Ar,Tr}, when measured at the NSR.

4.11. **BS 4142: 2014 +A1: 2019**

4.12. BS 4142: 2014 +A1: 2019 “Methods for Rating and Assessing Industrial and Commercial Sound” presents a method for assessing the significance and possible adverse impact due to an industrial or commercial noise source, based on a comparison of the source noise levels and the background noise levels, both of which are measured or predicted at a noise sensitive receiver e.g. a residential property.

4.13. The specific noise level due to the source is determined, with a series of corrections for tonality, impulsivity, intermittency or any other unusual characteristic. This can result in a maximum total correction of +21dB being added if the new noise source demonstrates all the above characteristics. The background noise level is then subtracted from the rating level and a comparison made.

4.14. The significance of the new noise source and the likelihood of any adverse impact is determined in accordance with the following advice:

“The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.

- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.”*

5. NOISE SURVEY RESULTS

5.1. The ambient and background noise levels at the measurement position as seen in Appendix A are provided below and have been based on an analysis of the monitoring data.

5.2. A summary of the data results is provided in Table 5.1. The time history can be seen in Appendix B (TH1).

	Ambient Noise Level $L_{Aeq, 15min}$	Typical Background Noise Level $L_{A90, 15min}$
Day (07:00 – 23:00)	52dB*	46dB*
Night (23:00 – 07:00)	49dB*	45dB*
Operating Hours (Monday – Sunday, 12:00 – 23:00 hours)	52dB*	48dB*

*includes -3dB facade noise correction

Table 5.1 Summary of typical noise measurement data

5.3. These noise levels are considered normal to the site location. No significant abnormal noise sources were identifiable during installation or collection of the equipment. It is considered that the measured noise levels are reasonable given the location of the measurement position.

6. NOISE IMPACT ASSESSMENT

6.1 It is proposed to install two air conditioning condenser units (1x Mitsubishi PUZ-ZM60VHA and 1x Mitsubishi PUZ-ZM140VKA) to the rear of the premises at ground floor level. Calculations have been undertaken to gain the specific noise level of the plant using information provided by the client and from manufacturer specifications.

6.2 Table 6.1 lists the proposed plant to be installed and its operational maximum sound pressure level.

Plant Make/Model	Reference Sound Pressure Level at 1m*
Mitsubishi PUZ-ZM60VHA	49 dB
Mitsubishi PUZ-ZM140VKA	52 dB

* Manufacturer's specifications are provided in Appendix C.

Table 6.1 Proposed plant

6.3 Table 6.2 lists the sound pressure spectral data for the plant.

	Frequency Spectral Data (Hz) at 1m								
	LZFeq 63	LZFeq 125	LZFeq 250	LZFeq 500	LZFeq 1000	LZFeq 2000	LZFeq 4000	LZFeq 8000	dB(A)
PUZ-ZM60VHA (Heating Mode)	53	52	53	44	42	39	33	27	49
PUZ-ZM140VKA (Heating Mode)	62	55	52	50	47	42	38	30	52

Table 6.2 Spectral sound data

6.4 Detailed calculations to predict the noise level of the plant at the NSR are given in Appendix D. The following factors have been taken into account during the assessment and within the calculations.

6.5 There is no line of sight between the plant and the NSR. This screening is conservatively estimated to provide 10 dB noise attenuation. This will be accounted for in the calculations.

6.6 A 'penalty' addition has been added to the fans for intermittency as the operation is considered to be such that it has defined on/off conditions and could attract attention at the NSR. A penalty has not been applied for tonality as spectral data of the fans show no significant tonal characteristics. Penalty

additions have not been applied for impulsiveness or any other unusual characteristics as plant of this type generally do not generate such features.

6.7 Detailed calculations to predict the noise level of the plant at the NSR are given in Appendix D. The rating noise level at the NSR is **31 dB L_{A,T,r}** and **17 dB(A) below** the assessed background noise level (48 dB L_{A90,15mins}). In accordance with BS 4142:2014 guidance, the rating noise ***“is an indication of the specific sound source having a low impact”***. *The lower the rating level is relative to the measured background level, the less likely it is that the specific sound source will have an adverse impact.*

6.8 Vibration from plant is not expected. However, as a precaution, all plant should be installed with anti-vibration isolators. Anti-vibration mounts are widely available from system suppliers/installers and shall need to be installed in accordance with the type, make and model of the mechanical plant specified. Anti-vibration mounts are often in pedestal rubber mountings. Examples of these are MPO and MP1, and ISL Maxi pedestal vibration mounts. These types of anti-vibration and shock isolators are industry standard and commonplace on air conditioning and ventilation systems. They are designed to provide medium to high frequency isolation from vibration and noise via high resilience rubber. Once type, location, manufacturer make and model of proposed mechanical plant is known, the M+E contractor shall be able to advise upon the specific anti-vibration isolators required to ensure no adverse impact occurs.

6.9 As BS 4142:2014 advises, the impact must be considered within the context of the site and the surrounding acoustic environment. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:

6.9.1 The assessment is undertaken at the most affected existing residential windows. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.

6.9.2 The site is located within a busy urban area with other comparable uses with similar plant located within the vicinity.

6.9.3 It should be noted that the above assessment is based on the plant operating simultaneously and at maximum duty. Given that the plant will not operate simultaneously at maximum

capacity all of the time, the above assessment is considered to be representative of the worst case.

6.10 British Standard 8233:2014 '*Sound insulation and noise reduction for buildings – Code of Practice*' gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS8233:2014 recommends 30dB(A) as being acceptable internal resting/sleeping conditions during night-time. According to BS8233:2014, the façade of a residential dwelling; with a window partially open for ventilation offers 15 dB attenuation. Therefore, taking into account this reduction for a partially open window the internal noise level with the plant operating would be 16 dB(A) which is lower than the acceptable internal noise level as seen under BS8233: 2014; and significantly lower than the background.

7. UNCERTAINTY

7.1 The levels of uncertainty in the data and calculations are considered to be low given the robust exercise undertaken in noise monitoring and the confidence in the statistical analysis.

7.2 All measurements taken on-site by instrumentation are subject to a margin of uncertainty. This is relatively small, with a sound level meter manufacturer's margin of uncertainty at $\pm 1.1\text{dB}$. It is due to the tolerances associated with the Class 1 sound level meter and calibrator equipment used to measure background.

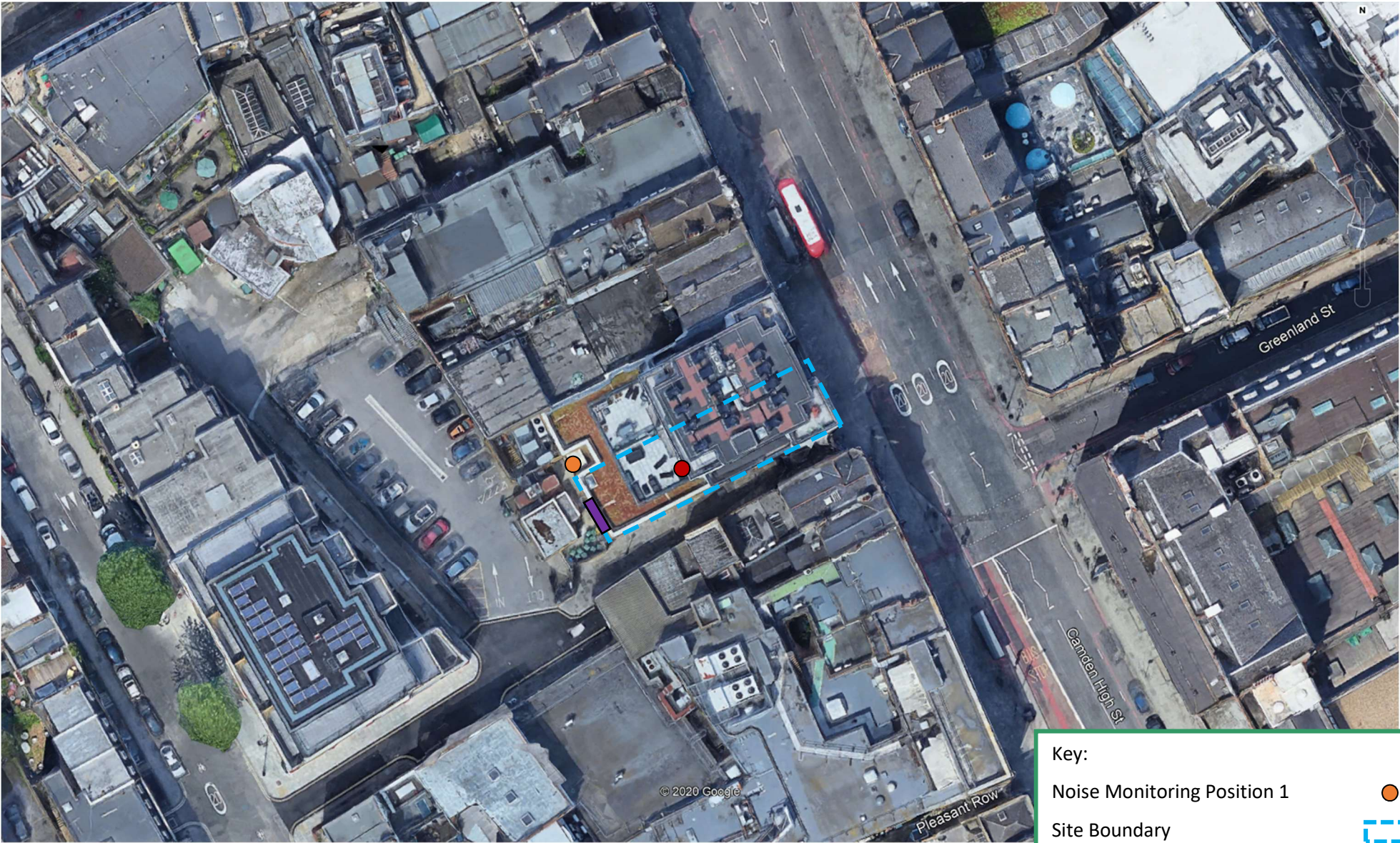
7.2.1 The meter and calibrator used have a traceable laboratory calibration and were field calibrated before and after the measurements.





7.3 Manufacturers' data for the plant is likely to be robust. Detailed calculations and resultant noise levels at the residential location are considered to be confidently predicted.

7.4 Uncertainty in the calculated impact has been reduced by the use of a well-established calculation method.

8. CONCLUSION

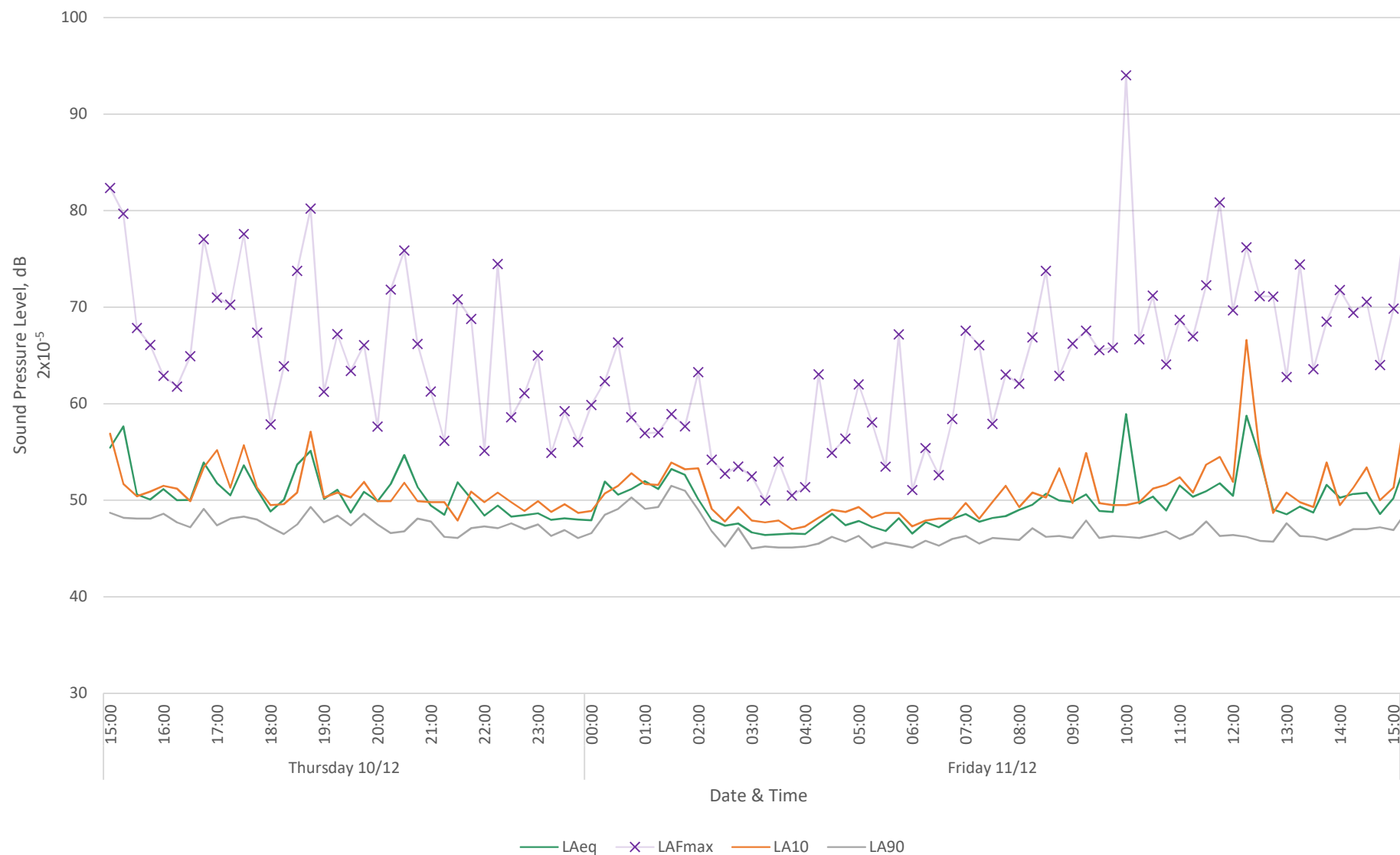
- 8.1. A noise assessment has been undertaken at 159-161 Camden High Street, Camden, London NW1 7JY. The noise survey was undertaken at a fixed monitoring point, representative of the nearest noise sensitive receptor.
- 8.2. Following on-site measurement of pre-existing noise levels, calculations have been made of the noise rating level of the proposed plant at the NSR. From this assessment, together with information from the plant manufacturer, the potential noise impact has been determined.
- 8.3. The Rating Noise Level from the plant at the NSR is predicted to be **31 dB $L_{Ar,Tr}$** .
- 8.4. BS 4142: 2014 +A1: 2019 assessment methodology shows that the rating noise level from the air conditioning condenser units is predicted to be **17 dB(A) below** the typical background of **48 dB $L_{A90,15mins}$** at the NSR. In accordance with BS 4142:2014, noise levels from the plant ***“is an indication of the specific sound source having a low impact”*** at the NSR.
- 8.5. Considering the results of the noise survey, the illustrative layouts and the calculations, the predicted resultant noise levels from the proposed plant are predicted to meet appropriate and reasonable guidance and the relevant noise criteria. Therefore, an adequate level of protection against noise for occupants of the nearest noise sensitive receptor is afforded; including when factoring in potential uncertainty.



Key:	
Noise Monitoring Position 1	
Site Boundary	
Noise Sensitive Receiver	
Proposed Plant Location	

Appendix B - Time History 1 (TH1)

159-161 Camden High Street, Camden, London
Thursday 10th December 2020 - Friday 11th December 2020



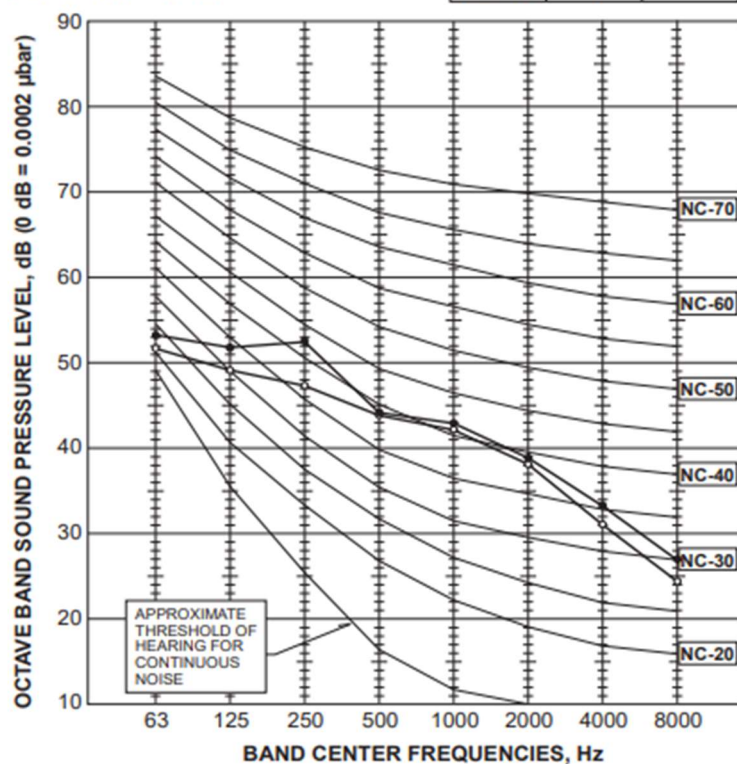


PLA-ZM - INDOOR UNITS		PLA-ZM35EA	PLA-ZM50EA	PLA-ZM60EA	PLA-ZM71EA	PLA-ZM100EA	PLA-ZM125EA	PLA-ZM140EA
CAPACITY (kW)	Heating (nominal)	4.1 (1.6-5.2)	6.0 (2.5-7.3)	7.0 (2.8-8.2)	8.0 (3.5-10.2)	11.2 (4.5-14.0)	14.0 (5.0-16.0)	16.0 (5.7-18.0)
	Cooling (nominal)	3.6 (1.6-4.5)	5.0 (2.3-5.6)	6.1 (2.7-6.5)	7.1 (3.3-8.1)	9.5 (4.9-11.4)	12.5 (5.5-14.0)	13.4 (6.2-15.0)
COP / EER (nominal)		5.00 / 5.10	4.40 / 4.52	4.10 / 4.20	4.40 / 4.30	4.30 / 4.60	3.81 / 3.70	3.71 / 3.60
SCOP / SEER (BS EN14825)		4.70 / 7.50	4.90 / 7.60	4.60 / 7.20	4.80 / 7.60	4.80 / 7.70	4.70 / 7.40	4.60 / 7.00
ERP ENERGY EFFICIENCY CLASS		A++ / A++	A++ / A++	A++ / A++	A++ / A++	A++ / A++	A++ / A++	A++ / A++
AIRFLOW (l/s)		183-217-250-267	200-233-267-300	200-233-267-300	283-317-350-383	317-367-417-467	350-400-433-483	400-433-483-533
PIPE SIZE MM (in)		12.7 (1/2") / 6.35 (1/4")	12.7 (1/2") / 6.35 (1/4")	15.88 (5/8") / 9.52 (3/8")	15.88 (5/8") / 9.52 (3/8")	15.88 (5/8") / 9.52 (3/8")	15.88 (5/8") / 9.52 (3/8")	15.88 (5/8") / 9.52 (3/8")
SOUND PRESSURE LEVEL (dBA)		26-28-29-31	27-29-31-32	27-29-31-32	28-30-33-36	31-34-37-40	33-36-39-41	36-39-42-44
SOUND POWER LEVEL (dBA)		51	54	54	57	61	62	65
DIMENSIONS (mm)		Width x Depth x Height (Grille)	840 (850) x 840 (850) x 258 (40)	840 (850) x 840 (850) x 258 (40)	840 (850) x 840 (850) x 258 (40)	840 (850) x 840 (850) x 298 (40)	840 (850) x 840 (850) x 298 (40)	840 (850) x 840 (850) x 298 (40)
WEIGHT (kg)		Unit / Grille	21 / 5	21 / 5	21 / 5	24 / 5	26 / 5	26 / 5
ELECTRICAL SUPPLY		Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit
FUSE RATING (BS88) - HRC (A)		6	6	6	6	6	6	6
INTERCONNECTING CABLE NO. CORES		4	4	4	4	4	4	4
GRILLE REFERENCE		PLP-6EA	PLP-6EA	PLP-6EA	PLP-6EA	PLP-6EA	PLP-6EA	PLP-6EA
WIRED REMOTE CONTROLLER REFERENCE		PAR-33MAA	PAR-33MAA	PAR-33MAA	PAR-33MAA	PAR-33MAA	PAR-33MAA	PAR-33MAA

PUZ-ZM - OUTDOOR UNITS		PUZ-ZM35VKA	PUZ-ZM50VKA	PUZ-ZM60VHA	PUZ-ZM71VHA	PUZ-ZM100VKA	PUZ-ZM125VKA	PUZ-ZM140VKA
SOUND PRESSURE LEVEL (dBA)		Heating/Cooling	46 / 44	46 / 44	49 / 47	49 / 47	51 / 49	52 / 50
SOUND POWER LEVEL (dBA)		Cooling	65	65	67	67	69	70
WEIGHT (kg)			46	46	70	70	116	118
DIMENSIONS (mm)		Width x Depth x Height	809 x 300 x 630	809 x 300 x 630	950 x 330 + 25 x 943	950 x 330 + 25 x 943	1050 x 330 + 40 x 1338	1050 x 330 + 40 x 1338
ELECTRICAL SUPPLY			220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz
PHASE			Single	Single	Single	Single	Single	Single
SYSTEM POWER INPUT (kW)		Heating/Cooling (nominal)	0.820 / 0.705	1.363 / 1.106	1.707 / 1.452	1.818 / 1.651	2.604 / 2.065	3.674 / 3.378
FUSE RATING (BS88) - HRC (A)			16	16	25	25	32	40
MAINS CABLE NO. CORES			3	3	3	3	3	3
MAX PIPE LENGTH (m)			50	50	55	55	100	100
MAX HEIGHT DIFFERENCE (m)			30	30	30	30	30	30
CHARGE REFRIGERANT (kg) / CO ₂ EQUIVALENT (t)		R32 (GWP 675) - 30m	2.0 / 1.35	2.00 / 1.35	2.80 / 1.89	2.80 / 1.89	4.00 / 2.70	4.00 / 2.70
MAX ADDITIONAL REFRIGERANT (kg) / CO ₂ EQUIVALENT (t)		R32 (GWP 675)	0.30 / 0.20	0.30 / 0.20	0.80 / 0.54	0.80 / 0.54	2.80 / 1.89	2.80 / 1.89

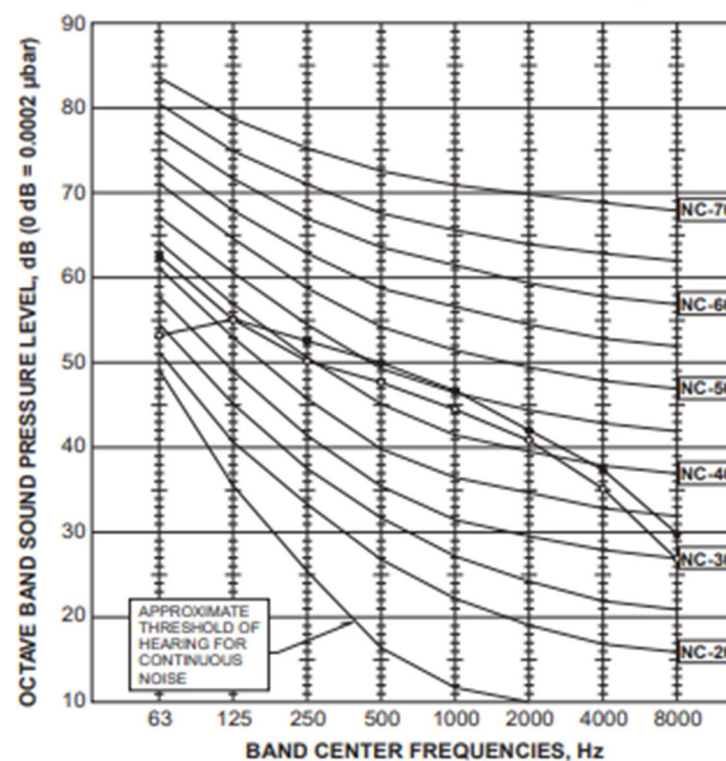
PUZ-ZM60VHA
PUZ-ZM71VHA

MODE	SPL(dB)	LINE
COOLING	47	○—○
HEATING	49	●—●



PUZ-ZM125VKA.UK
PUZ-ZM140VKA.UK
PUZ-ZM125YKA.UK
PUZ-ZM140YKA.UK

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



Appendix D - HA Calculations



Noise Sensitive Receiver 1

1x Mitsubishi PUZ-ZM60VHA + 1x Mitsubishi PUZ-ZM140VKA

	Frequency Spectral Data (Hz)								
	63	125	250	500	1000	2000	4000	8000	dB(A)
Mitsubishi PUZ-ZM60VHA	53	52	53	44	42	39	33	27	49
Mitsubishi PUZ-ZM140VKA	62	55	52	50	47	42	38	30	52
Cumulative Plant Sound Pressure Level at 1m	63	57	56	51	48	44	39	32	54
Distance Propagation	-22	-22	-22	-22	-22	-22	-22	-22	
Reflections	6	6	6	6	6	6	6	6	
BS4142 Penalty for Intermittancy	3	3	3	3	3	3	3	3	
No Line of Sight	-10	-10	-10	-10	-10	-10	-10	-10	
Calculated level at Receiver 1	40	34	33	28	25	21	16	9	31

Noise Criteria	38
No Observed Affect Level	

BS8233: Internal Night Time Levels

	Frequency Spectral Data (Hz)								
	63	125	250	500	1000	2000	4000	8000	dB(A)
Calculated level at NSR	40	34	33	28	25	21	16	9	31
Partially Open Window Attenuation	-15	-15	-15	-15	-15	-15	-15	-15	
Calculated level in Internal Receiver	25	19	18	13	10	6	1	-6	16

BS8233 Night Time Criteria	30
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