



Noise Impact Assessment

Site Address: 45-47 Thomas Street, Manchester, M4 1NA

Client Name: Bradley Parkins

Project Reference No: NP-011786



Authorisation and Version Control

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Revision	Date	Summary of Amendments
003	11/11/2024	Updated site layout.

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1. Introduction

NOVA Acoustics Ltd has been commissioned to prepare a noise impact assessment for a mixed-use development comprised of a bar, events room and retail space ('the proposed development') at 45-47 Thomas Street, Manchester, M4 1NA ('the site').

This report has been prepared to accompany the planning application to be submitted to the Local Planning Authority ('LPA'); Manchester City Council.

A noise survey has been undertaken to establish the prevailing sound levels at the proposed development and the closest noise sensitive receptors ('NSR'). The findings have been subsequently used to assess the suitability of the site for the proposed use. Measures required to mitigate noise impacts from the proposed development have been assessed in accordance with the relevant performance standards, legislation, policy, and guidance.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.1 Standards, Legislation, Policy & Guidance

The following performance standards, legislation, policy and guidance have been considered to ensure good acoustic design in the assessment:

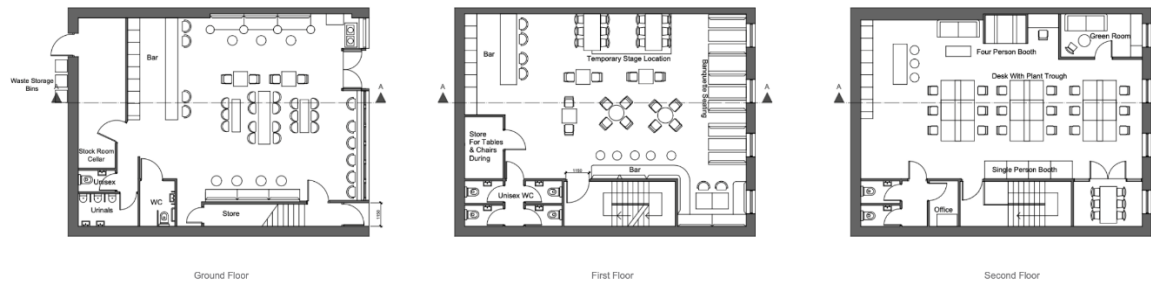
- The LPAs technical guidance, specifically; Manchester City Council 'Planning and Noise Technical Guidance' (2022)
- National Planning Policy Framework (2023).
- Noise Policy Statement for England (2010).
- British Standard BS4142:2014+A1:2019 – 'Methods on rating and assessing industrial and commercial sound'.
- IEMA 'Guidelines on Noise Impact' (2014).
- 'The Good Practice guide on the Control of Noise from Pubs and Clubs (NANR92)'

Further information on the legislation can be found in Appendix B.

1.2 Proposal Brief

The proposal is for the change of use of the existing site into a ground floor bar / record shop with a first-floor yoga/wellness studio during the day and an events room during the evening / night. The top floor will be a co-working space that will close at night. There is an existing external seating area on Thomas Street which is presently used by the customers of the neighbouring bars. Once the proposed operation at 45/47 Thomas Street begins trading, this area will be used by their patrons. Whilst this area is already in use for external seating used by the existing bars, we have included it within this assessment for completeness.

Figure 1 overleaf shows the layout of the proposed development.



Drawing Ref as per email dated 11.11.2024.

Figure 1 – Proposed Development Layout

The layout of the scheme will be as follows in the table below. The opening hours of each floor are also presented.

Floor	Use	Opening Hours
Ground	Bar / Record Shop	08:00 to 03:00 hours
First	Yoga & Wellness Studio (Day) / Events Room (Evening/Night)	08:00 to 03:00 hours (Events room at 19:00 hours)
Second	Co-working Space	08:00 to 18:00 hours

Table 1 – Operating Times of Proposed Development

The following details have also been provided in relation to the scheme:

- 3no. heat pumps have been proposed and a noise impact assessment has been carried out based on these in Section 6.
- There are 2no. existing plant items that will be recommissioned as part of the proposed development that are located to the rear of the site (northern elevation).
- The patron area to the front of the proposed development is to have a (assumed) maximum capacity of 20 No. patrons. This is expected to be in use only during daytime hours.
- It is understood that the first-floor events area will showcase live music acts and DJ's and this will be incorporated into the noise impact assessment.
- Currently the scheme has single or double glazing across each floor, and it is understood that the ground floor single glazing will be replaced with new double glazing. Secondary glazing will be installed on the upper floors.

1.3 LPA Criterion

At this stage, it is understood that the LPA has not been approached in relation to the proposed application and, therefore, no assessment methodology has been provided.

As such, a noise impact assessment must be carried out in accordance with the requirements of Manchester City Council's document 'Planning and Noise Technical Guidance' ('PNTG').

This document provides guidance on the assessment of noise breakout from entertainment venues and mechanical plant, and this is individually discussed in each subsequent section.

2. Environmental Noise Survey

2.1 Measurement Methodology

Unattended noise monitoring was undertaken at the site to determine the existing noise climate in and around the proposed development and at the nearest NSR(s) to the proposed development.

The following table outlines the measurement dates and particulars. All sound level meters were fitted with a proprietary environmental kit complete with a 130mm diameter windshield. The equipment was filed calibrated before and after the survey; negligible drift was noted. Survey weather conditions and the equipment register can be found in Appendix D.

Location	Survey Dates	Measurement Particulars
MP1	17 – 21/10/2024	Microphone protruding approximately 1m from a second-floor window overlooking Thomas Street.
MP2		Microphone fixed to a lamppost approximately 3.5m above ground level on High Street and no closer than 3.5m from any large reflective surface.

Table 2 – Measurement Methodology

The figure below outlines the site surroundings and measurement locations:



Imagery ©2024 Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2024

Figure 2 – Measurement Locations and Site Surroundings

2.2 Context & Subjective Impression

The proposed development site is in Manchester's Northern Quarter district, and the area surrounding the site is mixed with various derelict buildings / unused areas and bars / event areas. The acoustic environment is deemed to be moderate in level and during the daytime the noise profile dominated by road traffic noise emissions from the surrounding roads in the area.

Along Thomas Street are several external seating patron areas that are used by the bars in the area. Most of these establishments have amplified music / DJs, which along with patron noise, become more dominant during the evening and into the night.

The proposed development backs onto the rear seating area that is owned by Terrace HQ bar. The existing plant units in this area are owned by Terrace HQ and Cane and Grain. There are two existing plant items in this area that will be refurbished to service the proposed development.

The following table outlines the operating hours of the nearby bars in the area which provides context to the nature of the surrounding noise climate.

Business Name	Operating Hours
Terrace HQ	- Sunday to Wednesday: 12:00 to 01:00 hours - Thursday: 12:00 to 02:00 hours - Friday & Saturday: 12:00 to 03:00 hours
Cane and Grane	- Sunday to Thursday: 12:00 to 02:00 hours - Friday & Saturday: 12:00 to 03:00 hours
The Smithfield Social	- Monday to Sunday: 09:00 to 'late' (assumed 03:00 hours based on the time history for MP1)
Fierce Bar	- Sunday to Wednesday: 12:00 to 23:00 hours - Thursday - Saturday: 12:00 to 00:00 hours

Table 3 – Operating Times of Surrounding Businesses

The closest 'Noise Sensitive Receptors' ('NSR's) to the proposed establishment is understood to be Bollin House which is a five-storey residential development on Edge Street to the north.

2.3 Environmental Noise Survey Results

The table overleaf outlines a summary of the ambient sound levels measured during the survey. The time history results can be found in Appendix D.

All measurements shown in this section for MP1 have been corrected to account for a free-field level. The tenth highest maximum sound level measured over a 1-minute sampling period is also presented.

Location	Measurement Period ('T')	Octave Frequency Band (Hz, $L_{eq,t}$, dB)							$L_{Aeq,T}$ (dB)	$L_{AFmax,1min^*}$ (dB)
		63	125	250	500	1k	2k	4k		
MP1	$L_{eq,16hr}$ (Day)	59	58	56	59	58	54	49	62	--
	$L_{eq,8hr}$ (Night)	63	64	57	62	61	57	51	64	82
MP2	$L_{eq,16hr}$ (Day)	64	61	59	60	57	55	50	62	--
	$L_{eq,8hr}$ (Night)	63	59	56	59	57	53	47	61	85

Table 4 – Ambient Sound Level Results Summary

Ambient Sound Level Results Summary – External Patron Noise

The following table outlines the ambient sound levels measured during the most sensitive operational hours of the external patron area, that have been used in the IEMA 'Increase in Ambient Noise Level' ('IANL') assessment.

Measurement Period ('T')		MP1 $L_{Aeq,T}$ (dB)	MP2 $L_{Aeq,T}$ (dB)
Date & Day	Hours (hh:mm)		
17/10/2024: Thursday – Day 1	20:00 – 21:00	59	60
	21:00 – 22:00	59	58
	22:00 – 23:00	62	60
18/10/2024: Friday – Day 2	20:00 – 21:00	61	61
	21:00 – 22:00	63	62
	22:00 – 23:00	66	62
19/10/2024: Saturday – Day 3	20:00 – 21:00	68	64
	21:00 – 22:00	71	66
	22:00 – 23:00	71	66
20/10/2024: Sunday – Day 4	20:00 – 21:00	55	58
	21:00 – 22:00	55	60
	22:00 – 23:00	59	60

Table 5 – Ambient Sound Level Results Summary – External Patron Noise

Background Sound Level Analysis – BS4142

The following section outlines the typical background sound levels measured at MP1 and MP2 during the daytime and night-time periods. The figures below show histograms of the measured background sound levels.

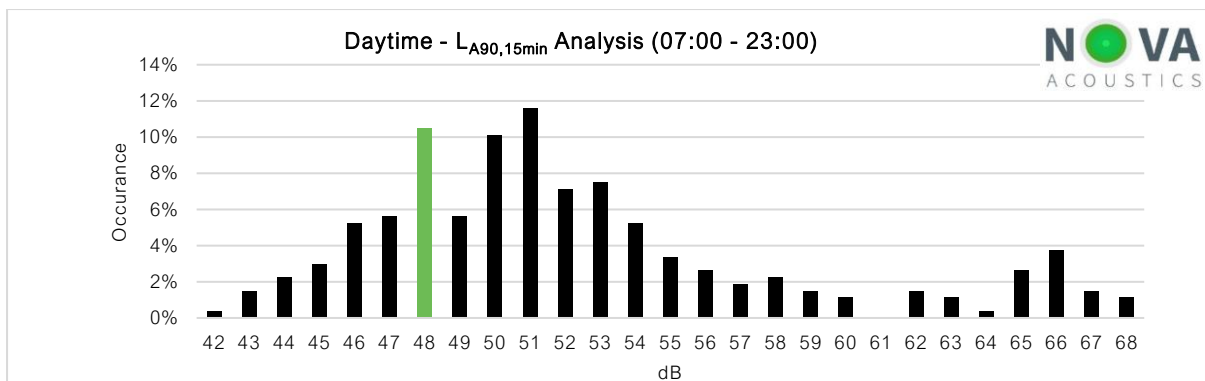


Figure 3 – MP1 $L_{A90,15min}$ Background Sound Level Analysis (07:00 – 23:00 hours)

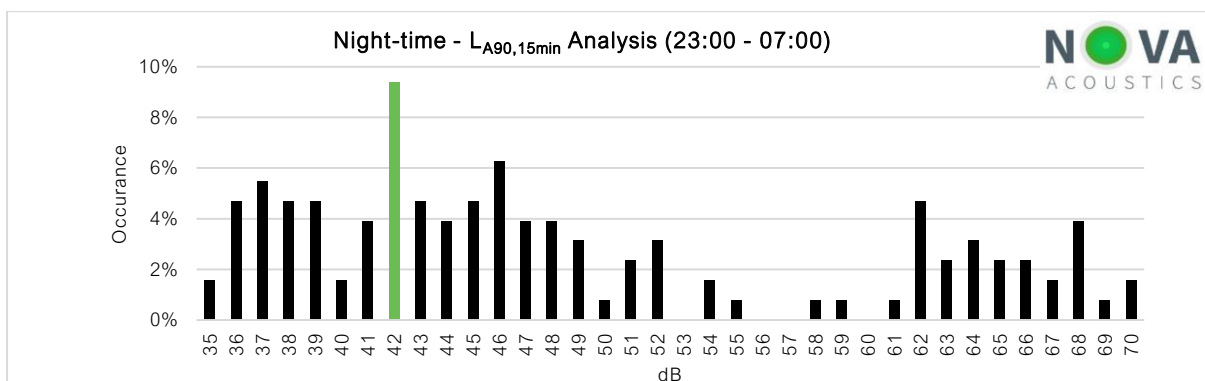


Figure 4 – MP1 $L_{A90,15min}$ Background Sound Level Analysis (23:00 – 07:00 hours)

It should be noted that the typical background sound level measured between 23:00 and 03:00 hours is 45 dB $L_{A90,15min}$ and, therefore, use of the entire night-time represents a lower background sound level.

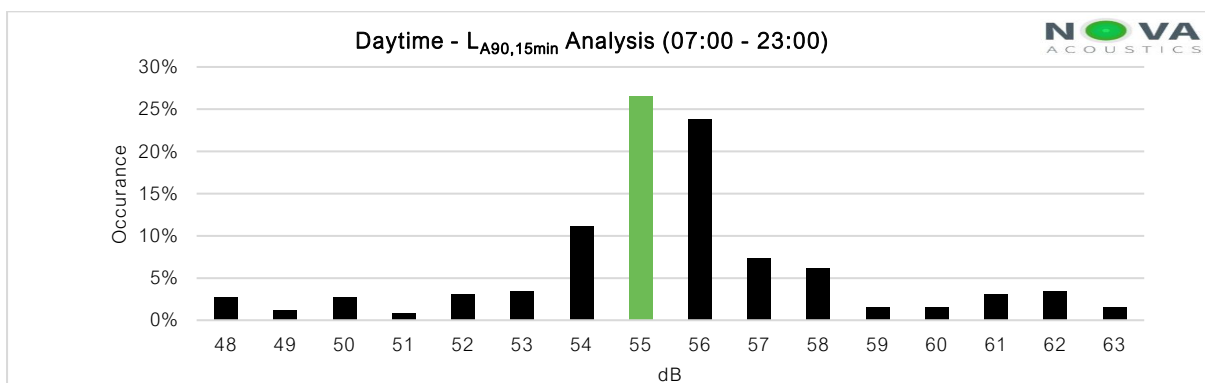


Figure 5 – MP2 $L_{A90,15min}$ Background Sound Level Analysis (07:00 – 23:00 hours)

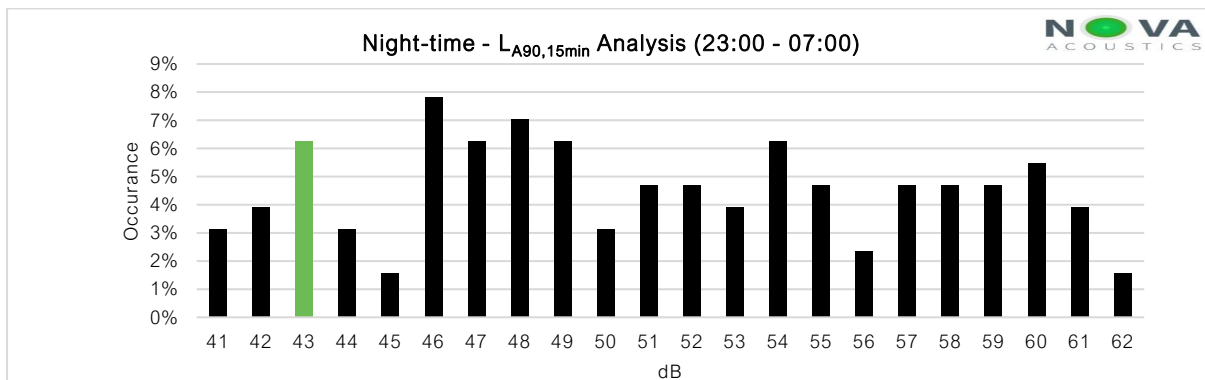


Figure 6 – MP2 $L_{A90,15min}$ Background Sound Level Analysis (23:00 – 07:00 hours)

For reference, the typical background sound level measured between 23:00 and 03:00 hours is 52 dB $L_{A90,15min}$ and, therefore, use of the entire night-time represents a lower background sound level that is more 'robust'.

As can be seen in the figures above, the 'lowest typical' $L_{A90,15min}$ measurements during the daytime and night-time periods at either measurement location are 48 dB $L_{A90,15min}$ during the daytime and 42 dB $L_{A90,15min}$ at night.

Whilst MP2 could be considered as more representative of the locality of the NSR, a more onerous assessment would be to compare the site against the 'lowest typical' background sound level measured and, therefore, figures of 48 dB $L_{A90,15min}$ during the daytime and 42 dB $L_{A90,15min}$ at night will be used as the basis for the noise impact assessment.

Background Sound Level Analysis – Entertainment Noise Breakout Assessment

The following table outlines the frequency spectrum data that is representative of the background sound levels stated above. The background sound levels below have subsequently been used as the baseline for the entertainment noise breakout assessment.

Measurement Period ('T')	Octave Frequency Band (Hz, $L_{90,15min}$, dB)							$L_{A90,15min}$ (dB)
	63	125	250	500	1k	2k	4k	
Daytime: 07:00 – 23:00	52	51	47	45	43	39	33	48
Night-time: 23:00 – 07:00	47	46	42	39	37	32	27	42

Table 6 – Background Sound Level Frequency Spectrum Results Summary

3. Noise Breakthrough Assessment and Sound Insulation Scheme

Based on the location of the site, the development does not structurally adjoin to any noise sensitive receptor. The site shares separating walls only with neighbouring bars, however, given that these operate with similar opening times as the proposed development, noise breakthrough via the wall is likely to be at least 10 dB below the noise climate already within those bars themselves. Therefore, a noise breakthrough assessment via this element is not required and has not been considered.

In relation to noise breakthrough via the floors, as all three levels will be run by the same operator, it is understood that a level of management can be implemented and appropriately controlled to ensure that there are acceptable levels of noise intrusion from the ground and first floor areas into the second-floor co-working space.

As this will be based upon ongoing management of the site by the client, this has not been considered further within this noise impact assessment.

4. Noise Breakout Assessment

To ensure the noise emissions from the proposed development do not cause an adverse impact on the surrounding residential NSRs, the noise breaking out of the building must be assessed.

4.1 Acoustic Design Criteria

PNTG states the following in relation to new entertainment venues that are structurally detached from other buildings:

“Entertainment noise ($L_{Aeq,5min}$) should be controlled to 5 dB below the typical background noise level (L_{A90}) in each octave band at the nearest noise sensitive location”.

Achieving the above criterion would be an indication of ‘No Observed Effect Level’ (‘NOEL’) when assessed in accordance with the NPSE and NPPF.

Furthermore, ‘The Good Practice guide on the Control of Noise from Pubs and Clubs (NANR92)’ states that where entertainment noise take place on a regular basis, music and associated sources should be inaudible within noise sensitive properties at any time.

Whilst the term ‘inaudibility’ is open to interpretation, it could be considered as ensuring that entertainment noise breakout does not exceed the measured background sound level (L_{90}) in each 1/1 octave frequency band at the closest NSRs. As the PNTG proposes a 5 dB more onerous criterion in each octave band, meeting the requirements of PNTG would ensure the guidance in ‘The Good Practice guide on the Control of Noise from Pubs and Clubs’ is also met.

To form a robust design, it would be appropriate to ensure that low frequency noise in the 63Hz and 125Hz frequency bands does not exceed 47 dB and 41 dB L_{eq} , respectively (in line with the Moorhouse Curve criteria).

4.2 Noise Breakout Assessment

Noise breakout levels have been assessed to the NSR windows of Bollin House that are located approximately 25m away.

The calculations have been performed assuming the following:

- The anticipated internal noise levels for the event space have been based on data within ‘The Little Red Book of Acoustics: A Practical Guide’ by the Association of Noise Consultants (‘ANC’) which states that a ‘Music Bar/Nightclub’ operates at a level of approximately 101 dB(A).
 - o As the live music / DJ is to be located on the first floor, a nominal spectrum that is 10 dB lower than this will be used to assess breakout from the ground floor.
- New double glazing has been installed at ground floor level. It is assumed this is equivalent to 6mm glass / 16mm cavity / 10mm laminated glass with a sound insulation performance of approximately 37 dB R_w (-5 C_{tr}).
- New secondary glazing has been installed at first floor level. It is assumed that this would be a 6mm pane of glass installed such that a cavity of at least 100mm is formed from the existing glazing.

- The masonry walls that form the remainder of the external envelope have not been included within the calculations as they would be expected to have a sound insulation performance that is at least 10 dB greater than the glazing; therefore, this would not impact the results.
- Noise breakout from the secondary floor has not been included as this will be shut off in the evening and night-time period and breakout would be more than 10 dB lower than that of the first floor.
- All glazed elements will remain closed throughout all operations as the development will have alternative means of ventilation.
- The entrance door to the establishment is assumed as being closed within the assessment. It is assumed that it will be left shut other than for brief entry to the establishment. If this cannot be properly managed, then good acoustic design should be implemented, and a lobbied door system should be installed.
- The noise breakout calculations have been conducted assuming the glazing is weakest element.
- The sound power levels of the glazed elements has been calculated using the formula contained within BS12354-4: $L_{W,rad} = L_{P,rev} - C_d - R + 10 \cdot \log(S)$, where;
 - o S is the surface area of the glazed element,
 - o C_d is the correction for the difference between reverberant internal conditions and non-reverberant external conditions (-6 dB),
 - o R is the sound reduction provided by the element,

Based on the above, the calculated external noise levels breaking out from the ground and first floor areas have been determined and are shown in Appendix F. The subsequent cumulative external noise levels incident on the NSR have been calculated and are compared against the criteria, and any exceedances are also highlighted in the table below.

The criteria are based on the 'lowest typical' background sound level measured during the more onerous night-time period. Ensuring the criteria is met during the night-time would inherently ensure it is met during the day when the acoustic climate is higher in level.

Description	Octave Frequency Band (Hz, dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Combined Noise Level at NSR (L_{eq})	58	55	38	27	7	-1	-12	40
Typical Background Sound Level (L_{90})	47	46	42	39	37	32	27	42
External Noise Criteria (Lowest $L_{90} - 5$ dB)	42	41	37	34	32	27	22	37
Exceedance of Criteria	+16	+14	+1	-7	-25	+28	+34	+3

Table 7 – Noise Breakout Assessment

The assessments above show that the predicted levels of noise breakout exceed the criteria at 63 – 250 Hz (albeit there is only a 1 dB exceedance at 250Hz which could be considered marginal and acceptable).

Based on the above, it is recommended that all amplified music should be controlled via a music limiting device. The maximum amplified music limit levels presented in the table below should be adhered to.

Description	Octave Frequency Band (Hz, L _p dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Amplified Music Limit Levels	94	96	99	100	95	90	85	100

Table 8 – Maximum Amplified Background Music Limit Levels

The amplified music limit levels presented above should be considered a baseline, and during the calibration of the equipment, the limit levels should be set as so amplified music is relatively inaudible outside the closest NSRs.

An example system capable of controlling specific frequencies is the 'MRC Audio EQ Limit, Data Logging Automatic Volume Sound Limiter with DD1 Display'. This is an example only and by no means constitutes a recommended product, other manufactures and products may also provide appropriate equipment.

The noise limiter must be installed and calibrated by an appropriately experienced noise control consultant/engineer to ensure the at the equipment operates effectively. Regardless of the system installed, it should be tamperproof and only staff should have access to the controls.

Should the amplified music limit levels in the table above be adhered to, the impact from amplified music noise breakout emissions would be classed as 'No Observed Adverse Effect Level' ('NOAEL') in accordance with the NPSE and NPPF.

It should be noted that it is critical that the glazing specified in Section 4.2 is installed. Where alternative glazing is selected, this should perform at least at the level stated, otherwise noise breakout can increase. Should alterations be required additional reviews will be necessary.

5. External Patron Noise Assessment

5.1 Adopted Noise Criteria

There are no standards or guidance that are specifically designed to be used for the assessment of patron noise. Further to this, the assessment of noise from people and recreation is specifically precluded in the scope of BS4142. BS8233 is intended to be used for the assessment of anonymous sources, such as road traffic and rail noise, in the design phase of residential development, and as such is also not appropriate.

Given this, the following assessment is based primarily on guidance presented in the IEMA 'Guidelines for Environmental Noise Impact Assessment (2014)' document. The level of impact from the site is calculated considering the increase in ambient noise level due to the noise emissions from the development.

It should be highlighted that the example criteria presented within the IEMA guidelines are generally for anonymous noise sources (i.e. from road traffic, rail, etc).

Given the character of noise associated with the development (noise from patrons and amplified music) and the associated impacts at nearby NSRs, it is considered appropriate to adapt the criteria accordingly. Noise from patrons is highly distinguishable in most environments and contains louder peaks due to shouting, singing, etc. This has the potential to cause higher levels of impact than the numbers alone suggest.

However, it must also be noted that there are many external patron areas along Thomas Street, as such, the nearby residents are likely to be more accustomed to patron noise. For this reason, it could be argued that the noise emissions from the external seating area would be congruent for the area.

The table below outlines the adopted criteria for the assessment.

IEMA Effect Descriptors	
Substantial	Greater than 5 dB L_{Aeq} change in sound level at a noise sensitive receptor.
Moderate	A 3 dB to 4.9 dB L_{Aeq} change in sound level at a noise sensitive receptor.
Slight	A 1 dB to 2.9 dB L_{Aeq} change in sound level at a noise sensitive receptor.
None/Not Significant	Less than 1 dB L_{Aeq} change in in sound level at a noise sensitive receptor.

Table 9 – IEMA Guidelines Effect Descriptors

Considering the table above, the following NPPF / NPSE impact levels are assumed:

- ≤ 1 dB: 'No Observed Effect Level' ('NOEL'),
- ≤ 2.9 dB: 'No Observed Adverse Effect Level' ('NOAEL'),
- ≤ 4.9 dB: 'Lowest Observed Adverse Effect Level' ('LOAEL'),
- ≥ 5 dB: 'Substantial Observed Adverse Effect Level' ('SOAEL').

5.2 Specific Sound Level Calculations

The external patron area at the front of the proposed development will hold a maximum of 20 no. patrons (this is assumed based on the size of the site). Considering this, the calculations have been conducted assuming the following:

- 5 no. patrons speaking in a normal voice and 5 no. patrons speaking in a raised voice simultaneously. This assumes that all 20 no. patrons are in conversation with one person speaking and the other listening. The source noise levels are taken from ANSI S3.5-1997 (R2017) in the 250Hz to 4kHz octave bands.
- No acoustic shielding is included in the calculation to form a robust assessment.

Description	Octave Frequency Band (Hz, dB)					Overall (dBA)
	250	500	1k	2k	4k	
1 No. Normal Voice Noise Level (L_w)	65	69	63	56	50	68
5 No. Normal Voices Noise Level (L_w)	72	76	70	63	57	75
1 No. Raised Voice Noise Level (L_w)	70	75	72	64	57	76
5 No. Raised Voices Noise Level (L_w)	77	82	79	71	64	83
Cumulative Noise Level of Patron Area (L_w)	78	83	80	72	65	83
Distance Correction to NSR1 (20m, Q2)	-36					--
Patron Noise Level at NSR1 (L_{eq})	42	47	44	36	29	47

Table 10 – External Patron Noise Level Calculations

Based on the calculated levels above, an IEMA assessment is presented overleaf.

5.3 IEMA 'Increase in Ambient Noise Level' Assessment

For the assessment, the predicted noise emissions from the proposed development (Table 10 = 47 dB(A)) are added to the lowest existing ambient noise levels (Shown in Table 4) from measurement position. The higher the increase in level, the higher the level of impact. This is shown in the table below.

Measurement Period ('T')		Existing L _{Aeq,T} (dB)	Cumulative Ambient Noise Levels (dB)	Increase (dB)	IEMA Impact Rating
Date & Day	Hours (hh:mm)				
17/10/2024: Thursday – Day 1	20:00 – 21:00	59	59.3	+0.3	"Not Significant"
	21:00 – 22:00	58	58.3	+0.3	"Not Significant"
	22:00 – 23:00	60	60.2	+0.2	"Not Significant"
18/10/2024: Friday – Day 2	20:00 – 21:00	61	61.2	+0.2	"Not Significant"
	21:00 – 22:00	62	62.1	+0.1	"Not Significant"
	22:00 – 23:00	62	62.1	+0.1	"Not Significant"
19/10/2024: Saturday – Day 3	20:00 – 21:00	64	64.1	+0.1	"Not Significant"
	21:00 – 22:00	66	66.1	+0.1	"Not Significant"
	22:00 – 23:00	66	66.1	+0.1	"Not Significant"
20/10/2024: Sunday – Day 4	20:00 – 21:00	55	55.6	+0.6	"Not Significant"
	21:00 – 22:00	55	55.6	+0.6	"Not Significant"
	22:00 – 23:00	59	59.3	+0.3	"Not Significant"

Table 11 – External Patron Noise Assessment

The assessment above indicates that the noise emissions from the external patron area are expected to have a 'Not Significant' impact on the closest NSR in line with the IEMA Guidelines on Noise Impact.

Furthermore, the specific patron noise level calculated at NSR(1) (47dB L_{Aeq}) is not predicted to exceed the 'lowest typical' daytime background sound level of 48dB L_{A90,15min} (MP1), which further indicates that the patron noise emissions would be unlikely to adversely affected the nearby NSRs.

Considering the above, the noise impacts are deemed a 'No Observed Adverse Effect Level' ('NOAEL') when assessed in accordance with the NPSE and NPPF.

6. BS4142 Noise Impact Assessments

6.1 Plant Noise Level Criteria

Based on the guidance presented in PNTG, Manchester City Council require the following:

“The development should be designed so as to achieve a rating level of 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location”

Based on a comparison with NPSE and NPPF, this would be determined as ‘No Observed Adverse Effect Level’.

6.2 Proposed External Fixed Plant & Specific Sound Levels

The following table shows the 1/1 octave frequency band sound power levels of the three proposed items of plant that will be used in the subsequent calculations. These calculations are shown in Appendix G. The two existing units that are being recommissioned are presented below as well as their determined sound power levels. It was not possible to measure these on-site.

Manufacturers data sheets can be found in Appendix H. No spectrum information is available and, therefore, this is based off noise levels of a similar sized heat pump that has previously measured by NOVA Acoustics.

Description	1/1 Octave Frequency Band (Hz, L_w dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
1 No. SUZ-M50VAR2	64	67	64	62	56	50	42	33	63
1 No. SUZ-M71VAR1	66	69	66	64	58	52	44	35	65
1 No. PUZ-M100VKA2	69	72	69	67	61	55	47	38	68
2 No. PUHZ-P100VKA2 (Existing)	72	75	72	70	64	58	50	41	71

Notes:

[1] All spectrum data is based on data measured within NOVA Acoustics report NP-011433-2. Measurements were conducted of a Daikin RXF71D5V1B heat pump.

[2] Please note that the overall sound power levels may differ by 1-2dB from that presented in the manufacturer datasheets which is due to minor discrepancies in the determination of sound power figures from the sound pressure levels.

Table 12 – Sound Power Levels of Proposed Plant

6.3 BS4142 Assessment

The table below shows the BS4142 assessment the noise breaking out of the above items of plant and impacting the NSR. Please note that as background sound levels are quieter at night, only a night-time assessment is presented. By ensuring the noise level limits are met during this period, the requirements would inherently be met for the daytime.

All items of plant will be in the rear courtyard area of the site on the northern elevation and distance attenuation will be taken from the nearest point to the NSR. The below calculations include for distance

attenuation based on a 30m distance from the units to the nearest window of the NSR. The calculations also include for a Q factor of 4.

Description	1/1 Octave Frequency Band (Hz, dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Cumulative Specific Sound Level at NSR	43	42	40	37	31	24	16	7	37
Acoustic Feature Correction	<i>A +2 dB penalty has been applied to account for the 'just perceptible' low frequency hum typically present in the noise emissions generated by heat pumps.</i> <i>A correction for intermittent has not been applied due to the presence of multiple other plant items all operating intermittently.</i>								+2
Rating Sound Level ($L_{Ar,Tr}$)	Specific Sound Level + Rating Penalties								39
Background Sound Level	MP1 Daytime $L_{A90,15min}$ – Figure 3.								43
Manchester City Council Criterion	MP1 Daytime $L_{A90,15min}$ – 5dB.								38
Exceedance	$L_{Ar,Tr} - L_{A90,15min}$								+1
BS4142 Initial Assessment Outcome	The assessment indicates 'Low Impact, dependent on context' in accordance with BS4142 at the most affected NSR.								

Table 13 – BS4142 Noise Impact Assessment

Based on the above, noise breakout from the items of plant would be controlled to within 1 dB of the target criterion of ensuring the rating level does not exceed 5dB below the background sound level.

As previously stated, the above calculations have not assumed for any screening provided by the building itself as the windows of the NSR do not directly overlook the plant. It could be expected that 5 dB of screening attenuation may be applicable.

As such by applying this, the above assessment would indicate that the requirements of Manchester City Council have been met.

In line with NPSE and NPPF, the above assessment would be an indication of 'No Observed Adverse Effect Level' ('NOAEL').

7. Noise Management Plan

To ensure good acoustic management, an example Noise Management Plan ('NMP') is provided below, outlining methods by which the venue manager will systematically assess and minimise the potential impacts of noise generated by the site. The NMP is a working document with the specific aim to ensure that:

- Noise impact is considered as part of routine inspections,
- Noise is primarily controlled at source by good operational practices, including physical and management control measures,
- All appropriate measures are taken to prevent or, where that is not reasonably practical, to reduce noise emissions from the venue.

7.1 Hours of Operation

The site will have the following opening hours:

Floor	Use	Opening Hours
Ground	Bar / Record Shop	08:00 to 03:00 hours
First	Yoga & Wellness Studio (Day) / Events Room (Evening/Night)	08:00 to 03:00 hours (Events room at 19:00 hours)
Second	Co-working Space	08:00 to 18:00 hours
External	Front Patron Area	To close at 23:00 Mon – Sat, and 21:00 hours on Sundays

Table 14 – Operating Times of Proposed Development

7.2 Internal Configuration

- The amplified music noise limit levels contained within this report must be adhered to and calibrated to achieve relative inactivity at the closest NSRs.
- All doors should remain closed when amplified music is playing.
- Lobbied door systems are not proposed, however, where the noise breakout through doors cannot be effectively managed, good acoustic design in the form of lobbied doors will be installed. This effective management would likely need to be implemented by door staff to ensure this door is kept closed.
- Heating and cooling will be provided by air-conditioning systems so there will be no requirement for the ventilation systems to penetrate the façade and compromise the sound insulation of the building.

7.3 External Amplified Music Noise Levels

- No amplified music will be played externally, unless this is specifically agreed with the Local Authority for special events.

7.4 External Patron Noise

- Patrons shall not be allowed to congregate outside the premises other than the proposed external area.
- Patrons using the external area will be made aware that the venue has residential properties nearby and that shouting and raised voices are unacceptable. If patrons frequently violate this, they will be asked to move inside the venue.
- Staff should actively encourage the gradual dispersal of customers to minimise the nuisance at closing time.

7.5 Dispersal of Customers

The following strategies will be implemented:

- Those using the external patron area will be made aware at 22:30 that the area will close in 30 minutes.
- The ambient lighting level will be gradually increased towards the final 30 minutes of internal trading.
- The background music will cease playing 10 minutes prior the closure of the premises.

A member of staff will be positioned in an area close to the main exit to oversee the end of night departure period to ensure that:

- Patrons are encouraged to be considerate upon leaving the premises.
- Patrons do not leave the premises other than by the doors and exits they are guided towards.
- Communication is made with taxi companies regarding the use of horns and slamming of doors.

Further to this, prominent, clear and legible notices will be displayed at the exit(s) requesting the public to respect residents and to leave the premises and the area quietly.

7.6 Continuous Subjective Monitoring

- All staff will, as part of their induction, be made aware of the surrounding NSRs and the effects of noise on residential amenity. It is the responsibility of all staff to be aware of noise on site and to report any potential noise issues to the premises manager at the earliest opportunity.
- All staff will have refresher training on noise issues, prevention and managements at six-monthly intervals.

7.7 Noise Complaint Investigation

An Issue Management System ('IMS') will be implemented and completed by the venue manager. This will include records of subjective noise monitoring and complaints. Further to this, a complaints procedure will be implemented. This procedure will allow for all complaints, feedback and requests made by third parties regarding the premises operational activities.

A phone number for the premises will be made available online to allow any member of the public to lodge a complaint without entering the premises. The premises manager will be specifically assigned to deal with complaints.

All complaints received from third parties including statutory authorities, statutory consultees, members of the general public and representatives of the company will be forward to the premises manager to action as below within 1-hour (where feasible). The complaint will be logged in the complaints log within 24-hours.

The operations manager will ensure that:

- The complaint is investigated to identify the cause, if necessary, this may involve direct communication with the complainant.
- In the event of elevated noise being detected, action will be taken immediately to prevent a recurrence of the same problem. These actions must be documented.
- The complainant will be contacted and given information on the investigations conducted and actions taken as appropriate.
- Details of other complaints are sent to other company personnel as appropriate.
- If the investigation indicates that the complaint has not been justified this will be clearly recorded on the incident report.
- All complaints will be logged.

The NMP will be reviewed annually or as agreed appropriate to ensure it is streamlined and effective. New and innovative approaches to problem-solving or incidents and any lessons learnt will be incorporated accordingly.

This is considered to be a 'live document' which evolves by experience in agreement with the Local Authority. A subjective monitoring guide is shown overleaf.

Premises: _____ Event: _____

Date: _____ Event start time: ____:____ Event End time: ____:____

Pre-start checklist:

- Windows & doors closed: Y/N
- Sound check and volume set: Y/N
- Agree who will complete objective noise monitoring & when: Y/N
- Check sound limiter is fully operational: Y/N
- Set end-time with performer(s): Y/N
- Complete monitoring form: Y/N

Subjective Noise Monitoring Guide			
Assessment		Description	Guide / Action
A	Not audible at NSRs.	No Entertainment Sound audible.	Okay
B	Just audible at NSRs.	Muffled sound, vocals/music not clear, easily masked by other ambient noise in area.	Okay, but adjust noise level to A.
C	Clearly audible at NSRs.	Clear vocals/music and likely to be heard by neighbours.	Reduce to B immediately, and aim to reduce to A.
D	Loud at NSRs.	Vocals/music are dominant and would be clearly heard by neighbours.	Not acceptable.

8. Conclusion and Action Plan

The proposed development has been assessed against an acoustic design criteria, and sound insulation and mitigation schemes have been provided to ensure the criteria can be achieved.

Provided the mitigation and recommendations within this report are adhered to, the noise impacts from the proposed development would be a 'No Observed Adverse Effect Level' ('NOAEL') in line with the NPSE and NPPF.

The NPSE comments that at NOAEL, noise can at times be heard, but does not cause any change in behaviour, attitude or other physiological response. In addition, noise at this level *"can slightly affect the acoustic character of the area but not such that there is a change in the quality of life."*

However, it should be recognised that the proposed development is congruent to the area, and that the latter NPSE comment above is thought unlikely provided the good acoustic design outlined in this report is implemented.

The following 'Action Plan' is outlined to ensure the design considerations and specifications from this report are duly implemented:

1. The glazing specification stated within Section 4 should be installed to limit noise breakout. Where alternative specifications are selected, additional noise assessment will be required to ensure the noise level limits are not exceeded.
2. Any amplified music within the ground and first floor areas should be controlled via a music limiting device and not exceed the limit levels presented in Section 4. The limit levels should be calibrated by a competent individual to ensure that relative inaudibility is achieved outside the closest NSRs.
3. Where noise breakout from doors cannot be effectively managed, good acoustic design in the form of lobbied door systems should be installed.
4. No mitigation measures are required to the external patron area; however, it would be prudent to setup an ongoing noise management plan; an example is provided in Section 7.
5. A noise impact assessment from the mechanical plant has been carried out and is detailed in Section 6. In summary, the requirements of Manchester City Council would be met without mitigation measures.

The findings of this report will require written approval from the Local Authority prior to work commencing.

Appendix A – Acoustic Terminology

A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure given by the following formula in decibels (dBA). $L_{pA} = 10 \log_{10} (pA/p_0)^2$. Where: pA is the A-weighted sound pressure in pascals (Pa) and p_0 is the reference sound pressure (20 μ Pa)
Background Sound	Underlying level of sound over a period, T , which might in part be an indication of relative quietness at a given location
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T , has the same mean-squared sound pressure as the sound under consideration that varies with time
Facade level	Sound pressure level 1 m in front of the facade
Free-field level	Sound pressure level away from reflecting surfaces
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants
Noise Criteria	Numerical indices used to define design goals in a given space
Noise Rating (NR)	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves
Octave Band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit
Percentile Level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting “F”, which is exceeded for $N\%$ of a specified time interval
Rating Level, $L_{Ar,Tr}$	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise
Reverberation time, T	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped
Sound Pressure, p	root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound
Sound Pressure Level, L_p	Quantity of sound pressure, in decibels (dB), given by the formula: $L_p = 10 \log_{10} (p/p_0)^2$. Where: p is the root-mean-square sound pressure in pascals (Pa) and p_0 is the reference sound pressure (20 μ Pa)
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies

Appendix B – Standards, Legislation, Policy, and Guidance

This report is to be primarily based on the following standards, legislation, policy and guidance.

B.1 – National Planning Policy Framework (2023)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), updated in 2023. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 180e, it states:

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 191 states:

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 impact 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.*

B.2 – Noise Policy Statement for England (2010)

Paragraph 191 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

To achieve this vision the Statement identifies the following three aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life;
- Where possible, contribute to the improvement of health and quality of life.

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that “significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development”.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: “all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”

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. This can be related to the third aim above, which seeks: “where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

This is further expanded using the updated “Noise Exposure Hierarchy Table” which includes an additional level of impact referred to as the ‘No Observed Adverse Effect Level’ (‘NOAEL’). It is stated that at this level: *“noise can be heard, but does not cause any change in behaviour, attitude or other physiological response”*. In addition, noise at this level *“can slightly affect the acoustic character of the area but not such that there is a change in the quality of life”*.

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 – British Standard BS4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound

Overview

BS4142:2014 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{A,r}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method."*

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) Tonality

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) Other Sound Characteristics

BS4142:2014 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied."

d) Intermittency

BS4142:2014 states that when the “specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time ... if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.”

Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a ‘typical’ background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night time period for sleep purposes.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

Assessment of Impact

BS4142:2014 states: “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”. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- “Typically, the greater this difference, the greater the magnitude of the impact.”
- “A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.”
- “A difference of around +5dB 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 negligible impact, depending on the context.”

Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;

- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound 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 sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact and would therefore be classified as a No Observed Adverse Effect Level.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

B.4 – Entertainment Noise Legislation

Noise from entertainment venues, e.g., noise from recorded music, live bands or karaoke, can be particularly annoying for residents and business if it is not adequately contained within the venue. When considering the potential impact of a proposal for an entertainment premises or residential near to entertainment premises a consideration for the overall noise level (L_{Aeq}) and the 63Hz and 125Hz octave band noise levels. Music noise in the 63Hz and 125Hz octave bands, which is described as 'bass noise' is particularly difficult to contain and the impulsive and non-steady character of low frequency music noise is particularly disturbing for residents exposed to it.

A lively city centre bar can operate around 95 dB L_{Aeq} and nightclubs can be even higher at 105 dB L_{Aeq} . The range of level of 63Hz and 125Hz octave bands is wider than the a-weighted levels and can be up to 115 dB L_{eq} and 110 dB L_{eq} respectively (Davies et al 2005).

There is a lack of consensus on an assessment method for noise levels within habitable rooms regarding entertainment noise. The design aim should be to design to 'inaudible*'. The building structure is therefore key and will usually involve a high performing solution in either the music venue or residential premises. Existing noise standards/criteria are not appropriate for evaluating low frequency noise; in almost all other situations the established noise descriptors are based on the A-weighted sound level (dBA) which effectively filters out low frequency sound (Moorhouse et al 2011).

**Noise is considered to be inaudible when it is at a sufficiently low level such that it is not recognizable as emanating from the source in question and it does not alter the perception of the ambient noise environment that would prevail in the absence of the source in question. The DEFRA report 'Noise from Pubs and Clubs – Phase 1', which, on page 17 reproduces the Institute of Acoustics (IOA) working group guidance to achieve music noise levels which are 'virtually inaudible' inside a residential property.*

When dealing with noise control, especially at the lower frequencies it is usual to look at the octave band data as a Z-weighting (linear) and not the A-weighting, due in main to the amount you have to 'take off', resulting in meaningless data (-26.2dB at 63Hz) and also with respect to the sound insulation performance of various construction materials. Rather than just A-weighted levels being assessed e.g., internal noise levels as per BS8233:2014; a low frequency band analysis should be carried out (McCullough et al 2004).

In the 'Procedure for the assessment of low frequency noise complaints – Revision 1', Moorhouse et al (2011) use limits for low frequency noise levels in 1/3 octave bands between 10Hz and 160Hz. For the assessment of low frequency music noise, it is more practical to consider the 63Hz and 125 Hz octave bands. The Noise Council's Code of Practice on 'Environmental Noise Control at Concerts' suggests limits on both these octave bands. The DEFRA report 'Noise from Pubs and Clubs – Phase 1' suggests limits on 1/3 octave bands. However, the problem with this suggestion, and one of the reasons it is not widely used, is due to the difficulty in obtaining 1/3 octave band sound insulation performance data for various construction materials. With regards to assessing music noise at the 63 Hz and 125 Hz octave band levels a good correlation is shown between the NR 15 curve and Moorhouse curve at low frequencies. See figure below.

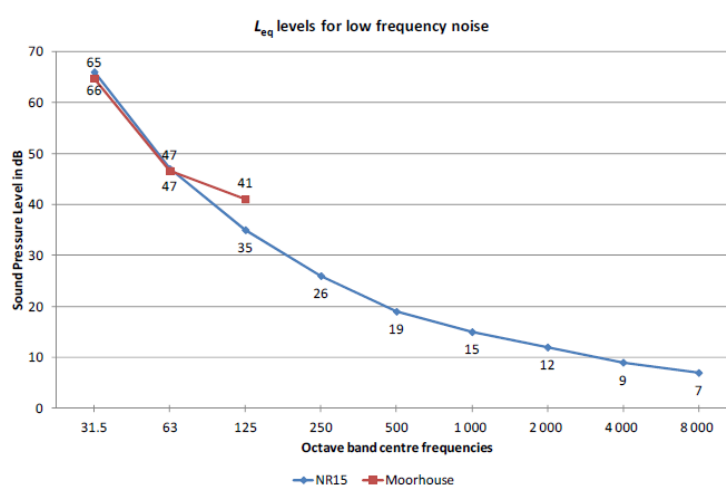


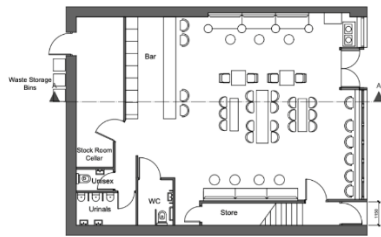
Figure 7 – Moorhouse Low Frequency Noise Rating Curve

However, The NR curve may be too stringent at mid and higher frequencies and may be lower than background noise levels in habitable spaces. Further, the NR curve is most commonly used to set limits for mechanical services noise in buildings i.e., steady, continuous noise sources. Music noise has distinctive characteristics and as such can be described as unsteady and non-continuous in comparison. Even though the Moorhouse curve does not specifically relate to entertainment noise (as per the caveat in the revised edition) these levels provide a good practical basis to assess low frequency music noise. They also provide a workable prediction for planning applications and a measurement method and assessment for in-situ low frequency issues in existing habitable spaces. Therefore, a criterion that would achieve a condition of 'inaudible' / 'virtually inaudible' which is applicable for new residential developments that are structurally connected to entertainment venues (or vice versa) would be: 'Music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed (in habitable rooms) 47 dB and 41 dB (L_{eq}), respectively'. This criterion may also be applicable for new residential developments that are structurally separate from an existing entertainment venue.

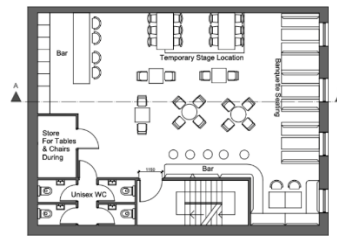
References:

- i) Institute of Acoustics (2002) – Good practice guide on the control of noise from pubs and clubs – Draft Annex 2.
- ii) McCullough et al (2004) A practical evaluation of objective noise criteria used for the assessment of disturbance due to entertainment music
- iii) Moorhouse et al (2005) Proposed criteria for the assessment of low frequency noise disturbance, Defra (updated in 2008 and 2011)

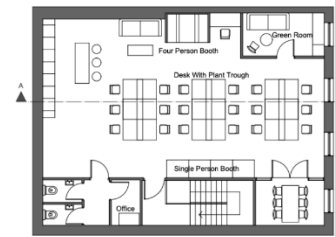
Appendix C – Drawing & Plans



Ground Floor



First Floor



Second Floor

Appendix D – Environmental Survey

Please note that the time history data presented for MP1 is representative of the converted free-field data.

D.1 – Time History Noise Data

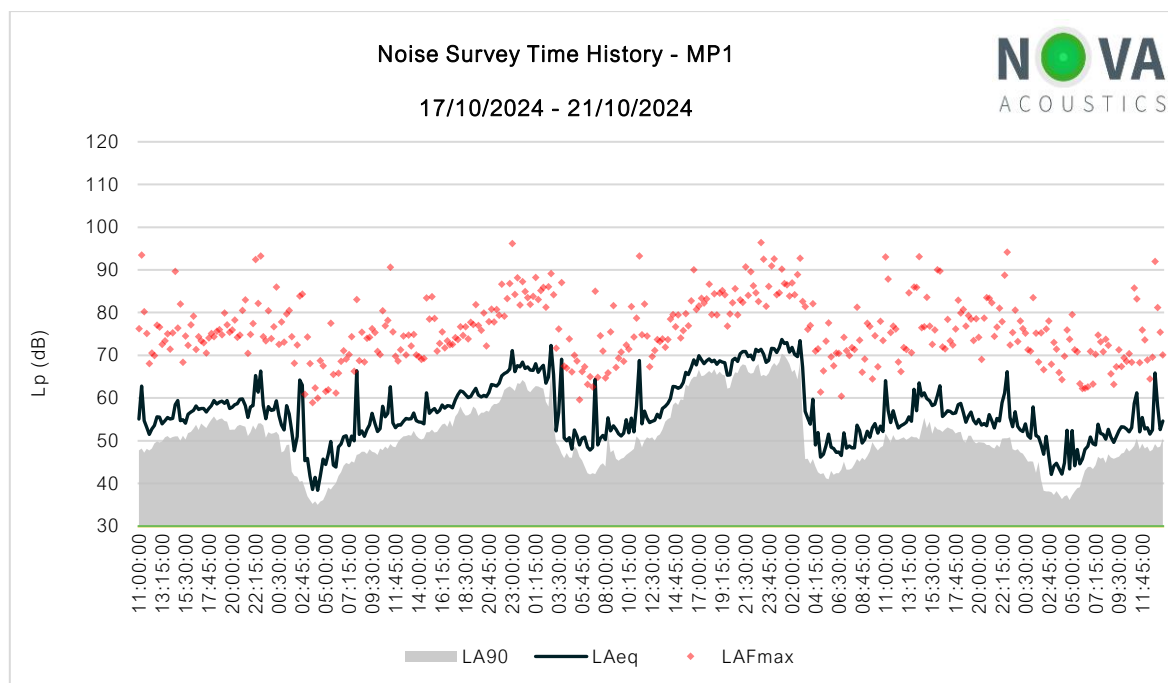


Figure 8 – MP1 Noise Survey Time History

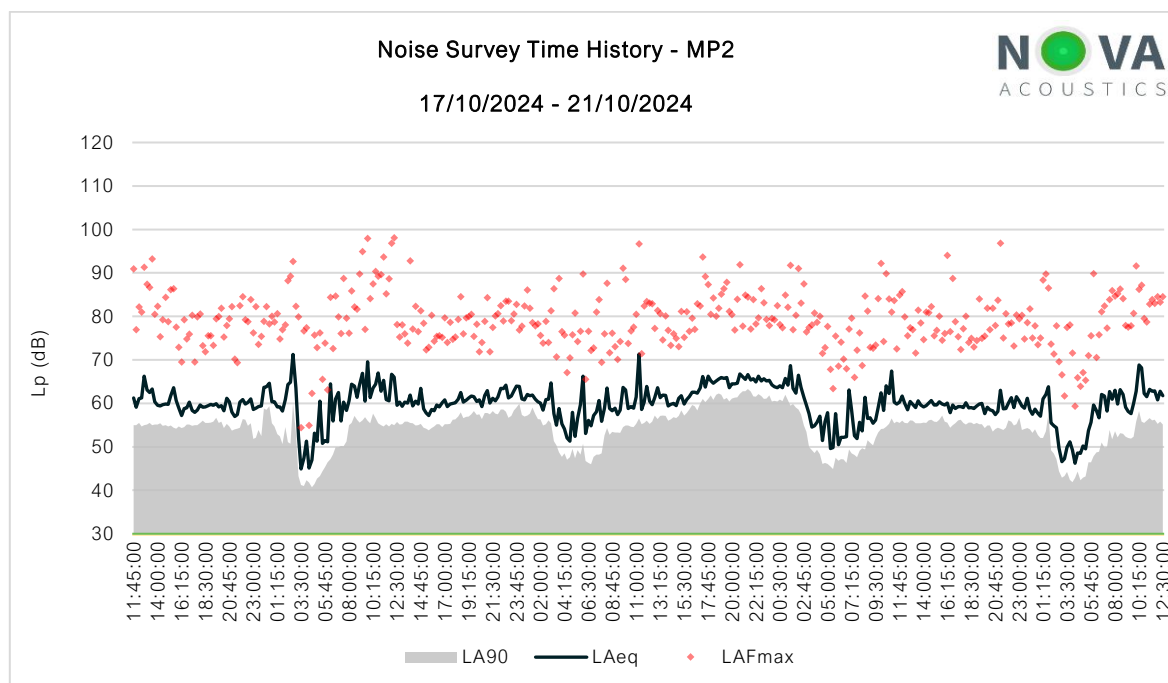


Figure 9 – MP2 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
Svantek SV971A Class 1 Sound Level Meter	141346	≤0.2
Svantek SV33B Class 1 Calibrator	125695	
Svantek SV971A Class 1 Sound Level Meter	141359	≤0.2
Svantek SV33B Class 1 Calibrator	125695	

Table 15 – Surveying Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 – Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted.

The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather Conditions – Chorlton (Approx. 4km SW of Site)				
Time Period	Air Temp (°C)	Rainfall (mm/h)**	Prevailing Wind Direction	Wind Speed (m/s)
17/10/2024: 06:00 – 23:59	10.8 – 17.8	0.0	E	0.0 – 0.8
18/10/2024: 00:00 – 23:59	7.7 – 15.5	0.0 – 1.8	NE	0.0 – 1.3
19/10/2024: 00:00 – 23:59	9.2 – 15.6	0.0 – 1.8	WSW	0.0 – 1.2
20/10/2024: 00:00 – 23:59	9.2 – 17.5	0.0 – 1.8	NE	0.0 – 3.0
21/10/2024: 00:00 – 12:00	11.1 – 14.1	0.0	E	0.0 – 1.5

Table 16 – Weather Conditions

**The recorded rainfall did not impact the measurements, and therefore, these periods have retained in the dataset.

Appendix F – Noise Breakout Calculations

The resulting L_{eq} noise breakout emissions at the closest window of the NSR have been determined and are presented below.

Description	Octave Frequency Band (Hz, dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Ground Floor Breakout								
Total Internal Noise Level (L _{eq})	100	100	90	90	85	80	75	91
Double Glazed Window SRI (R')	24	24	25	33	39	40	49	--
Internal to External Correction (C _d)	-6							--
Sound Power Level of Window (L _w)	81	81	70	62	51	45	31	68
Distance Correction (25m)	-33							--
Screening Attenuation	-6	-7	-8	-10	-13	-16	-19	
Total External Noise Level at NSR (L _{eq})	42	41	29	19	5	-4	-21	27
First Floor Breakout								
Total Internal Noise Level (L _{eq})	110	110	100	100	95	90	85	101
Secondary Glazed Window SRI (R')	20	22	28	37	52	52	52	--
Internal to External Correction (C _d)	-6							--
Sound Power Level of Window (L _w)	97	95	79	70	50	45	40	80
Distance Correction (25m)	-33							--
Screening Attenuation	-6	-7	-8	-10	-13	-16	-19	
Total External Noise Level at NSR (L _{eq})	58	55	38	27	4	-4	-12	40
Combined Noise Level at NSR (L _{eq})	58	55	38	27	7	-1	-12	40

Table 17 – Entertainment Noise Breakout Calculations

Appendix G – Mechanical Plant Sound Power Calculations

Description	Item	Source Term	Parameter	dBA	1/1 Octave Frequency Band (Hz, dB)								Lp Dist (m)	Q Factor
					63	125	250	500	1k	2k	4k	8k		
Model / Unit	SUZ-M50VAR2	Global Lp dBA	Lp at 2m, Q factor (Q=2)	49									2	2
No. of	1		Typical Spectrum	47	48	51	48	46	40	34	26	17		
			Corrected Spectrum	49	50	53	50	48	42	36	28	19		
Data Type	Manufacturers Data		Total Lw	63	64	67	64	62	56	50	42	33		

Description	Item	Source Term	Parameter	dBA	1/1 Octave Frequency Band (Hz, dB)								Lp Dist (m)	Q Factor
					63	125	250	500	1k	2k	4k	8k		
Model / Unit	SUZ-M71VAR1	Global Lp dBA	Lp at 2m, Q factor (Q=2)	51									2	2
No. of	1		Typical Spectrum	47	48	51	48	46	40	34	26	17		
			Corrected Spectrum	51	52	55	52	50	44	38	30	21		
Data Type	Manufacturers Data		Total Lw	65	66	69	66	64	58	52	44	35		

Description	Item	Source Term	Parameter	dBA	1/1 Octave Frequency Band (Hz, dB)								Lp Dist (m)	Q Factor
					63	125	250	500	1k	2k	4k	8k		
Model / Unit	PUZ-M100VKA2	Global Lp dBA	Lp at 2m, Q factor (Q=2)	54									2	2
No. of	1		Typical Spectrum	47	48	51	48	46	40	34	26	17		
			Corrected Spectrum	54	55	58	55	53	47	41	33	24		
Data Type	Manufacturers Data		Total Lw	68	69	72	69	67	61	55	47	38		

Description	Item	Source Term	Parameter	dBA	1/1 Octave Frequency Band (Hz, dB)								Lp Dist (m)	Q Factor
					63	125	250	500	1k	2k	4k	8k		
Model / Unit	PUHZ-P100VKA2	Global Lp dBA	Lp at 2m, Q factor (Q=2)	54									2	2
No. of	2		Typical Spectrum	47	48	51	48	46	40	34	26	17		
			Corrected Spectrum	54	55	58	55	53	47	41	33	24		
Data Type	Manufacturers Data		Total Lw	71	72	75	72	70	64	58	50	41		

Appendix H – Manufacturer Datasheets

Air Conditioning

Product Information

PLA-M R32

4-Way Blow Ceiling Cassette System
Standard Inverter Heat Pump (Single Phase)

R32



PLP-6EA



PLP-6EA-B



PLA-M INDOOR UNITS		PLA-M35EA2	PLA-M50EA2	PLA-M60EA2	PLA-M71EA2	PLA-M100EA2	PLA-M125EA2	PLA-M140EA2
CAPACITY (kW)	Heating (nominal)	4.1 (1.0-5.0)	6.0 (1.5-7.2)	7.0 (1.6-8.0)	8.0 (2.0-10.2)	11.2 (2.8-12.5)	13.5 (4.1-15.0)	15.0 (4.2-15.8)
	Cooling (nominal)	3.6 (0.8-3.9)	5.5 (1.2-5.9)	6.1 (1.6-6.3)	7.1 (2.2-8.1)	9.5 (4.0-10.9)	12.1 (5.8-13.0)	13.4 (5.8-14.1)
	Heating (UK)	3.49 (0.85-4.26)	5.11 (1.28-6.13)	6.13 (1.30-6.81)	6.81 (1.70-8.68)	9.63 (2.41-10.75)	11.49 (3.49-12.77)	12.77 (3.57-13.43)
	Cooling (UK)	3.31 (0.74-3.00)	5.06 (1.10-5.19)	5.61 (1.47-5.80)	6.53 (2.02-7.49)	8.65 (3.64-9.65)	11.01 (5.28-11.83)	12.19 (5.28-12.83)
SHF (nominal)		0.91	0.77	0.79	0.74	0.77	0.72	0.70
COP / EER (nominal)		4.20 / 4.00	3.46 / 3.40	3.80 / 3.30	3.61 / 3.70	3.71 / 3.50	3.71 / 3.01	3.41 / 2.70
SCOP (rsh) / SEER (nsc) (BS EN14825)		4.70 / 7.40	4.10 / 6.70	4.40 / 6.60	4.50 / 7.50	4.60 / 7.00	4.1 (162%) / 5.6 (231.9%)	4.1 (161.3%) / 5.7 (232.7%)
ERP ENERGY EFFICIENCY CLASS	Heating/Cooling	A++ / A++	A+ / A++	A+ / A++	A+ / A++	A++ / A++	A+ / A+	A+ / A+
AIRFLOW (l/s)	Lo-Mid-Hi	183-217-250-267	200-233-317-350	200-233-317-350	233-283-317-350	317-383-433-483	350-417-467-517	400-433-483-533
PIPE SIZE mm (in)	Gas/Liquid	9.52 (3/8") / 6.35 (1/4")	12.7 (1/2") / 6.35 (1/4")	15.88 (5/8") / 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")
SOUND PRESSURE LEVEL (dBA)	Lo-Mid-Hi	26-28-29-31	27-29-31-32	27-29-31-32	28-30-32-34	31-34-37-40	33-37-41-44	36-39-42-44
SOUND POWER LEVEL (dBA)		51	54	54	56	61	65	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 258 (40)	840 (850) x 840 (850) x 258 (40)	840 (850) x 840 (850) x 258 (40)	840 (850) x 840 (850) x 258 (40)
WEIGHT (kg)	Unit / Grille	19 / 5	19 / 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
3D TOTAL AIRFLOW CASEMENT		PLP-U160ELR-E	PLP-U160ELR-E	PLP-U160ELR-E	PLP-U160ELR-E	PLP-U160ELR-E	PLP-U160ELR-E	PLP-U160ELR-E
3D I-SEE SENSOR		PLP-6EAE	PLP-6EAE	PLP-6EAE	PLP-6EAE	PLP-6EAE	PLP-6EAE	PLP-6EAE
SELF-ELEVATING GRILLE		PLP-6EAE	PLP-6EAE	PLP-6EAE	PLP-6EAE	PLP-6EAE	PLP-6EAE	PLP-6EAE
GRILLE REFERENCE	White	PLP-6EA	PLP-6EA	PLP-6EA	PLP-6EA	PLP-6EA	PLP-6EA	PLP-6EA
	Black Satin	PLP-6EA-B	PLP-6EA-B	PLP-6EA-B	PLP-6EA-B	PLP-6EA-B	PLP-6EA-B	PLP-6EA-B
V BLOCKING FILTER		PAC-SK53KF-E	PAC-SK53KF-E	PAC-SK53KF-E	PAC-SK53KF-E	PAC-SK53KF-E	PAC-SK53KF-E	PAC-SK53KF-E
WIRED REMOTE CONTROLLER REFERENCE		PAR-411MAA	PAR-411MAA	PAR-411MAA	PAR-411MAA	PAR-411MAA	PAR-411MAA	PAR-411MAA
WIRELESS REMOTE CONTROLLER REFERENCE		PAR-SL101A-E	PAR-SL101A-E	PAR-SL101A-E	PAR-SL101A-E	PAR-SL101A-E	PAR-SL101A-E	PAR-SL101A-E
SUZ-M / PUZ-M OUTDOOR UNITS		SUZ-M35VAR2	SUZ-M50VAR2	SUZ-M60VAR2	SUZ-M71VAR1	PUZ-M100VKA2	PUZ-M125VKA2	PUZ-M140VKA2
SOUND PRESSURE LEVEL (dBA)	Heating/Cooling	48 / 48	48 / 49	49 / 51	49 / 51	51 / 54	54 / 56	55 / 57
	Cooling	50	54	65	66	70	72	73
SOUND POWER LEVEL (dBA)		35	41	54	55	76	84	84
WEIGHT (kg)								
DIMENSIONS (mm)	Width x Depth x Height	800 x 285 x 550	800 x 285 x 714	840 x 330 x 880	840 x 330 x 880	1050 x 330 x 981	1050 x 330 x 981	1050 x 330 x 981
ELECTRICAL SUPPLY		220-240V, 50Hz	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	Single
SYSTEM POWER INPUT (kW)	Heating/Cooling (nominal)	0.97 / 0.90	1.73 / 1.61	1.84 / 1.84	2.21 / 1.91	3.01 / 2.71	3.63 / 4.01	4.39 / 4.96
	Heating/Cooling (UK)	0.83 / 0.77	1.47 / 1.39	1.56 / 1.58	1.88 / 1.64	2.71 / 2.50	3.27 / 3.33	3.59 / 4.12
STARTING CURRENT (A)		5.0	5.7	7.6	10.0	7.1	2.9	2.9
SYSTEM RUNNING CURRENT (A)	Heating/Cooling (MAX)	5.0 / 4.1 [8.5]	8.0 / 7.1 [13.5]	9.3 / 8.4 [14.8]	9.5 / 9.1 [14.8]	13.0 / 11.7 [20]	15.6 / 17.4 [26.5]	19.0 / 21.5 [30]
FUSE RATING (BS88) - HRC (A)		10	20	20	20	32	32	40
MAINS CABLE No. CORES		3	3	3	3	3	3	3
MAX PIPE LENGTH (m)		20	30	30	30	55	65	65
MAX HEIGHT DIFFERENCE (m)		12	30	30	30	30	30	30
CHARGE REFRIGERANT (kg) / CO ₂ EQUIVALENT (g) - R32 (GWP 675)		0.90 / 0.61 (7m)	1.20 / 0.81 (7m)	1.25 / 0.84 (7m)	1.45 / 0.98 (7m)	3.10 / 2.09 (30m)	3.60 / 2.43 (30m)	3.60 / 2.43 (30m)
MAX ADDITIONAL REFRIGERANT (kg) / CO ₂ EQUIVALENT (g) - R32 (GWP 675)		1.16 / 0.78	1.66 / 1.12	1.71 / 1.15	2.37 / 1.80	4.10 / 2.77	5.00 / 3.38	5.00 / 3.38

Note: No duty/standby operation on SUZ-M35/50/60/71VAR2/1.

PLA-M35/50/60/71/100/125/140EA2 DIMENSIONS

Air Conditioning

Product Information

PCA-M R410A Ceiling Suspended System
Standard Inverter Heat Pump
(Single Phase)

Making a
World of
Difference



PCA-M - INDOOR UNITS		PCA-M50KA	PCA-M60KA	PCA-M71KA	PCA-M100KA	PCA-M125KA	PCA-M140KA
CAPACITY (kW)	Heating (nominal)	5.5 (1.7-6.6)	6.9 (2.5-8.0)	7.9 (2.6-10.2)	11.2 (2.8-12.5)	13.5 (4.8-15.0)	15.0 (4.9-15.8)
	Cooling (nominal)	5.0 (2.3-5.6)	5.7 (2.3-6.3)	7.1 (2.8-8.1)	9.4 (3.7-10.6)	12.1 (5.6-13.0)	13.6 (5.8-14.1)
	Heating (UK)	4.62 (1.43-5.54)	5.8 (2.1-6.72)	6.63 (2.18-8.56)	9.63 (2.41-10.75)	11.61 (4.13-12.9)	12.9 (4.21-13.59)
	Cooling (UK)	4.9 (2.25-5.49)	5.58 (2.25-6.17)	6.95 (2.74-7.93)	8.55 (3.37-9.65)	11.01 (5.1-11.83)	12.38 (5.28-12.83)
SHF (nominal)		0.79	0.81	0.78	0.77	0.72	0.72
COP / EER (nominal)		3.62 / 3.23	3.61 / 3.31	3.62 / 3.45	3.32 / 3.08	3.32 / 2.85	3.35 / 2.41
SCOP (ipsh) / SEER (ipsc) (BS EN14825)		4.0 / 5.8	4.0 / 6.1	4.3 / 6.0	4.1 / 5.6	4.00 (160.0%) / 5.26 (210.2%)	3.93 (157.2%) / 5.13 (205.1%)
EIP ENERGY EFFICIENCY CLASS	Heating/Cooling	A+ / A+	A+ / A++	A+ / A+	A+ / A+	N/A	N/A
AIRFLOW (l/s)	Lo-M1-M2-Hi	167-183-217-250	250-267-283-317	267-283-300-333	367-400-433-467	383-417-450-483	400-433-483-533
PIPE SIZE mm (in)	Gas/Liquid	12.7 (1/2) / 6.35 (1/4")	15.88 (5/8) / 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")
SOUND PRESSURE LEVEL (dBA)	Lo-M1-M2-Hi	32-34-37-40	33-35-37-40	35-37-39-41	37-39-41-43	39-41-43-45	41-43-45-48
SOUND POWER LEVEL (dBA)		60	60	62	63	65	68
DIMENSIONS (mm)	Width x Depth x Height	960 x 680 x 230	1280 x 680 x 230	1280 x 680 x 230	1600 x 680 x 230	1600 x 680 x 230	1600 x 680 x 230
WEIGHT (kg)		26	32	32	37	38	40
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
FUSE RATING (BS88) - HRC (A)		6	6	6	6	6	6
INTERCONNECTING CABLE No. Cores		4	4	4	4	4	4
WIRED REMOTE CONTROLLER REFERENCE		PAR-33MAA	PAR-33MAA	PAR-33MAA	PAR-33MAA	PAR-33MAA	PAR-33MAA
WIRELESS REMOTE CONTROLLER REFERENCE		PAR-SL94B	PAR-SL94B	PAR-SL94B	PAR-SL94B	PAR-SL94B	PAR-SL94B

SUZ-KA / PUHZ-P - OUTDOOR UNITS		SUZ-KA50VA6	SUZ-KA60VA6	SUZ-KA71VA6	PUHZ-P100VKA	PUHZ-P125VKA	PUHZ-P140VKA
SOUND PRESSURE LEVEL (dBA)	Heating/Cooling	52 / 52	55 / 55	55 / 55	54 / 51	56 / 54	57 / 56
	Cooling	65	65	69	70	72	75
WEIGHT (kg)		54	50	53	76	84	84
DIMENSIONS (mm)	Width x Depth x Height	840 x 330 x 880	840 x 330 x 880	840 x 330 x 880	1050 x 330 x 981	1050 x 330 x 981	1050 x 330 x 981
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)	1.52 / 1.55	1.91 / 1.72	2.18 / 2.06	3.37 / 3.05	4.06 / 4.24	4.47 / 5.62
	Heating/Cooling (UK)	1.28 / 1.32	1.60 / 1.46	1.83 / 1.75	3.03 / 2.53	3.65 / 3.52	4.02 / 4.66
STARTING CURRENT (A)		7.7	8.3	9.1	7.0	11.1	11.1
SYSTEM RUNNING CURRENT (A)	Heating/Cooling [MAX]	7.50 / 7.70 [12.4]	7.80 / 8.30 [14.4]	9.10 / 8.70 [16.5]	13.4 / 14.9 [20]	18.9 / 17.9 [26.5]	23.0 / 18.9 [30]
FUSE RATING (BS88) - HRC (A)		20	20	20	32	32	40
MAINS CABLE No. Cores		3	3	3	3	3	3
MAX PIPE LENGTH (m)		30	30	30	50	50	50
MAX HEIGHT DIFFERENCE (m)		30	30	30	30	30	30
CHARGE REFRIGERANT (kg) / CO ₂ EQUIVALENT (t)		1.60 / 3.34 (7m)	1.60 / 3.34 (7m)	1.80 / 3.76 (7m)	3.30 / 6.89 (30m)	3.80 / 7.93 (30m)	3.80 / 7.93 (30m)
R410A (GWP 2088)							
MAX ADDITIONAL REFRIGERANT (kg) / CO ₂ EQUIVALENT (t)		0.46 / 0.96	0.46 / 0.96	1.265 / 2.64	1.20 / 2.51	1.20 / 2.51	1.20 / 2.51
R410A (GWP 2088)							

Note: Duty/standby not available on SUZ-KA50/60/71VA6.



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