



MMU Geoffrey Manton Building

Plant Noise Impact Assessment

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REVISION HISTORY

Revision	Date	Revision Details	Author	Checked
R01	18/04/2023	Original issue	Susan Witterick BSc MIOA	Ben Tomlin BSc MIOA
R01A	24/04/2023	Added assessment for MVHR intake and exhaust	<i>Susan Witterick</i> Susan Witterick BSc MIOA	<i>Ben Tomlin</i> Ben Tomlin BSc MIOA

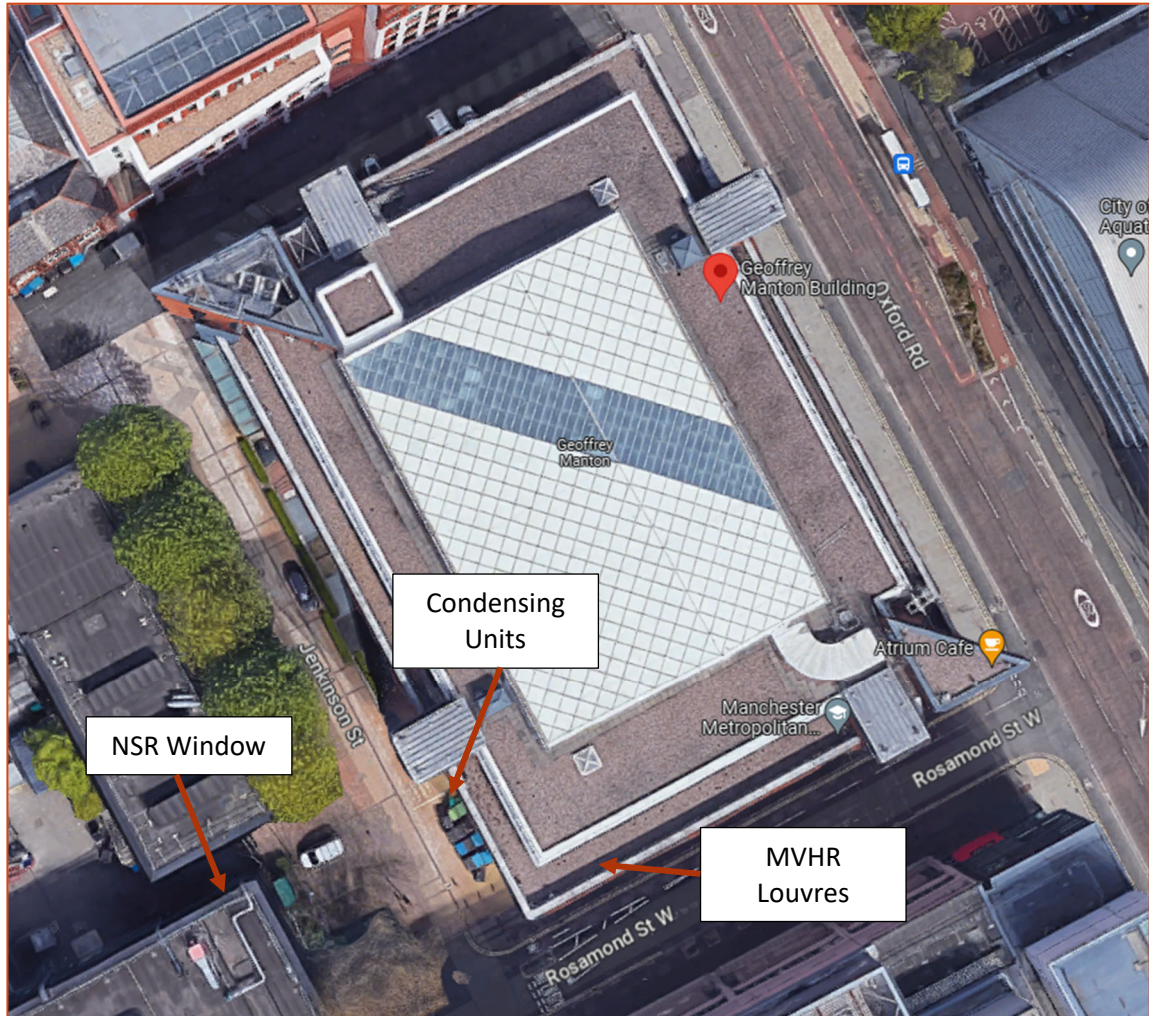
1 INTRODUCTION

- 1.1 dBx Acoustics has been appointed by Manchester Metropolitan University (MMU) to carry out a noise survey and noise impact assessment for the proposed installation of 2no. external condenser units and 2no externally ducted MVHR units to the Geoffrey Manton Building, Rosamond St West, Manchester M15 6EB.
- 1.2 This report presents the results of a noise survey carried out at the site, and an assessment of the noise impact from the proposed units.
- 1.3 A glossary of acoustic terminology is provided in Appendix A to assist the reader.

2 DESIGN PROPOSAL

- 2.1 Two Mitsubishi PUZ-M140VAR1 condensing units will be installed at ground floor level at the rear of the Geoffrey Manton Building.
- 2.2 Two Mitsubishi LGH-250-RGXT-E MVHR units will be located internally to the building, with ducted fresh air intake and exhaust to Rosamond Street West.
- 2.3 The location of the proposed plant is indicated in Figure 1, below.

Figure 1: Proposed Plant Location



- 2.4 The nearest noise sensitive receptor (NSRs) to the condensing units is the Benzie and Chatham Building across Jenkinson Street. This has no windows overlooking Jenkinson Street. The nearest windows are approximately 20m from the proposed units, indicated on Figure 1 above.
- 2.5 The RNCM building is on the far side of Rosamond St W, at a distance of 30m from the proposed condensing units and 15m from the MVHR louvres.
- 2.6 There are no residential buildings within the vicinity of the proposed units.
- 2.7 The opening hours of the building are 08:00h-19:30h Monday-Friday. It is not anticipated that the proposed units will operate outside these hours.

3 ACOUSTIC DESIGN CRITERIA

Local Authority Requirements

- 3.1 The Local Authority is Manchester City Council (MCC).
- 3.2 MCC's document *Planning and Noise*, last updated in October 2022, requires that BS412 should be used to assess the likely impact of noise from new items of plant. Specifically, it is required that:

'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'

BS 4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound'

- 3.3 BS 4142:2014 sets out a procedure for assessing noise impact whereby a Noise Rating Level is determined and compared with the existing local Background Sound Level.
- 3.4 The Rating Level ($dB_{L_{Ar,Tr}}$) is evaluated from the Specific Noise Level by including cumulative corrections to account for factors such as distinguishable tone, impulsivity, intermittency or other readily distinguishable sound characteristics.
- 3.5 The assessment of the impact depends upon the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level. An initial estimate of the impact of the specific sound is made by subtracting the Background Sound Level from the Rating Level, while considering the following points:
- a) Typically, the greater this difference, the greater the magnitude of the impact.
 - b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
 - d) 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.

4 NOISE SURVEY

- 4.1 An attended noise survey was carried out between 13:30h and 16:45h on Thursday 13th April 2023. The monitoring locations are shown in Figure 2, below.
- 4.2 All measurements were made in free-field conditions and were 15 minutes in duration.

Figure 2: Noise Monitoring Locations



- 4.3 The key noise sources noted during the noise survey were traffic on the surrounding road network, and building services plant associated with the Benzie and Chatham Building.
- 4.4 Measurements were undertaken in accordance with BS 7445-1:2003 *Description and Measurement of Environmental Noise*, with the microphone located approximately 1.5 metres above the local ground level and at least 3.5 metres away from reflective surfaces other than the ground; i.e in free field conditions.

Weather Conditions

- 4.5 Weather conditions during the measurement period were cold and dry.
- 4.6 Wind speeds were within suitable parameters for the measurement of environmental noise (i.e. generally under 5 ms^{-1}). The microphone was protected with a windshield for the duration of the survey.

Equipment

- 4.7 The equipment used during the environmental noise survey is detailed in Table 1, below.

Table 1: Equipment Used in Environmental Noise Survey

Kit Reference	Equipment	Manufacturer & Part No.	Serial Number	Calibration Date	Certificate Number
Kit 3 - Cirrus	Meter	CR:171B	G300741	31/01/2022	169319
	Pre-Amp	MV:200F	9082F		
	Microphone	MK:224	211753D		
	Calibrator	CR:515	87160	18/01/2023	06083/2

- 4.8 The sound level meter was calibrated before and after measurements, with no significant drift recorded. An accredited laboratory calibrated the equipment not more than two years prior to the measurements being made, with the exception of the calibrator, which had been calibrated not more than one year prior to the survey.

5 ENVIRONMENTAL NOISE SURVEY RESULTS

- 5.1 The noise levels measured during the environmental noise survey are summarised in Table 2, below. Full measurement data are available on request.

Table 2: Measured Noise Levels

Location	Time	Ambient Noise Level, dBL _{Aeq,T}	Background Noise Level, dBL _{A90,T}
A – Rosamund St West	13:38	57	53
	14:57	57	53
	15:58	55	53
B – Jenkinson Street	13:54	57	54
	15:15	57	54
	16:13	57	54

- 5.2 It can be seen that the measured noise levels were consistent throughout the survey period. The measurements are therefore considered representative of the typical conditions affecting the noise sensitive receptors.

6 PLANT NOISE IMPACT ASSESSMENT

- 6.1 Two Mitsubishi PUZ-M140VAR1 condensing units will be installed at ground floor level at the rear of the Geoffrey Manton Building. The location is indicated in Figure 1, below.
- 6.2 The manufacturer's noise data for these units is presented in Figure 3, below.

Figure 3: Manufacturer's Noise Data

SUZ-M/PUZ-M OUTDOOR UNITS		PUZ-M140VAR1
SOUND PRESSURE LEVEL (dBA)	Heating/Cooling	55 / 57
SOUND POWER LEVEL (dBA)	Cooling	73
WEIGHT (kg)		84
DIMENSIONS (mm)	Width x Depth x Height	1050 x 330 x 981
ELECTRICAL SUPPLY		220-240v, 50Hz
PHASE		Single
SYSTEM POWER INPUT (kW)	Heating/Cooling (nominal)	4.15 / 4.76
	Heating/Cooling (UK)	3.74 / 3.95
STARTING CURRENT (A)		19.3
SYSTEM RUNNING CURRENT (A)	Heating/Cooling [MAX]	16.8 / 19.3 [30.0]
FUSE RATING (BS88) - HRC (A)		40
MAINS CABLE No. CORES		3
MAX PIPE LENGTH (m)		65
MAX HEIGHT DIFFERENCE (m)		30
CHARGE REFRIGERANT (kg) / CO ₂ EQUIVALENT (t) - R32 (GWP 675)		3.60 / 2.43 (30m)
MAX ADDITIONAL REFRIGERANT (kg) / CO ₂ EQUIVALENT (t) - R32 (GWP 675)		5.00 / 3.38
Note: No duty/standby operation on SUZ-M35/50/60/71VAR2/1.		

- 6.3 Calculations have been undertaken to predict the specific sound level arising at the noise sensitive receptors from the operation of these units.
- 6.4 The predicted specific sound level due to these units is 45dB_{L_{Aeq,T}} when assessed at the nearest noise sensitive receptor, the Benzie and Chatham Building. The predicted specific sound level due to these units when assessed at the RNCM façade is 33dB_{L_{Aeq,T}}.
- 6.5 Two Mitsubishi LGH-250-RGXT-E MVHR units will be installed internally, with ducted fresh air inlet and exhaust connections to Rosamund Street. Attenuators have been specified to these connections. The predicted specific sound level due to these units when assessed at the RNCM façade is 35dB_{L_{Aeq,T}}. These units are fully acoustically screened from the Benzie and Chatham Building and therefore would not contribute to the overall plant noise level arising at that location.
- 6.6 Therefore the calculated specific sound level for all plant operating simultaneously is 45dB_{L_{Aeq,T}} at the Benzie and Chatham Building, and 37dB_{L_{Aeq,T}} when assessed at the RNCM. The Benzie and Chatham Building is therefore the most affected noise sensitive receptor.
- 6.7 Table 5, below, presents a BS4142 assessment of noise impact to the Benzie and Chatham Building during the daytime operating hours (08:00h-19:30h).

Table 5: BS4142 Assessment

Item	Calculation	Relevant Clause	Comments
Measured background sound level – daytime	$53\text{dB}_{\text{LA90,1hr}}$	8.3	The typical background sound level measured during the daytime period.
Specific sound level	$45\text{dB}_{\text{LAeq,1hr}}$	7.3.3	A prediction made using the methodology outlined above, includes all sources, screening and distance corrections.
Assessment made during the daytime period so reference period is 1 hour		7.2	-
Acoustic Feature Correction	0dB	9.2	No acoustically distinct characteristics
Rating Level	$45\text{dB}_{\text{LA,r,Tr}}$	9.2	The predicted Rating Level during the night-time period.
Excess of Rating Level over background sound level	-8dB	11	-
Assessment indicates low likelihood of adverse impact		11	Predicted Rating Level does not exceed the lowest measured background level. This is an indication of the development having a low impact.
Uncertainty of the assessment	Minor	10	Background sound level based on repeatable measurements. The predicted Rating Level is based on established prediction methodologies.

- 6.8 The BS4142 assessment detailed above indicates that plant noise from the proposed installation will be more than 5dB below the background noise level at the nearest noise sensitive receptors and will therefore be compliant with MCC requirements. No additional mitigation is required.

7 CONCLUSION

- 7.1 dBx Acoustics Ltd has been appointed by Manchester Metropolitan University to undertake a noise survey and noise impact assessment for the proposed installation of two external condensing and ducted inlet and exhaust for MVHR units at the Geoffrey Manton Building, Manchester M15 6EB.
- 7.2 An attended noise survey has been undertaken at the site at locations representative of the nearest noise sensitive receptors.
- 7.3 Based upon the manufacturers data for the plant intended for the development, an assessment of operational plant noise levels at the nearest sensitive receptors has been undertaken.
- 7.4 The predicted cumulative plant noise rating level when assessed at the NSR is more than 5dB below the measured background noise levels, and therefore meets the requirements of Manchester City Council.
- 7.5 Taking the above into account, noise should not be a limiting factor in any planning application.

APPENDIX A – GLOSSARY OF ACOUSTIC TERMINOLOGY

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (L_p) the reference quantity is 2×10^{-5} N/m ² . The sound pressure level existing when microphone measured pressure is 2×10^{-5} N/m ² is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A-weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n,T}$	L_p which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
L_{Fmax}	The instantaneous maximum sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
L_{AFmax}	The instantaneous maximum A weighted sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
$L_{Ar,Tr}$	The rating level: the equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise.
Reverberation Time, T	The time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped. The descriptor T, often includes other nomenclature to describe the type of reverberation time measurement or if the reverberation time is an average taken for specific frequencies. For example, a T_{mf} is the mid-frequency reverberation time.
Absorption Coefficient, α	The fraction of reverberant sound energy absorbed by a material. It is expressed as a value between 1.0 which equates to perfect absorption and 0 which equates to zero absorption.
Acoustic Class, A - E	Classification of sound absorbers into Sound Absorption Classes A-E, according to BS EN ISO 11654, including frequencies 200-5000 Hz
NRC	A single-number rating system used to compare the sound-absorbing characteristics of building materials. A measurement of the acoustical absorption performance of a material, calculated by averaging its Sound Absorption Coefficients at 250, 500, 1000 and 2000 Hz
STI	Speech Transmission Index , Metric ranging between 0 and 1 representing the transmission quality of speech with respect to intelligibility by a speech transmission channel
R	Sound Reduction Index , the laboratory measured sound insulation properties of a material or building element in octave or third octave bands.
R_w	Weighted Sound Reduction Index , a single number which represents the sound reduction of a material. It is derived by plotting the sound reduction index against a set of reference curves. The curves are shifted until a best-fit is established and the curve which best fits the sound reduction spectrum is used to represent the single figure value.
D_w	Weighted Level Difference , the weighted level difference between a pair of rooms, stated as a single figure.

D_{nT}	Standardised Level Difference, a frequency-dependent measurement of airborne sound insulation, calculated using the following formula: $D_{nT} = L_1 - L_2 + 10\log(T/T_0)$ dB Where: L_1 is the energy-averaged sound pressure level due to the pink noise source measured in the source room using a sweep technique. L_2 is the energy-averaged sound pressure level measured in the receiving room using a sweep technique. T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (= 0.5s for dwellings).
$D_{nT,w}$	Weighted Standardised Level Difference, a single-figure value of airborne sound insulation performance, derived according to procedures in BS EN ISO 717-1, based on the D_{nT} values at different frequencies (100-3150 Hz third octave bands).
$D_{n,F,w}$	Weighted, Normalised Flanking Level Difference, the normalised, weighted difference in sound level between a pair of rooms via a flanking element, such as mullion or ceiling detail. The level difference in octave bands is first normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.
D_{ne}	Normalised Element Level Difference. The normalised difference in sound level between a pair of rooms via a small element such as a trickle ventilator. The level difference in octave bands is normalized to a reference amount of absorption.
$D_{n,e,w}$	Weighted, Normalised Element Level Difference. The normalised, weighted difference in sound level between a pair of rooms via a small element such as a trickle ventilator, stated as a single figure. The level difference in octave bands is normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.
C_{tr}	Spectrum Adaptation Term, a correction term applied to the sound insulation single-number values (R_w, D_w, and $D_{nT,w}$) in accordance with BS EN ISO 717-1. Applying the C_{tr} penalises a construction's performance if its low frequency performance is poor in relation its performance at higher frequencies.
Impact Sound	The noise generated by an impact on a structure. This is normally used to describe the noise created by people walking or moving furniture on a floor structure.
L_{nT}	Standardised Impact Sound Pressure Level, a frequency dependent measurement of impact sound insulation, calculated using the following formula: $L_{nT} = L_1 + 10\log(T/T_0)$ dB Where: L_1 is the mean sound pressure level due to the tapping machine measured in the receiving room using a sweep technique. T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (0.5s for dwellings)
$L'_{nT,w}$	Weighted Standardised Impact Sound Pressure Level, a single-figure value (@ 500 Hz) of impact sound insulation, performance, derived according to BS EN ISO 717-2, based on the L_{nT} values at different frequencies (100Hz- 3150 Hz third octave bands).
Insertion Loss, IL	The reduction of noise level due to the presence of a noise control device such as an attenuator, excluding any regeneration noise created by its presence.
NR	The Noise Rating level. This is a single figure value derived by plotting a noise spectrum against a set of curves. The curve under which the spectrum fits is the resulting NR level.

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Final Audit Report

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