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44 King Street, Manchester

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Noise Impact Assessment

Project Number
20706

Issued For
DTS Development

Institute of Acoustics sponsoring organisation
CQMS Safety Scheme
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UKAS TESTING 7688

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UKAS accreditation is only applicable to pre-completion sound insulation testing services for building regulations and is not linked to the endorsements and certifications shown above

EXECUTIVE SUMMARY

This noise impact assessment has been undertaken in order to assess a proposed plant installation for commercial use at 44 King Street, Manchester.

The proposed plant installation comprises the following plant units:

- 2 No. Daikin Air source heat pump Units.
- 1 No. Samsung Heat Recovery Unit.

A background noise survey has been undertaken as detailed in the report, in order to determine an appropriate noise emission criterion, in accordance with the requirements of Manchester City Council.

Calculations were undertaken for the nearest receiver, identified as 33 South King Street. It should be noted that if there are closer receivers that Clement Acoustics is not aware of, a reassessment will be necessary, and this should therefore be confirmed by the Client.

It has been demonstrated that compliance with the established criterion is feasible, dependent on the following material considerations:

- The plant could be in use at any time over a 24 hour period
- The noise emissions data for the proposed units, as obtained from available manufacturer information
- Plant and receiver locations are as established in this report and marked on the attached site plan
- Mitigation is applied as recommended in this report, as follows:
    - Air source heat pumps are restricted to a ‘low noise’ mode,
    - Manufacturer-supplied acoustic enclosures installed around the air source heat pumps,
    - In-duct attenuators are installed on the heat recovery unit as proposed.

If there is any deviation from the above, Clement Acoustics must be informed, in order to establish whether a reassessment is necessary.

Clement Acoustics has used all reasonable skill and professional judgement when preparing this report. The report relies on the information as provided to us at the time of writing and the assumptions as made in our assessment.

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Appendix A	Glossary of Acoustic Terminology
Appendix B	Acoustic Calculations

REVISION HISTORY

Issue	Date of Issue	Author	Reviewed	Authorised
R2	16/04/2025	[redacted]	[redacted]	[redacted]
		Jamie Newton Senior Consultant BEng (Hons) MIOA	**Andy Thomas** Director BSc (Hons) MIOA	**Andy Thomas** Director BSc (Hons) MIOA

Issue	Comment
R0	First Issue
R1	Revision due to change in proposed plant installation and mitigation strategy
R2	Revision due to introduction of a specific planning condition from Manchester City Council

1.0 INTRODUCTION

Clement Acoustics has been commissioned by DTS Development to measure existing background noise levels at 44 King Street, Manchester. Measured noise levels have been used to determine noise emissions criteria for a proposed plant installation in agreement with the planning requirements of the Manchester City Council.

This report presents the results of the environmental survey followed by noise impact calculations and outlines any necessary mitigation measures.

An acoustic terminology glossary is provided in Appendix A.

2.0 SITE DESCRIPTION

The site consists of the basement, ground floor and first floor of 44 King Street, a residential unit bound by King Street to the north, further retail units to the west, an alley and further commercial units to the west and residential building 33 South King Street to the south. The surrounding area is predominantly commercial in nature.

Current proposals are to install two air source heat pump units at first floor level on the south façade of the site, and one heat recovery unit located within the building with ducting to the southern façade of the site. The units will service a commercial unit.

A residential unit at 33 South King Street has been identified as the nearest affected receiver. This nearest noise sensitive receivers was identified through observations on-site. If there are any receivers closer than that identified within this report then a further assessment will need to be carried out. Therefore, the closest noise sensitive receiver should be confirmed by the client before the plant is installed or any noise mitigation measures are implemented.

Locations are shown in attached site plan 20706-SP1.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Unattended Noise Survey Procedure

Measurements were undertaken at one position as shown on indicative site drawing 20706-SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the nearest affected receiver.

The surroundings and position used for the monitoring location are described in Table 3.1.

Position No.	Description
UN1	The microphone was mounted on a 1st storey window flat roof at the back of the building. The microphone was positioned >3.5 m in front of any vertical reflective surface. [1]

Table 3.1 Description of unattended monitoring locations

Note [1]: The position was considered to be free-field according to guidance found in BS 4142: 2014 *'Methods for rating and assessing industrial and commercial sound'* (BS 4142: 2014), and a correction for reflections has therefore not been applied.

Continuous automated monitoring was undertaken for the duration of the survey between 17:00 on 15 December 2025 and 16:00 on 17 December 2025.

The measurement procedure generally complied with ISO 1996-2: 2017: '*Description, measurement and assessment of environmental noise'*.

3.2 Weather Conditions

At the time of set-up and collection of the monitoring the weather conditions had light winds and occasional precipitation. It is understood that the weather conditions during the unattended survey remained dry with light winds until 08:00 on 17 December when rain began, and so noise data measured between 08:00 – 16:00 on 17 December have been excluded from this assessment.

Outside of data excluded from this assessment, it is considered that the weather conditions did not significantly adversely affect the measurements and are therefore considered suitable for the measurement of environmental noise.

3.3 Equipment

The equipment calibration was verified, by means of a field verification check, before and after use and no abnormalities were observed.

The equipment used was as summarised in Table 3.2.

Position	Instrument	Manufacturer	Type
UN1	Class 1 sound level meter[1]	01dB	Solo
-	Class 1 sound level meter calibrator[1]	Norsonic	1251

Table 3.2 Instrumentation used during the survey

Note [1]: Calibration certificates available upon request

4.0 ENVIRONMENTAL NOISE SURVEY RESULTS

4.1 Unattended Noise Survey Results

The $L_{Aeq:\ 5min}$, $L_{Amax:\ 5min}$, $L_{A10:\ 5min}$ and $L_{A90:\ 5min}$ acoustic parameters were measured at the location shown in site drawing 20706-SP1. Measured noise levels are shown as a time history in Attachment 20706-TH1, with average ambient and typical background noise levels summarised in Table 4.1.Position

	Time Period	Average ambient noise level $L_{Aeq:\ T}$, dB	Typical background noise level $L_{A90:\ 5min}$, dB
UN1	Daytime (07:00 - 23:00)	56	55
	Night-time (23:00 - 07:00)	49	43

Table 4.1 Average ambient and typical background noise levels

5.0 NOISE CRITERIA

5.1 Local Authority Criteria – Residential Recievers

It is understood that Manchester City Council have applied the following planning condition relating to plant noise emissions at the site:

"Prior to the installation of the Daikin condensers and louvre screens hereby approved, either a scheme that demonstrates that the Daikin condensers and louvre screens will achieve a rating level of 5dB (LAeq) below the typical background (LA90) level in each octave band at the nearest noise sensitive location, or a scheme showing a method to acoustically treat/insulate the Daikin condensers and louvre screens so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level in each

octave band at the nearest noise sensitive location, shall be submitted to and approved in writing by the Local Planning Authority. "

It is understood that the proposed plant units will be for commercial use, but could be in use at any time during a 24 hour period. In order to present a robust assessment, proposed plant levels will be assessed against typical background noise levels during the night-time period.

Based on the results of the environmental noise survey and requirements of Manchester City Council, Table 5.1 presents the proposed plant noise emission criteria.

	Sound pressure Level in each Frequency Band, Hz							
	63	125	250	500	1k	2k	4k	8k
Typical Night-time background noise level $L_{A90:\,5min}$, dB	50	57	42	38	37	37	35	27
Plant Noise Emission Limit $L_{Aeq:T}$, dB	45	52	37	33	32	32	30	22

Table 5.1 Plant noise emission limits

5.2 Commercial Receivers

The closest receiver to the proposed plant is an existing commercial office at the second floor of 44 King Street.

In order to assess whether noise emissions will be controlled to an acceptable level, guidance has been sought in British Standard 8233: 2014 '*Guidance on sound insulation and noise reduction for buildings*' [BS 8233].

In Table 6 of BS 8233, guidance is given on typical noise levels for non-domestic buildings where concentration may be required. The relevant guidance given in this table is summarised in Table 5.2

Objective	Location	Design range $L_{Aeq,T}$ dB
Study and work requiring concentration	Staff/meeting room	35-45 dB(A)
	Executive office	35-40 dB(A)

Table 5.2 BS8233 recommended internal background noise levels

Based on the use of the adjacent space, we would recommend noise emissions should not exceed the design ranges shown in Table 5.2.

6.0 PLANT NOISE IMPACT ASSESSMENT

6.1 Proposed Installation

The proposed plant installation comprises the following:

- 2 No. Daikin RZAG125N Air Source Heat Pump unit[1]
- 1 No. Samsung AN080JSKL heat recovery unit[2]

[1] Restricted to Low-Noise operations, and located in a manufacturer provided acoustic enclosure

[2] Blauberg SD200/900 Attenuator proposed on Fresh air Inlet duct

Noise emissions for the proposed plant units, as provided by the manufacturer, are shown in Table 6.1. Loudest modes of operation have been used in order to present a robust worst-case assessment.

It should be noted that in-duct sound power levels were not available from the manufacturer, and so in-duct levels have been taken from a similar unit with the same stated noise breakout levels (Daikin ALB03LBS).

Unit		Sound pressure Level at 1 m in each Frequency Band, Hz								
		63	125	250	500	1k	2k	4k	8k	dB(A)
Daikin RZAG125N Air Source Heat Pump ***Low Noise and with Enclosure***		45	50	37	30	15	6	3	7	35
Sound power Level in each Frequency Band, Hz										
Samsung AN080JSKL heat recovery unit	Fresh Air Inlet ***With Proposed attenuator***	62	64	62	53	51	46	32	20	58
		-2	-4	-6	-10	-27	-13	-7	-7	
	Exhaust Outlet	67	72	76	74	65	64	56	48	74

Table 6.1 Manufacturer provided noise emissions levels

6.2 Consideration of Penalties

BS 4142 provides guideline penalties that can be applied to noise emissions to account for tonality, impulsivity and intermittency. Where a sound source is neither tonal nor impulsive, but is still distinctive against the residual acoustic environment, a penalty may still be applied.

The available penalties for different characteristics are summarised in Table 6.2

Characteristic	Comments	Maximum Penalty
Tonality	Can be converted to 2 dB for a tone which is just perceptible, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible	+6 dB
Impulsivity	Can be converted to 3 dB for impulsivity which is just perceptible, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible	+9 dB
Intermittency	When the sound has identifiable on/off conditions	+3 dB
Distinctiveness	Intended for sources that are neither tonal nor impulsive, but distinctive against background noise sources	+3 dB

Table 6.2 Available penalties according to BS 4142

6.2.1 Consideration of Tonality

Air source heat pumps and heat recovery units would not be considered a tonal source of noise.

6.2.2 Consideration of Impulsivity

The proposed plant would not be considered an impulsive source of noise, provided the units are maintained in good working order.

6.2.3 Consideration of Intermittency

In terms of the potential intermittency, the following guidance taken from Section 9.2 of BS 4142 is noted:

> *"Intermittency*
>
> *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. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."*

For the assessed worst-case periods, the plant is assumed to be in constant operation, in line with the above guidance. It can therefore be determined that there will be no intermittency within that period.

6.2.4 Consideration of Distinctiveness

It is noted that the design target is to achieve a plant noise level that is 5 dB below the background noise level, as described in Section 5.1. As such, plant noise emissions are not expected to be distinctive against the residual noise environment, and no penalty has therefore been applied.

6.3 Proposed Mitigation Measures

In order to meet the proposed criteria stated in Section 5.0, it is recommended that an in-duct attenuator is installed to the exhaust atmospheric duct of the heat recovery unit, in addition to the one proposed to the fresh air intake and the proposed measures being applied to the heat pumps.

Based on the information provided, attenuators meeting the sound reduction indices as stated in Table 6.3 installed on the exhaust outlet duct should be suitable.

Mitigation	Minimum Required Attenuation (dB) in each Frequency Band, Hz							
	63	125	250	500	1k	2k	4k	8k
Exhaust Attenuator	0	0	19	20	11	10	4	4

Table 6.3 Required attenuation from proposed attenuator

6.4 Noise Impact Assessment

6.4.1 Residential Receiver

The closest residential receiver has been identified as the window on the southern façade of a 33 South King Street, a residential property 7 m south of the site, on the opposite side of a light-well.

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.4. Detailed calculations are shown in Appendix B.

Description	Sound pressure Level in each Frequency Band, Hz							
	63	125	250	500	1k	2k	4k	8k
Plant Noise Emission Limit $L_{Aeq:T}$, dB	45	52	37	33	32	32	30	22
Predicted Noise level at Receiver 1 $L_{Aeq:T}$, dB	41	49	37	33	32	32	30	22
Difference between Criteria and Predicted Level, dB	-4	-3	0	0	0	0	0	0

Table 6.4 Noise levels and project criterion at noise sensitive residential receivers

As presented in Table 6.4 and Appendix B, the proposed plant installation with suitable operation restrictions, an acoustic enclosure and in-duct attenuators would be expected to meet the requirements of the proposed criteria.

Further calculations have been undertaken to assess whether the noise emissions from the proposed plant unit would be expected to meet recognised British Standard recommendations, in order to further ensure the amenity of nearby noise sensitive receivers.

British Standard 8233: 2014 '*Guidance on sound insulation and noise reduction for buildings*' (BS 8233: 2014) gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS 8233: 2014 recommends 30 dB(A) as being acceptable internal sleeping conditions during night-time.

With loudest external levels of 38 dB(A), acceptable internal conditions would be met by taking the attenuation of the window itself into consideration. According to BS 8233: 2014, a typical building facade with a partially open window offers 15 dB attenuation.

It can therefore be predicted that, in addition to meeting the requirements of the set criteria, the emissions from the proposed plant would be expected to meet the most stringent recommendations of the relevant British Standard, with neighbouring windows partially open. Predicted levels are shown in Table 6.5.

Receiver	Recommended Target – For sleeping conditions in a bedroom, in BS 8233: 2014	Noise Level at Receiver (due to plant installation)
Inside Residential Window	30 dB(A)	23 dB(A)

Table 6.5 Noise levels and BS 8233: 2014 criteria inside nearest residential space

6.4.2 Commercial Receiver

The closest commercial receiver has been identified as the window on the southern façade of a second floor office at 44 King Street

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.6. Detailed calculations are shown in Appendix B.

Receiver	Design Range	Noise Level at Receiver (due to plant installation)
Inside Commercial Window	35-40 dB(A)	28 dB(A)

Table 6.6 Noise levels and project criterion at noise sensitive commercial receiver

As presented in Table 6.6 and Appendix B, the proposed plant installation with suggested attenuation would be expected to meet the requirements of the proposed criteria.

7.0 CONCLUSION

An environmental noise survey has been undertaken at 44 King Street, Manchester. The results of the survey have enabled criteria to be set for noise emissions from the proposed plant in accordance with the requirements of the Manchester City Council.

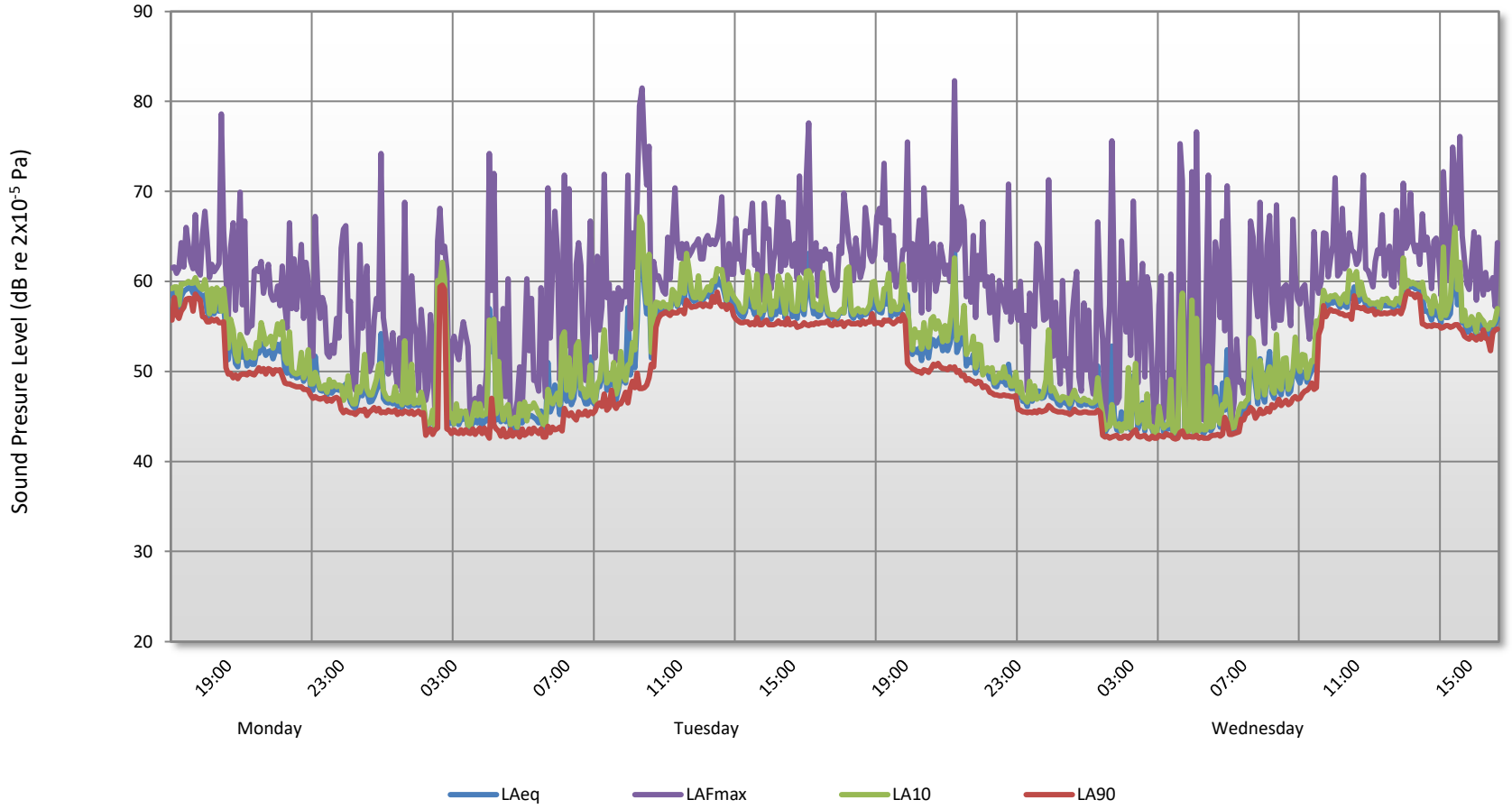
A noise impact assessment has then been undertaken using manufacturer noise data to predict the noise levels, due to the proposed plant, at the nearby noise sensitive receiver.

Calculations show that noise emissions from the proposed units should meet the requirements of the Manchester City Council and British Standard 8233: 2014 with the recommended mitigation installed as stated herein.

44 King Street, Manchester

Position UN1

Environmental Noise Time History
15 December 2025 to 17 December 2025



20706-TH1

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.
Acceleration	The rate of change of velocity, often measured in ms^{-2}. Commonly used to assess human response to vibration and for machine condition monitoring.
Accelerometer	A vibration transducer sensor that is used to measure acceleration.
Airborne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.
Ambient Vibration	The all-encompassing vibration occurring at a given location, at a given time, composed of all vibration sources near and far.
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in a typical young adult detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits. Typically, as a person ages their audible hearing range decreases.
A-Weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.
Axis	A fixed reference line for the measurement of vibration in a particular direction. Vibration is commonly measured in transverse (T), longitudinal (L) and vertical (V) axes (or X, Y and Z).
Background Noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation. The L_{90} parameter, i.e. the level exceeded for not more than 90% of the time is often used as a descriptor of "background noise" for environmental impact studies.
Background Vibration	The underlying level of vibration in the ambient environment, measured in the absence of the vibration sources of interest.
Continuous Vibration	Vibration that continues uninterrupted over a defined period.
dB(A)	The human ear is less sensitive to low (below 125 Hz) and high (above 16 kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and the unit is dB(A).
Decibel [dB]	The unit that sound is measured in. Decibels are a logarithmic scale hence two equally intense sound sources operating together produce a sound level which is 3 dB higher than one alone and 10 identical, uncorrelated sources produce a 10 dB higher sound level.
Distance Attenuation	Sound which propagates from a point source in free air attenuates by 6 dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3 dB for each doubling of distance.
$D_{nT,w}$	Weighted Standardised Field Level Difference A measure of sound insulation performance of a building element. It is characterised by the difference in noise level on each side of a wall or floor. It is measured in-situ. It is a field measurement that relates to the R_w laboratory measured value but is not equal to it because an in-situ space is not of the same quality as a laboratory space. The value is indicative of the level of speech privacy between spaces. The higher its value the better the insulation performance.
Flanking	Flanking is the transfer of sound through paths around a building element rather than through the building element material directly. For example, sound travelling through a gap underneath a door or a gap at the top of a wall.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch, and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz. In the case of vibration, frequency is the number of oscillations that occurs per second. Frequency is measured in units of Hertz (Hz).
Ground-Borne Noise	Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.
Impact Noise	Impact noise / structure-borne noise is generated when an object impacts with a separating element, causing that element to vibrate and re-radiate as noise in the receiving room. Common domestic examples of impact noise include footsteps and dropping objects.
Impulsive Noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.

APPENDIX A

Impulsive Vibration	Vibration that rapidly builds up to a peak followed by a damped decay. May consist of multiple impulsive events, typically less than two seconds in duration.
Intermittent Noise	The level suddenly drops to that of the background noise several times during the period of observation.
Intermittent Vibration	Either interrupted periods of continuous vibration or repeated periods of impulsive vibration.
L_{10}	This is the level exceeded for not more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise
L_{90}	This is the level exceeded for not more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.
L_{eq}	The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.
L_{max}	This is the maximum sound pressure level that has been measured over a period.
$L_{nT,w}$	Weighted Standardised Field Impact Sound Pressure Level As for $L_{n,w}$ but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The equivalent measurement in a laboratory is the $L_{n,w}$. A lower value indicates a better performing floor.
Noise	Unwanted sound.
Octave	An octave represents a doubling or halving in frequency. Noise or vibration levels across a frequency spectrum are commonly given in octave or one-third octave frequency bands.
PPV	Peak Particle Velocity. The absolute maximum value of the vibration velocity signal measured in any axis during a given time interval.
Reflection	Sound wave reflected from a solid object obscuring its path.
R_w	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The related field measurement is the $D_{nT,w}$. The higher the value the better the acoustic performance of the building element.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound Absorption	The ability of a material to absorb sound energy by conversion to thermal energy.
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the R_w and the sound insulation between two rooms can be described by the $D_{nT,w}$.
Sound Level Meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound Power Level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 pico watt.
Sound Pressure Level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 micro Pascal.
Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft.
Subjective Impression of Noise	Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

APPENDIX A

Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100 dB and 65 dB on the other side, it is said that the transmission loss of the wall is 35 dB. If the transmission loss is normalised or standardised, it then becomes the R_w or R'_w or $D_{nT,w}$.
VDV	Vibration Dose Value. A measure of tactile vibration levels used to assess intermittent vibration.
Velocity	The rate of change of vibration displacement, usually measured in mms^{-1}.
Vibration	A mechanical phenomenon whereby oscillations occur about an equilibrium point; a periodic back-and-forth motion of an elastic body or medium, commonly resulting when almost any physical system is displaced from its equilibrium condition.

Appendix B

Acoustic Calculations

20706

44 King Street, Manchester

Receiver 1: 33 South King Street

External Plant Noise Emissions Calculation

Description	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Manufacturer provided sound pressure level									
Daikin RZAG125NV1 Air Source Heat Pump - Low Noise, With Enclosure	45	50	37	30	15	6	3	7	36
Correction for Multiple Units (2 units)	3	3	3	3	3	3	3	3	
Correction for reflections (Quarter-Spherical)	6	6	6	6	6	6	6	6	
Distance correction to receiver, dB (7 m) [1]	-17	-17	-17	-17	-17	-17	-17	-17	
Condenser Sound pressure level at receiver	**37**	**42**	**29**	**22**	**7**	**-2**	**-5**	**-1**	**28**
	2	**4**	**6**	**10**	**27**	**3**	**7**	**7**	
Samsung AN080JSKL Supply Inlet	62	64	62	53	51	46	32	20	58
Correction for end reflections	-7	-3	-1	0	0	0	0	0	
Proposed Attenuator (SD200/600)	-2	-4	-6	-10	-27	-3	-7	-7	
Correction for Hemi-spherical radiation	-5	-5	-5	-5	-5	-5	-5	-5	
Distance correction to receiver, dB (7 m) [1]	-17	-17	-17	-17	-17	-17	-17	-17	
Supply Inlet Sound Pressure at Reciever	**31**	**35**	**33**	**21**	**2**	**21**	**3**	**-9**	**28**
	0	**0**	**19**	**20**	**11**	**10**	**4**	**4**	
Samsung AN080JSKL Return Outlet	67	72	76	74	65	64	56	48	74
Correction for end reflections	-7	-3	-1	0	0	0	0	0	
Proposed Attenuator (SD200/1200)	0	0	-19	-20	-11	-10	-4	-4	
Correction for quarter-spherical radiation	-5	-5	-5	-5	-5	-5	-5	-5	
Distance correction to receiver, dB (7 m) [1]	-17	-17	-17	-17	-17	-17	-17	-17	
Supply Inlet Sound Pressure at Reciever	**38**	**47**	**34**	**32**	**32**	**32**	**30**	**22**	**39**
Combined Sound Pressure Level at Reciever	**41**	**49**	**37**	**33**	**32**	**32**	**30**	**22**	**39**

[1] Distance loss calculated assuming Point Source attenuation (*typically used where distance is more than 3x the largest source dimension*)

Design Criteria	**45**	**52**	**37**	**33**	**32**	**32**	**30**	**22**	

BS 8233 Assessment Calculation

Description	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Sound pressure level outside window	41	49	37	33	32	32	30	22	39
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive residential premises	**26**	**34**	**22**	**18**	**17**	**17**	**15**	**7**	**24**

Design Criterion	**30**

Appendix B

Receiver 2: 44 King Street Second Floor Office

External Plant Noise Emissions Calculation

Description	Frequency, Hz								dB(A)
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	
Manufacturer provided sound pressure level									
Daikin RZAG125NV1 Air Source Heat Pump - Low Noise, With Enclosure	45	50	37	30	15	6	3	7	36
Correction for Multiple Units (2 units)	3	3	3	3	3	3	3	3	
Correction for reflections (Quarter-Spherical)	6	6	6	6	6	6	6	6	
Distance correction to receiver, dB (4 m) [1]	-12	-12	-12	-12	-12	-12	-12	-12	
Condenser Sound pressure level at receiver	**42**	**47**	**34**	**27**	**12**	**3**	**0**	**4**	**33**
	2	**4**	**6**	**10**	**27**	**3**	**7**	**7**	
Samsung AN080JSKL Supply Inlet	62	64	62	53	51	46	32	20	58
Correction for end reflections	-7	-3	-1	0	0	0	0	0	
Proposed Attenuator (SD200/600)	-2	-4	-6	-10	-27	-3	-7	-7	
Correction for Hemi-spherical radiation	-5	-5	-5	-5	-5	-5	-5	-5	
Distance correction to receiver, dB (5 m) [1]	-14	-14	-14	-14	-14	-14	-14	-14	
Supply Inlet Sound Pressure at Reciever	**34**	**38**	**36**	**24**	**5**	**24**	**6**	**-6**	**31**
	0	**0**	**19**	**20**	**11**	**10**	**4**	**4**	
Samsung AN080JSKL Return Outlet	67	72	76	74	65	64	56	48	74
Correction for end reflections	-7	-3	-1	0	0	0	0	0	
Proposed Attenuator (SD200/1200)	0	0	-19	-20	-11	-10	-4	-4	
Correction for quarter-spherical radiation	-5	-5	-5	-5	-5	-5	-5	-5	
Distance correction to receiver, dB (5 m) [1]	-14	-14	-14	-14	-14	-14	-14	-14	
Supply Inlet Sound Pressure at Reciever	**41**	**50**	**37**	**35**	**35**	**35**	**33**	**25**	**42**
Combined Sound Pressure Level at Reciever	**45**	**52**	**41**	**36**	**35**	**35**	**33**	**25**	**43**
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive commercial premises	**30**	**37**	**26**	**21**	**20**	**20**	**18**	**10**	**28**

[1] Distance loss calculated assuming Point Source attenuation (*typically used where distance is more than 3x the largest source dimension*)

Design Range	35 - 40