

ATELIER CRESCENDO

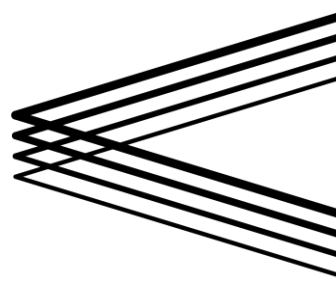
CONAMAR BUILDING SERVICES LTD

**DWP OFFICE,
TOTTENHAM**

PLANT NOISE ASSESSMENT REPORT
REVISION A

22/12/2022





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A	22/12/2022	Marc Fuzellier-Hart	-

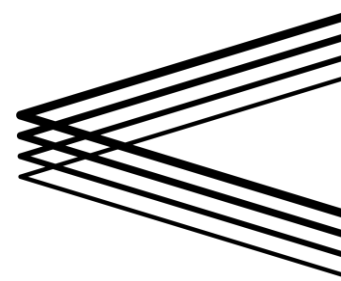
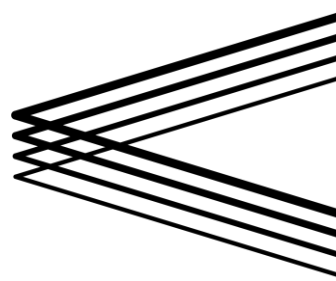


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1 **EXECUTIVE SUMMARY**

It is proposed to replace the Air Source Heat Pumps and Air Handling Units, currently serving the DWP office in Tottenham and installed a roof level, with new units for energy efficiency purposes.

Atelier Crescendo have been appointed to undertake a plant noise assessment of the new units on the nearest residential properties, to the east and the north of the site.

A background noise survey has been undertaken on site to establish the lowest background noise levels representative of those at the nearest residential properties.

Based on the proposals, the proposed requirements and the background noise survey, a plant noise impact assessment has been carried out in-line with the methodology set out in BS 4142 +A1.

Calculations show that, in order to achieve the proposed plant noise requirements and ensure a low impact on the nearest residential properties, attenuators should be fitted to the air supply and the exhaust terminations of the new Air Handling Unit.

Should the units be operated during night-time periods (23:00 – 07:00), a 2.5 m high acoustic screen would also be required around the units.

See full specifications and recommendations for these mitigation measures in Section 5.6.

2 SITE DESCRIPTION AND PROPOSALS

2.1 SITE DESCRIPTION

The site is located in Tottenham and falls within the jurisdiction of Haringey London Borough Council.

The site is surrounded by High Road to the west, Hampden Lane to the north and other commercial buildings to the south.

The nearest noise sensitive receptors are located at minimum 12 meters to the north and 15 meters from the nearest site boundaries.

Figure 1 below presents a plan of the site.

Figure 1 - Site description



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2.2 PROPOSALS

It is proposed to replace the existing external Air Source Heat Pumps and Air Handling Unit, at roof top level, with new and more efficient units.

It is understood that their proposed operation is 24/7.

Figure 2 below shows a proposed layout and Figure 3 shows the location of the plant area at roof level.

Figure 2 – Proposed external plant layout (roof level)

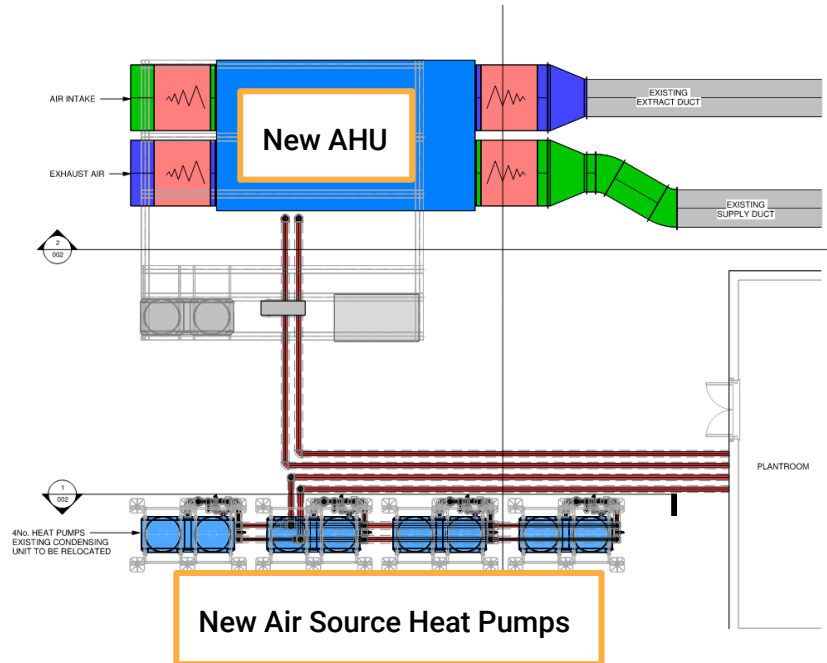
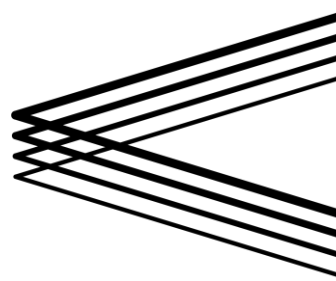


Figure 3 – Location of external plant area at roof level



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3 LEGISLATION AND GUIDELINES

3.1 LOCAL AUTHORITY REQUIREMENTS

The site falls within the jurisdiction of Haringey London Borough Council.

Currently, no noise related conditions have been received from the Local Authority. However, from previous experience working on projects in or around London, it is likely that the criterion for noise emitted by externally mounted plant, equipment and servicing **shall not exceed 10 dB (L_{Aeq}) below the typical background noise level (L_{A90,T})** at nearest noise sensitive location.

The noise assessment should be in line with the methodology set in *BS 4142:2014 – Method for rating and assessing industrial and commercial sound*.

3.2 BRITISH STANDARD 4142 - METHOD FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

BS 4142:2014+A1 describes methods for rating and assessing the effects of outdoor sound levels, of an industrial and/or a commercial nature, *“on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident”*.

The impact of a specific sound is indicated by subtracting the existing background noise level from the rating level (i.e. noise level from the proposed items of plant/machinery/etc plus any acoustic feature corrections).

The standard states that:

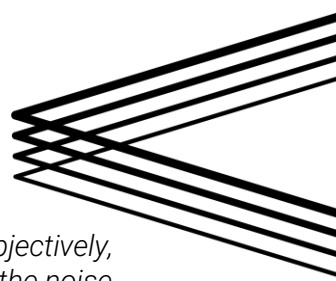
- > “a difference of around +10dB or more is likely to be an indication of a significant adverse impact”;
- > “a difference of around +5dB is of marginal significance is likely to be an indication of an adverse impact”;
- > “where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact”.

The noise from the current redevelopment is expressed in terms of a rating level and given as a L_{Aeq, T} noise level. The existing background noise level is expressed in terms of a L_{A90, T} noise level.

T is the assessment time interval, 1 hour for operations during day time (07:00 – 23:00) and 15-minutes for operations during night-time hours (23:00 to 07:00 hours).

BS 4142:2014 states that if a noise source contains an ‘acoustic feature’, such as tonality, intermittency or impulsiveness, a penalty should be applied.

A penalty of between 0 dB and +6 dB can be applied for tonality, and the standard states, *“Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible”*.



A penalty of up to +9dB can be applied for impulsivity, and the standard states. *"Subjectively, this can be converted to a penalty of +3 dB for impulsivity which is just perceptible at the noise receptor, +6dB where it is clearly perceptible, and +9 dB where it is highly perceptible".*

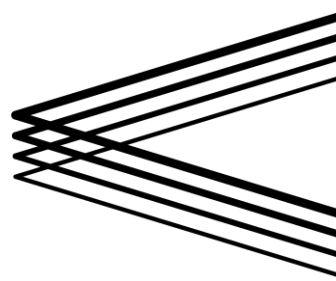
A penalty of +3dB can be applied for intermittency, and the standard states: *"When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of 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."*

About low background noise levels, the previous version of BS 4142 (1997) used to advise as follows:

"the method is not suitable for assessing [...] when the background noise and rating noise levels are both very low. NOTE: for the purpose of this standard, background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low."

Although the latest version (BS 4142:2014 +A1) doesn't mention any values for "low" background noise level any more, it still states the following:

"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."



4 BACKGROUND NOISE SURVEY

4.1 OVERVIEW

A fully automated background noise survey was undertaken from Thursday 17 November until Friday 18 November 2022.

The purpose of the noise survey was to determine the lowest background noise levels representative of those that would be measured at the nearest residential properties.

The results of the survey have been used to inform a plant noise impact assessment at the nearest noise sensitive properties.

Measurements were taken of the A-weighted (dBA) L_{90} sound pressure levels continuously over periods of 5 minutes.

4.2 MEASUREMENT LOCATION

The noise level measurements were undertaken at two locations as described in the table below and shown on Figure 4 below.

Table 1 - Description of measurement locations

Measurement Location	Description
1	The sound level meter was located to the west of the site in direct line of sight of High Road. The microphone was positioned at roof level at approximately 1 m horizontally from the existing building façade.
2	The sound level meter was located to the east of the site above the existing staff car park. The microphone was positioned at roof level at approximately 1 m horizontally from the existing building façade.

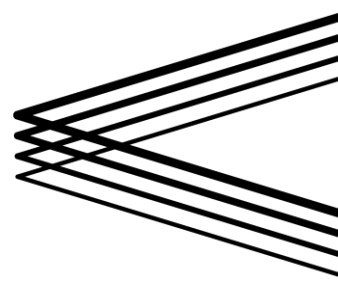


Figure 4 - Noise measurement locations 1 and 2



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4.3 MEASUREMENT EQUIPMENT

The Table 2 below presents the details of the instrumentation used to undertake the noise measurements.

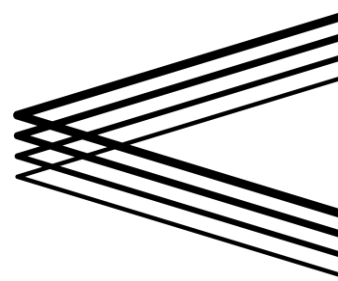


Table 2 - Details of measurement instrumentation

Measurement Location	Equipment	Manufacturer & Model	Serial Number	Calibration Due Date
1	Sound level meter	Rion NL-42	654029	21/10/2024
	Microphone	Rion UC-59	08283	
	Pre-amplifier	Rion NH-25	54074	
	Calibrator	Rion NC-75	35270123	25/02/2023
2	Sound level meter	Rion NL-42	375678	21/10/2024
	Microphone	Rion UC-59	11167	
	Pre-amplifier	Rion NH-25	65805	
	Calibrator	Rion NC-75	35270123	27/07/2023

the sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable.

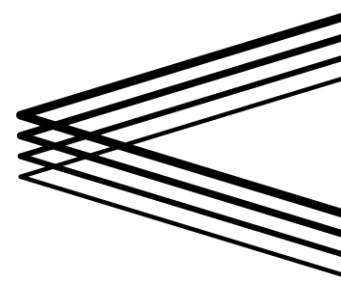
It was calibrated prior to and on completion of the survey. No significant drift was noted (no more than 0.1 dB)

4.4 SURVEY RESULTS

For the purpose of the assessment, Table 3 below presents the lowest representative background noise levels $L_{A90,T}$ measured during daytime (07:00 – 19:00), evening time (19:00 – 23:00) and night-time (23:00 - 07:00) periods.

Table 3 - Results of environmental noise survey at measurement Location 1

Time period	Minimum Background Noise Levels
	$L_{A90,T}$ (T=1 hour for daytime and evening time, and 15 min for night-time periods)
17/11/2022 Daytime (07:00 – 19:00)	58 dB
17/11/2022 Evening time (19:00 – 23:00)	57 dB



Minimum Background Noise Levels

Time period

$L_{A90,T}$

(T=1 hour for daytime and evening time, and 15 min for night-time periods)

17/11/2022 Night time (23:00 – 07:00)	47 dB
18/11/2022 Daytime (07:00 – 09:00)	56 dB

*T=16 hours for daytime (07:00-19:00) and evening time (19:00 - 23:00), and 8 hours for night time (23:00-07:00)

4.5 METEOROLOGICAL CONDITIONS

Due to the nature of the background noise survey, i.e. unmanned, it is not possible to accurately comment on the weather conditions throughout the entire duration of the survey.

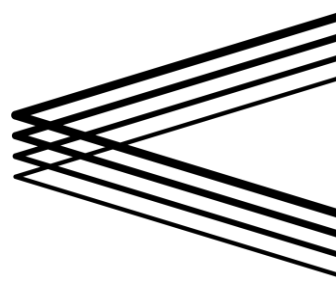
However, at the beginning and end of the survey period, the weather conditions during the noise survey were noted to be dry and the sky was clear. The wind speeds were perceived to be below 5 m/s. The ground was identified to be dry under foot.

The local temperature was recorded as approximately 10°C during the day and approximately 5°C during the night.

These conditions were considered conducive for undertaking accurate and reliable environmental noise measurements around the site.

4.6 DISCUSSION OF NOISE CLIMATE

During attendance on site at all positions, the dominant noise sources were noted to be road traffic on High Road, distant plant and distant road network.



5 PLANT NOISE ASSESSMENT

5.1 ASSESSMENT OVERVIEW

As discussed in Section 2.2, two types of plant are proposed at roof level to replace the existing units:

- > 4 new Air Source Heat Pumps;
- > 1 New Air Handling Unit.

Therefore, this section presents a detailed noise impact assessment of the above plant, serving the office, on the nearest residential properties.

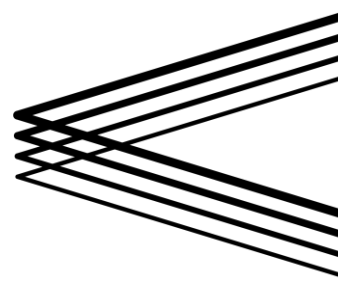
5.2 PROPOSALS

The proposals are outlined in Section 2.2.

Table 4 below presents the details of the new plant at roof level.

Table 4 – Details of the new plant

Unit	Manufacturer	Model	Noise data
3x Air Source Heat pump	Mitsubishi Electric	CAHV-P500YB-HPB (-BS)	SPL = 59 dB at 1 m horizontally from the unit in <i>COP priority Mode</i>
			SPL = 63 dB at 1m horizontally from the unit in <i>Capacity Priority Mode</i> (see octave band data in Appendix B)
1x Air Handling Unit	ECE air handling & conditioning	-	see sound power levels in octave band data in Appendix B for each termination and element



5.3 NEAREST NOISE SENSITIVE RECEPTORS

The nearest noise sensitive receptors considered for this assessment are presented in Section 2.1.

5.4 PLANT NOISE EMISSION LIMITS

As discussed in Section 3.1, the noise generated by building services equipment associated with the development should be controlled such that it is no greater than 10dB below the prevailing background noise level at all noise sensitive properties.

Based on this and the results of the baseline noise survey presented in Section 4.4, Table 5 presents the plant noise emission limits not to be exceeded at the nearest residential properties for daytime (07:00 – 19:00), evening time (19:00 – 23:00) and night-time (23:00 – 07:00) periods.

Table 5 – Plant Noise Emission Limits

Time period	Plant Noise Emission Limits
	(to be achieved at 1m from any noise sensitive window) $L_{A,Tr}^*$
Daytime (07:00 – 23:00)	48 dB
Evening time (19:00 – 23:00)	47 dB
Night-time (23:00 – 07:00)	37 dB

*Tr=1hour for daytime and evening periods; T=15min for night-time period

5.5 PLANT NOISE CALCULATIONS

Based on the proposals presented in Section 0 and the results of the plant noise survey, calculations have been undertaken to predict the plant noise emission levels, resulting from the operation of the new units, at the nearest residential properties to the north and the east of the site.

For the calculations, it has been assumed that the plant can be operated continuously over minimum 1 hour.

The calculations consider distance, directivity and screening losses.

In line with BS 4142:2014 +A1 methodology, the noise from the Air Source Heat Pump (in Capacity Mode – understood to be the standard operation mode) has been assessed to be tonal. Therefore, a 6 dB penalty has been applied.

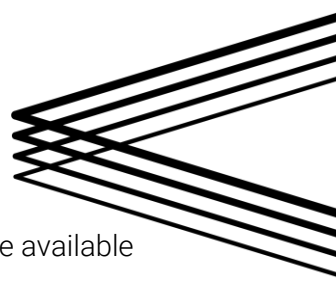


Table 6 below presents the results of the calculations. Details of the calculations are available upon request.

Table 6 – Plant Noise Emission Levels at the nearest residential properties to the north and the east of the site

Receptor	Worst-case Plant Noise Emission Levels	
	(at 1m from any noise sensitive window)	
	$L_{Ar,15min}$	
Residential property to the east (along Hampden Lane)	63 dB	
Residential property to the north (across Hampden Lane)	65 dB	

5.6 ASSESSMENT AND MITIGATION MEASURES

The results of the calculations (in Table 6) show that the predicted plant noise levels, $L_{Ar,15min}$, resulting from the operation of the new Air Source Heat Pumps and the new Air Handling Unit, exceed the noise emission limits periods presented in Table 5.

To reduce the plant noise levels below the noise emission limits, then the following mitigation measures should be considered.

- > If the plant are only operated during daytime (07:00 – 23:00) and evening time periods (19:00 – 23:00), then attenuators should be fitted to the air intake and air exhaust terminations of the AHU and achieve the minimum insertion losses presented in Table 7 below.

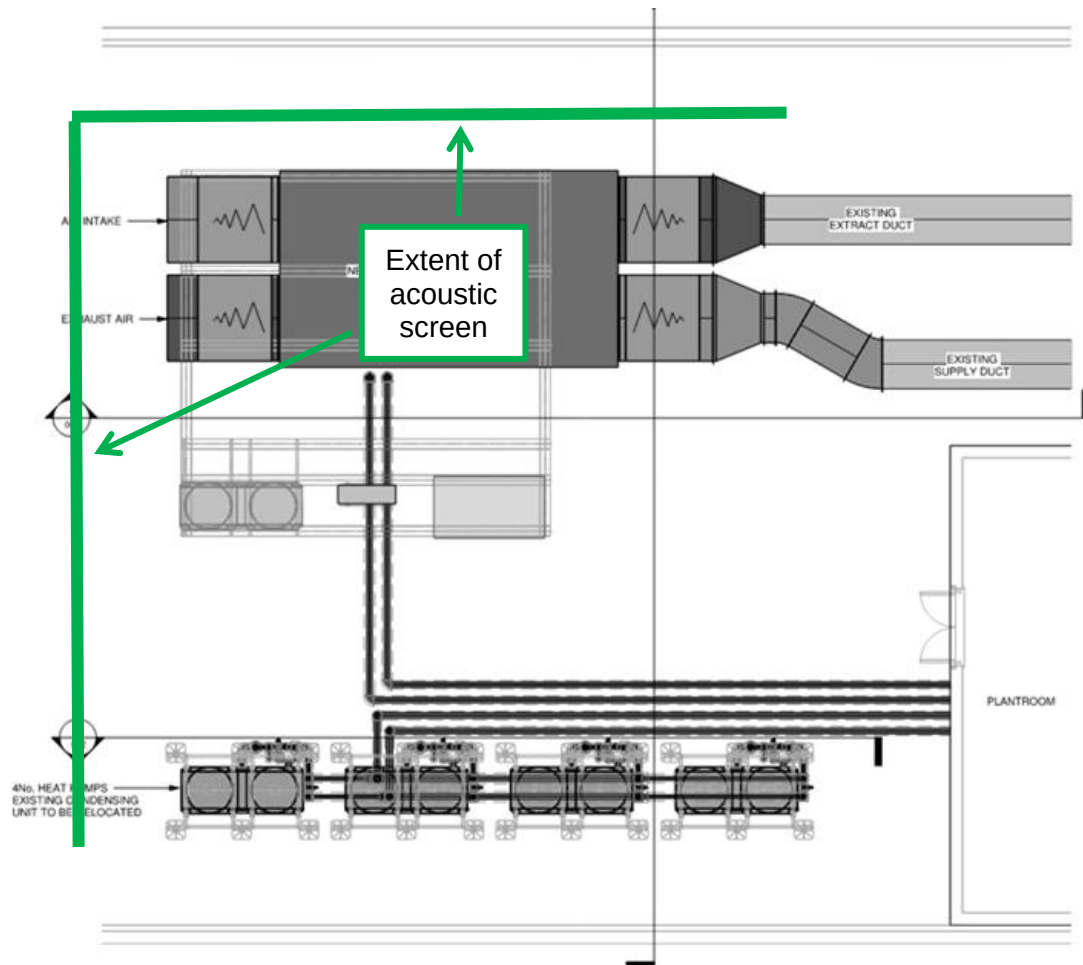
Table 7 – Minimum insertion losses for the attenuators

Attenuator type	Minimum insertion losses (dB) in each octave band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
900 mm long with 30% free area	7	12	20	33	39	40	35

- > If the plant are also operated during night-time periods (23:00 – 07:00), then an acoustic screen should to be installed (as well as the attenuators) as shown on Figure 5 below.

The screen should be minimum 2.5 meters high, continuous/uninterrupted and have a minimum density of minimum 20 kg/m².

Figure 5 – Extent of required acoustic screen (in green)



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APPENDICES

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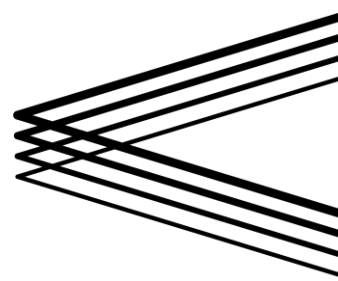
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APPENDIX A

ACOUSTIC TERMINOLOGY



NOISE

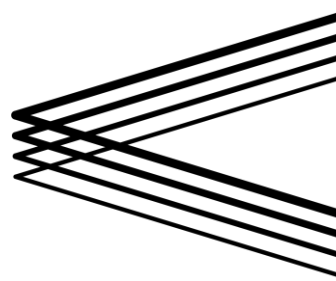
Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

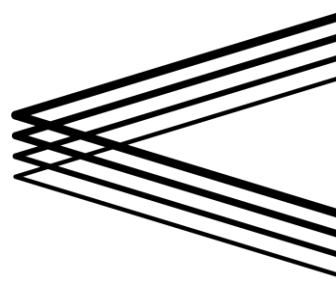
The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table.



Sound Level	Location
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside factory
100 to 110 dB(A)	Burglar alarm at 1m away
110 to 130 dB(A)	Jet aircraft on take off
140 dB(A)	Threshold of pain



Terminology	Description
<i>Sound Pressure</i>	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
<i>Sound Pressure Level (Sound Level)</i>	The sound level is the sound pressure relative to a standard reference pressure of 20mPa (20x10 ⁻⁶ Pascals) on a decibel scale.
<i>Decibel (dB)</i>	Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
<i>A-weighting, dB(A)</i>	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
<i>Noise Level Indices</i>	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
<i>L_{eq,T}</i>	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
<i>L_{max,T}</i>	A noise level index defined as the maximum noise level during the period T. L _{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L _{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
<i>L_{90,T}</i>	A noise level index. The noise level exceeded for 90% of the time over the period T. L ₉₀ can be considered to be the "average minimum" noise level and is often used to describe the background noise.
<i>L_{10,T}</i>	A noise level index. The noise level exceeded for 10% of the time over the period T. L ₁₀ can be considered to be the "average minimum" noise level and is often used to describe the road traffic noise.
<i>Free-Field</i>	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
<i>Façade</i>	At a distance of 1m in front of a large sound reflecting object such as a building façade.
<i>Octave Band</i>	Octave Band A range of frequencies whose upper limit is twice the frequency of the lower limit.

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APPENDIX B

PLANT NOISE DATA

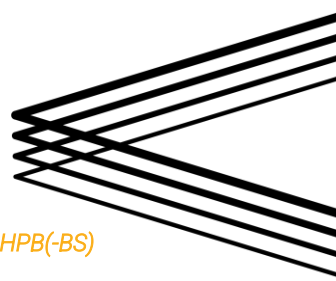


Table 8 – Noise emission data for the proposed Air Source Heat Pumps (Mitsubishi CAHV-P500YB-HPB(-BS))

	Sound pressure level (dB) at 1 m horizontally from the unit, in each octave band centre frequency (Hz)								Broadband, $L_{Aeq,T}$
	63	125	250	500	1000	2000	4000	8000	
<i>COP Priority Mode</i>	70	65	61	57	51	47	49	45	59
<i>Capacity Priority Mode</i>	66	60	67	60	52	50	56	48	63

Table 9 – Noise emission data for the proposed Air Handling Unit

	Sound power level (dB) in each octave band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
<i>Fresh Air connection</i>	75	79	73	67	63	57	51	46
<i>Supply connection</i>	79	81	78	77	79	73	67	61
<i>Extract connection</i>	77	81	76	70	66	60	54	49
<i>Exhaust connection</i>	80	82	80	80	82	77	71	65
<i>To surroundings</i>	68	66	59	55	53	48	43	40

