

Tottenham Mews London

Plant Noise Assessment Report

27931/PNA1

12 October 2020

For:
Central London Commercial Estates Limited



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1.0 Introduction

Items of external building services plant are proposed to be installed at Tottenham Mews, London.

Hann Tucker Associates have therefore been commissioned to undertake a plant noise assessment based on the environmental noise survey data (ref. 27931/ADS1 dated 1 September 2020). This report assesses proposed plant in line with the requirements of the Local Authority.

2.0 Objectives

To review data from a previous environmental noise survey to identify noise emission limits from the development with reference to the requirements of the Local Authority and/or the application of BS4142: 2014 and to minimise the possibility of noise nuisance to neighbours.

To assess the noise emissions of the proposed plant, based on data with which we are provided and comment on the acceptability.

To advise on noise control measures if required with reference to the requirements of the Local Authority.

3.0 Site Description

3.1 Location

The site is located Tottenham Mews and falls within the jurisdiction of the London Borough of Camden Council. See location map overleaf with neighbouring properties annotated.

The proposed development comprises a 5No. storey building. We understand the nearest office receptors are located to the rear of 32-42 Middlesex House, approximately 4m away from the proposed location of roof plant. The nearest residential noise sensitive windows are located on Tottenham Mews approximately 15m from the proposed plant installation. The residential windows are approximately the same height as the plant installation but line of sight is to be blocked by the flats on the level 05. There are also residential windows 25m away on Arthur Stanley House which overlook the plant area. The plant location and nearest receptors are shown below.



Site plan (Open Street Map Contributors © 2020)

4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Acoustic Standards and Guidelines

5.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010 (i.e. before the NPPF). The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is 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.”

“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; and*
- *where possible, contribute to the improvement of health and quality of life.”*

The Explanatory Note to the NPSE has three concepts for the assessment of noise in this country:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

None of these three levels are defined numerically and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research to investigate what may represent an SOAEL for noise is acknowledged in the NPSE and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.

The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three NPSE noise policy aims listed above. It starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when *“all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development.”* The final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development which include the need to minimise travel distance between housing and employment uses in an area.

5.2 National Planning Policy Framework (NPPF)

The following paragraphs are from the NPPF (revised February 2019):

“180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on



health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”

Paragraph 180 also references the Noise Policy Statement for England. This document does not refer to specific noise levels but instead sets out three aims:

“Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

5.3 Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource at <http://planningguidance.planningportal.gov.uk/blog/guidance/>. This includes specific guidance on Noise although, like the NPPF and NPSE the PPG does not provide any quantitative advice. It seeks to illustrate a range of effect levels in terms of



examples of outcomes as set out in the following table:

Perception	Examples of Outcomes	Increasing effect level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable hard, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

5.4 Local Authority Requirements

Building services plant external noise emission levels will need to comply with local authority requirements and statutory noise nuisance legislation.

We understand that the requirements of the London Borough of Camden are as follows:

Note: NOAL – No Observed Effect Level, LOAEL- Lowest Observed Adverse Effect Level, SOAEL – Significant Observed Adverse Effect Level.



“A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ (BS 4142) will be used. For such cases a ‘Rating Level’ of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)					
Existing Noise Sensitive Receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining window (façade)	Day	‘Rating level’ 10dB below background	‘Rating level’ 9dB below and 5dB above background	‘Rating level’ greater than 5dB above background
Dwellings **		Night	‘Rating level’ 10dB below background and no events exceeding 57dBL _{Amax}	‘Rating level’ 9dB below and 5dB above background or noise events between 57dB and 88dBL _{Amax}	‘Rating level’ greater than 5dB above background and/or events exceeding 88dBL _{Amax}

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

***Levels are given for dwellings, however, levels are use specific and different levels will apply dependant on the use of premises”*

5.5 BS 4142:2014

When setting plant noise emission criteria reference is commonly made to BS 4142: 2014 “Methods for rating and assessing industrial and commercial sound”.

The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound



on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains “a tone, impulse or other characteristic” then various corrections can be added to the specific (source) noise level to obtain the “rating level”.

BS 4142 states that: *“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 noise can be obtained by the difference of the rating noise level and the background noise 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 low impact, depending on the context.”*

The determination of the “rating level” and the “background level” are both open to interpretation, depending on the context.

In summary it is not possible to set plant noise emission criteria purely on the basis of BS 4142:2014. It is reasonable to infer from the above, however, that a difference of around -5dB corresponds to “No Observed Effect Level” as defined in the Noise Policy Statement for England. It is also reasonable to infer from the above that if the plant noise rating level does not exceed the existing background noise level outside any noise sensitive residential window then the plant noise is of “low impact”.

5.6 World Health Organisation Guidelines on Community Noise

BS8233:2014 is based upon the current World Health Organisation (WHO) guidance “Guidelines on Community Noise”. A summary of the noise guidelines relevant to the proposed scheme is presented in the table below.



Residential Environment	Critical Health Effect(s)	L _{Aeq}	L _{AFmax}	Time Base
Outdoor living area	Serious annoyance, daytime and evening	55	-	07:00-23:00
	Moderate annoyance, daytime and evening	50	-	07:00-23:00
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	-	07:00-23:00
Inside bedrooms	Sleep disturbance, night-time	30	45	23:00-07:00
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	60	23:00-07:00

These WHO guidelines are based, in almost all cases, on the lower threshold below which the occurrence rates of any particular effect can be assumed to be negligible.

5.7 Statutory Noise Nuisance

There is no quantitative definition of statutory noise nuisance. It is generally accepted however, that if the plant noise level is at least 5dB (or 10dB if tonal) below the minimum background L_{90(15minutes)} at 1m from the nearest noise sensitive residential window, then the risk of a statutory noise nuisance is avoided. By adopting this as a design criterion the guidance contained in BS 4142:2014 should also be complied with.

6.0 Plant Noise Emission Criteria

6.1 Residential Windows

On the basis of the requirements of the local authority (outlined in Section 3.4) above and the results of the environmental noise survey (see 27931/ADS1), we propose that the following plant noise emission criteria be achieved at 1 metre from the nearest noise sensitive residential window.

Position	Plant Noise Emission Criteria (dBA) At 1m from the nearest noise sensitive residential window	
	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
1	35	35
2	33	33



The above criteria are to be achieved with all of the proposed plant operating simultaneously.

It should be noted that the above are subject to the final approval of the Local Authority.

6.2 Commercial/Office Windows

The requirements of the London Borough of Camden (outlined in Section 5.4) states “****Levels are given for dwellings, however, levels are use specific and different levels will apply dependant on the use of premises*” and does not offer specific guidance for office windows.

However, at the nearest commercial properties, it is generally acceptable to design plant such that the guidelines of BS 8233: 2014 “Sound insulation and noise reduction for buildings – Code of Practice” to be satisfied.

In relation to the commercial properties within the vicinity of the proposed location of the new plant, Table 6 of this standard states that for “reasonable conditions for study and work requiring concentration”, the following internal ambient noise level design range should be satisfied.

Internal Ambient Noise Level Design Range, $L_{Aeq,T}$
35-50

In addition, BS 8233 states that attenuation of 10 to 15 dB can be provided by an open window. Hence the following external noise level criteria must be satisfied outside the nearest office façade (based on achieving the above design range):

External Ambient Noise Level Limit, $L_{Aeq,T}$
45-65

50dBA is generally as an acceptable external ambient noise level for plant installations to achieve outside and office window.

It should be noted that the above criteria are subject to final approval by the London Borough of Camden.



7.0 Plant Noise Impact Assessment

We understand the proposed plant comprises the following items:

Description	Quantity	Manufacturer	Model	Location
Hot Water Heat Pumps	4No.	Mitsubishi	CAHV-P500YA-HPB	Level 05
Heat Recovery VRF	2No.	TBC	TBC	Level 05
Inline Hot Water Circulating Pumps	1No.	TBC	TBC	Level 05

7.1 Plant Noise Data

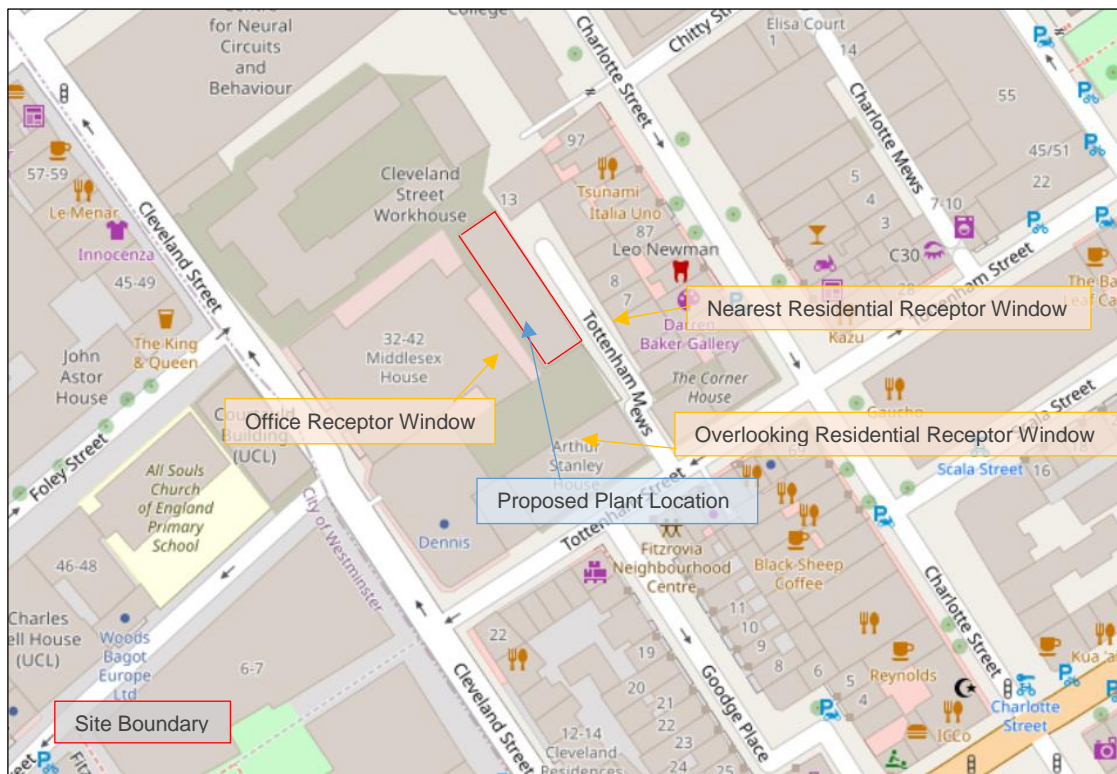
We understand the manufacturer's sound pressure level (SPL) noise data for the equipment to be as follows:

Plant Description	Sound Pressure Level (dB re 2x10 ⁻⁵ Pa) Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Hot Water Heat Pumps	70	65	67	60	53	50	56	48	63
Heat Recovery VRF	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC
Inline Hot Water Circulating Pumps	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC

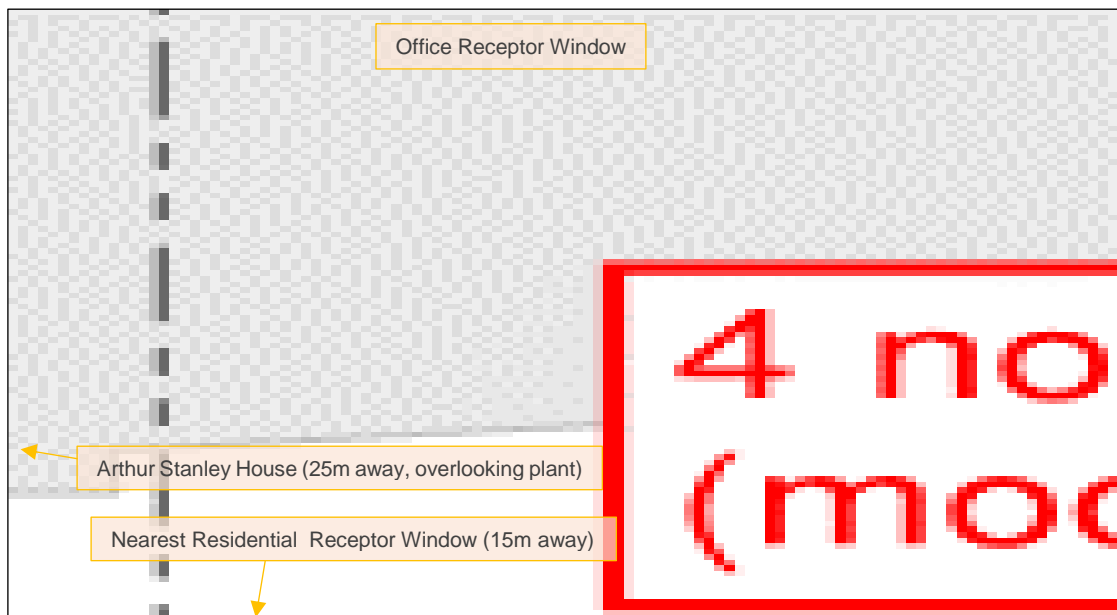
7.2 Location of Plant

All units are to be installed on level 05 to the rear of the roof. We understand the nearest office receptors are located to the rear of 32-42 Middlesex House, approximately 4m away from the proposed location of roof plant. We understand line of site is to be blocked with a solid screen on the top of the roof at least 500mm taller than the tallest item of plant.

We understand the nearest residential noise sensitive windows are located on Tottenham Mews, approximately 15m from the proposed plant installation. The residential windows are approximately the same height as the plant installation but line of sight is to be blocked by the flats on the level 05. There is also a noise sensitive residential window approximately 25m from the proposed installation on Arthur Stanley House which overlooks the installation. The plant location and nearest receptors are shown below.



Site plan (Open Street Map Contributors © 2020)



7.3 Mitigation Measures

In order to control plant noise emissions in line with the requirements of the local authority we recommend all units are selected and attenuated such that they are limited to a sound pressure level of 50 dBA at 1m (approximately 58dBA sound power level) individually.



To achieve these noise levels, the 4No. Heat Pumps and Heat Recovery VRF are to require individual acoustic enclosures, please see enclosed specification. A screen is not likely to suffice as the plant area is overlooked. The Hot Water Circulating pumps should also be housed in an acoustic enclosure should these exceed the limiting sound pressure level.

Suitable vibration isolation should also be incorporated for all units (particularly the Hot Water Circulating pumps) and associated pipework, noting their location on the level 05 floor slab on a residential property.

7.4 Plant Noise Impact Assessment

We understand that the proposed 4No. heat pumps and hot water pump will be operational 24 hours. The 2No. VRFs serving the office space are to operate from 07:00 to 23:00 hours only.

The following tables summarise our predictions of atmospheric noise emissions from the proposed plant installations to the nearest noise sensitive residential receptors.

7.4.1 Middlesex House (Office) – Daytime

	Sound Pressure Level (dB re 2×10^{-5} Pa) at Octave Band Centre Frequency (Hz)
	Daytime (07:00 to 23:00 hours)
4No. Hot Water Heat Pumps Limiting SPL at 1m	56
2No. Heat Recovery VRF Limiting SPL at 1m	53
1No. Inline Hot Water Circulating Pumps Limiting SPL at 1m	50
Cumulative Noise Levels at 1m	58
Screening	-6
Distance Loss (1m to 4m)	-7
Façade Reflection	+3
Calculated Noise Level at Receptor	48

**7.4.2 Arthur Stanley House (Residential) – Daytime and Night-time**

	Sound Pressure Level (dB re 2x10 ⁻⁵ Pa) at Octave Band Centre Frequency (Hz)	
	Daytime (07:00 to 23:00 hours)	Night time (23:00 to 07:00 hours)
4No. Hot Water Heat Pumps Limiting SPL at 1m	56	56
2No. Heat Recovery VRF Limiting SPL at 1m	53	Not running
1No. Inline Hot Water Circulating Pumps Limiting SPL at 1m	50	50
Cumulative Noise Levels at 1m	58	57
Distance Loss (1m to 25m)	-28	-28
Façade Reflection	+3	+3
Calculated Noise Level at Receptor	33	32

7.4.3 Tottenham Mews (Residential) – Daytime and Night-time

	Sound Pressure Level (dB re 2x10 ⁻⁵ Pa) at Octave Band Centre Frequency (Hz)	
	Daytime (07:00 to 23:00 hours)	Night time (23:00 to 07:00 hours)
4No. Hot Water Heat Pumps Limiting SPL at 1m	56	56
2No. Heat Recovery VRF Limiting SPL at 1m	53	Not running
1No. Inline Hot Water Circulating Pumps Limiting SPL at 1m	50	50
Cumulative Noise Levels at 1m	58	57
Screening	-12	-12
Distance Loss (1m to 15m)	-23	-23
Façade Reflection	+3	+3
Calculated Noise Level at Receptor	26	25

Our calculations indicate that the proposed plant, with proposed mitigation measures should be capable of achieving the proposed plant noise criteria based on the requirements of the Local Authority outlined in Section 6.0.



8.0 Conclusions

An environmental noise survey has been previously undertaken in order to establish the currently prevailing noise levels.

Plant noise emission criteria have been recommended based on the results of the noise survey and with reference to the Local Authority's requirements.

An assessment has been carried out to determine the plant noise emissions at the nearest noise sensitive windows.

The assessment indicates that the proposed plant, plus proposed mitigation measures, should be capable of achieving the proposed environmental noise criteria at the nearest noise sensitive residential window.

Appendix A

The acoustic terms used in this report are defined as follows:

dB Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dBA The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

L_{90,T} L₉₀ is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

L_{eq,T} L_{eq,T} is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

Sound Pressure Level (L_p) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

Sound Power Level (SWL or L_w) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

TOTTENHAM MEWS

SPECIFICATION FOR

SMALL ACOUSTIC ENCLOSURES

The plant items shall each be individually supplied complete with acoustic treatment which shall achieve adequate levels of attenuation to ensure that the following limiting sound pressure levels are not exceeded when measured at a distance of 1m (free field over a reflecting plane) or in any horizontal or vertical direction under any load conditions.

Units	No.	A-weighted Limiting Sound Pressure Level For each individual unit at 1m (dB re 2×10^{-5} Pa)
Hot Water Heat Pumps	4No.	50
Heat Recovery VRF	2No.	50
Inline Hot Water Circulating Pumps	1No.	50

NB: the limiting noise levels above are to be achieved at 1m from 1No. unit individually, please advise if units are to be packaged in a larger enclosure and we will revise our specification.

Furthermore they shall not exhibit any significant tonal content.

Exceedances in excess of the measurement tolerance for a Type 1 sound level meter shall constitute a failure.

The enclosed outer panels shall be constructed from galvanized sheet steel having a minimum thickness of 1.6mm and fixed at 300mm (max) centres. The enclosure inner panels shall be constructed from punch-perforated (round-hole) galvanised sheet steel facing, having a minimum thickness of 0.7mm fixed at 300mm (max) centres. Flattened-expanded ("Expamet") sheet shall not be used, unless all edges of the sheet are mechanically fixed to the panel casing and galvanised steel cover strips are used to prevent rivet heads pulling through the perforated sheet (trapping the Expamet between two solid steel layers).

The inert, rot and vermin proof, non-hygroscopic and non-combustible mineral wool or glass fibre acoustic medium shall be packed to a density of not less than 48kg/m^3 . This shall be faced with a glass fibre cloth, or other approved infill protection membrane. Panels shall be constructed and assembled so that no egress of the acoustic medium will occur under the operating conditions.

Doors, access panels, windows and ventilation ducts or electrical cable penetrations shall be treated so as to maintain the specified acoustic insulation of the assembled enclosure.

Demountable sections shall be designed to allow easy disassembly and reassembly by unskilled personnel without affecting the acoustic performance.

The supplier shall ensure that the assembled enclosure is designed and constructed to withstand site operating conditions such as wind and snow loads, roof mounted plant, etc., as appropriate, and if outside, to be suitably weatherproofed.

The acoustic media shall not comprise materials which are generally composed of mineral fibres, either man made or naturally occurring, which have a diameter of 3 microns or less and a length of 200 microns or less or which contain any fibres not sealed or otherwise stabilised to ensure that fibre migration is prevented.

Any deviations from the above specification must be agreed by, and confirmed in writing to, Hann Tucker Associates.