

3-4 South Square, Gray's Inn London WC1

Environmental Noise Survey and Plant Noise Assessment Report

31327/PNA1-R3

5 August 2024

For:
The Honourable Society of Gray's Inn
Treasury Office
8 South Square
London
WC1R 5ET













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Document Control

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3	05/08/2024	Section 3.2 amended to reflect correct nearby development type as indicated by Client			
		TH graph title amended for consistency	Kyungmin Kim Consultant PgDip, BMus(Hons), AMIOA	Rodrigo Espinosa-Garcia Principal Consultant MSc, BEng(Hons), MIOA	
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1.0 Introduction

The proposal is to relocate an existing chiller plantroom located within the basement of the building into a new rooftop plantroom (referred to as Plantroom 2 herein for simplicity) set down within the existing concrete mansard roof. The current basement chiller plant provides cooling only, with heating provided by radiators served by gas-fired, district-heating serving the whole of South Square.

The driver for the new rooftop plantroom is the requirement to move away from fossil fuels for heating and to install a more energy efficient combined heating/cooling system which will allow surplus heat from areas being cooled to those requiring heating (e.g. from a densely populated seminar room to an individual office).

The proposed new rooftop plantroom (Plantroom 2) is in addition to that recently consented under Planning Consent 2023/4842/P (Plantroom 1) to serve a refurbished Holker Library Building. Because the two plantrooms will be in close proximity (albeit Plantroom 1 was subject to its own noise assessment at the time: Hann Tucker Associates Ref. 27562/PNA2Rev1) it is necessary to consider both plantrooms together in this assessment.

Hann Tucker Associates Limited (Hann Tucker) have therefore been commissioned to undertake a detailed environmental noise survey to determine the currently prevailing noise climate at the site, the results of which will be used in design assessments in order to assess compliance with the Local Authority's requirements.

2.0 Objectives

To establish by means of an unmanned 72-hour survey the existing environmental noise levels at up to two secure and accessible on-site positions, using fully computerised noise monitoring equipment.

Measurement procedures shall be in general accordance with those described in BS 4142: 2014, Method for rating industrial noise affecting mixed residential areas, published by the British Standards Institution.

The survey will enable noise emission limits from the development to be identified with reference to the requirements of the Local Authority and/or the application of BS 4142: 2014 and to minimise the possibility of noise nuisance to neighbours.



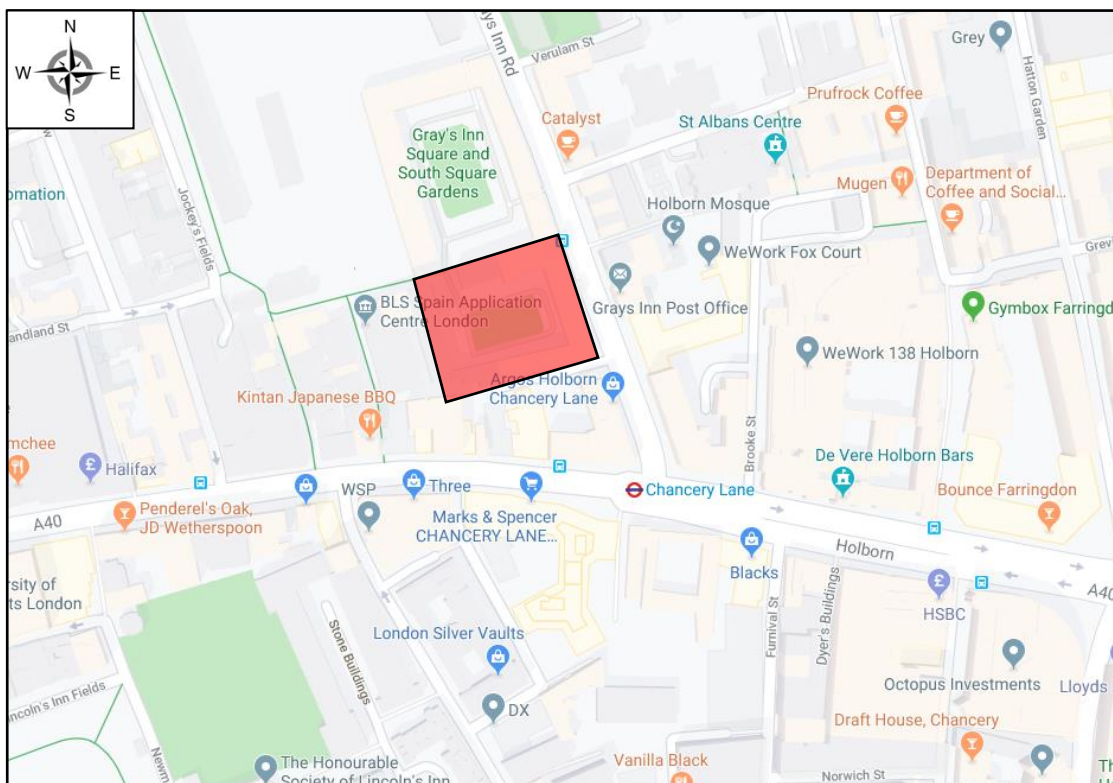
To assess the noise emissions from the proposed plant, based upon data with which we are provided, and comment upon the acceptability.

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 between Grays Inn Road and Fulwood Place, in London, and falls within the London Borough of Camden's jurisdiction. The location is shown in the Location Map below:



Location Map (Map Data © 2024 Google)

3.2 Description

The site comprises a mixture of three to five-storey mixed-use building with residential flats located on the top floor on the southside of the square.

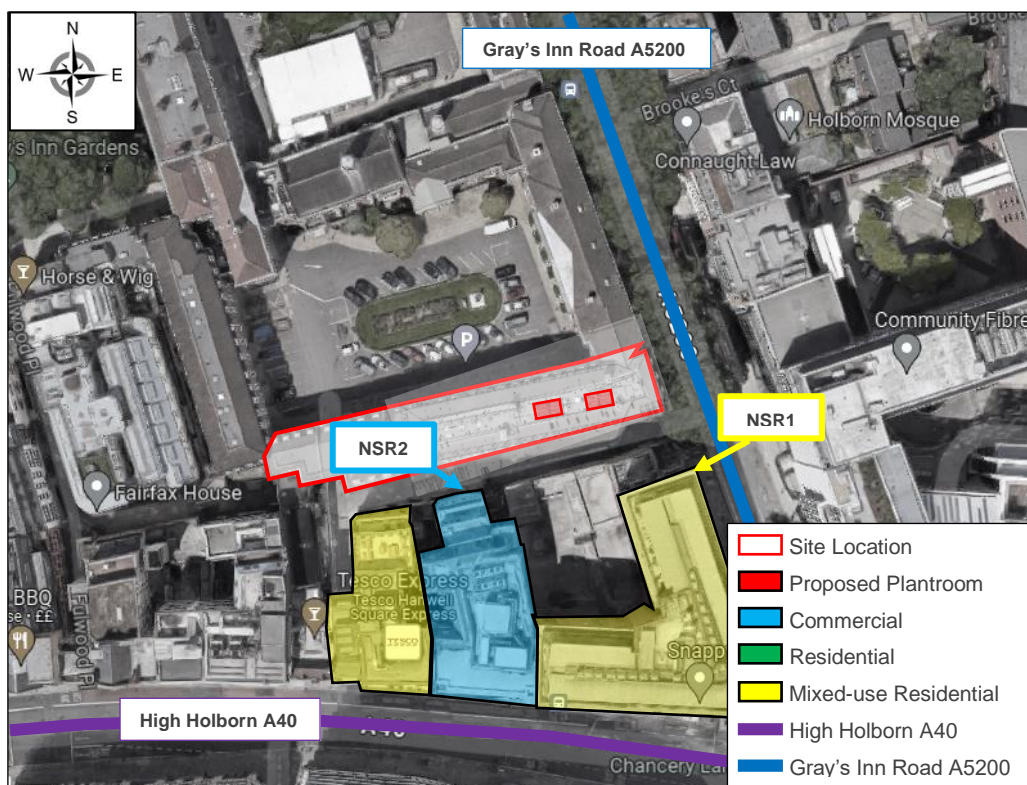
To the north is Gray's Inn Square and South Square Gardens. To the south of the site, on the corner of High Holborn and Gray's Inn Road, there is a 7-storey mixed-use residential building



with commercial units on ground floor, at which we have considered the top floor to be worst affected nearest noise sensitive residential receptor (NSR1 from herein). The next nearest noise sensitive receptor (NSR2 from herein) is a commercial receptor located on the top floor of 16 High Holborn.

The surrounding road comprises Grays Inn Road A5200 to the east and High Holborn A40 to the south.

The site is shown in the Site Plans overleaf.



4.0 Acoustic Terminology

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



5.0 Project Proposals

5.1 Proposed Plant

We understand the consented 'Plantroom 1' will contain 4No. condenser units – Mitsubishi PURY-EP500 YNW-A, to be installed in the attic spaces with open/louvred roof and 1No. mechanical ventilation heat recovery unit (MVHR) with the atmospheric ductwork located within the adjacent attic space.

'Plantroom 2' which is the subject of the current planning application will contain a further 4 No. condenser units – Mitsubishi PURY-EP500 YNW-A

Plant Description	Location	Qty	Plant Make	Model Number
Condenser unit	Plantroom 1	4	Mitsubishi	PURY-EP500 YNW-A
Condenser unit	Plantroom 2	4	Mitsubishi	PURY-EP500 YNW-A
MVHR unit	Plantroom 1	1	Airflow	DUPLEXVENT 6500 Multi ECO

5.2 Operating Hours

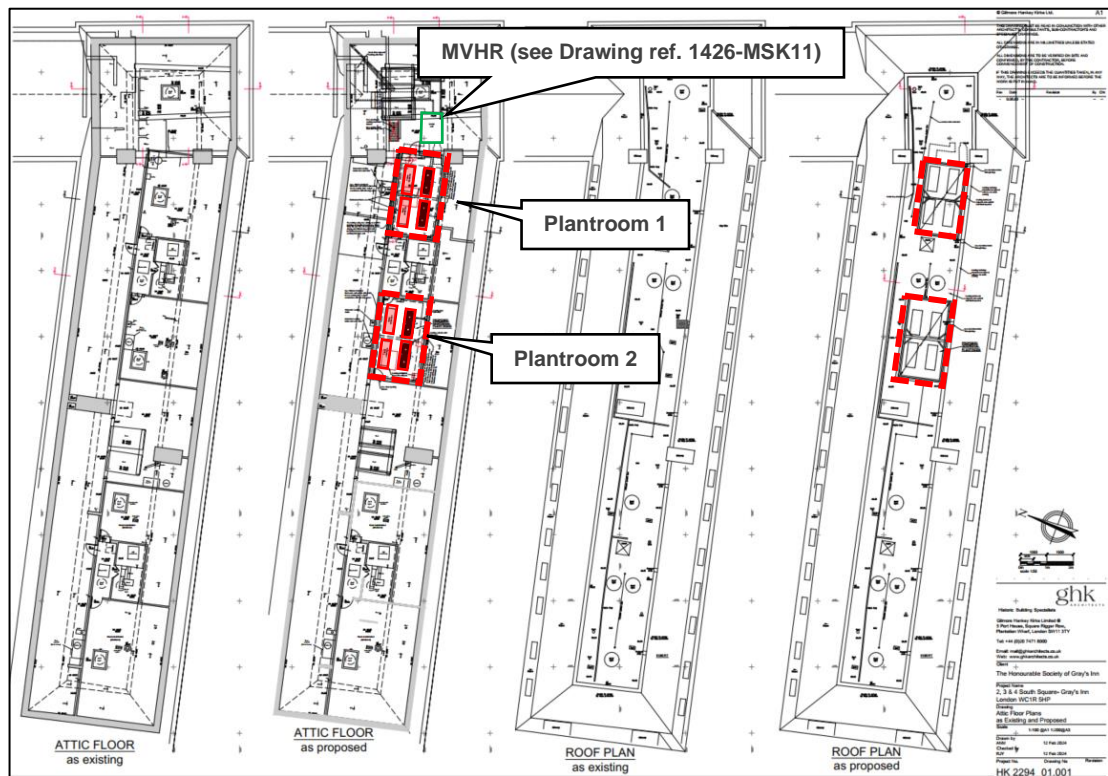
We understand that the above proposed plant will operate during the daytime (07:00 to 18:00 hours) only.

5.3 Drawings

Our acoustic analysis is based on the drawings provided by Richard Young Architect.

Reference	Title	Date
HK 2294 01.001	Attic Floor Plans as Existing and Proposed	12 Dec 2024
1426-MSK11	Attic Level Mechanical Services Layout	19 Dec 2019

See drawing below showing the locations of the proposed plantrooms and plant items.



Proposed Plantroom and plant locations indicated on Attic Floor Plans as Existing and Proposed
(Drawing Ref. HK 2294 01.001)



Proposed MVHR and condenser locations within Plantroom 1 indicated on Attic Level Mechanical Services Layout (Drawing Ref. 1426-MSK11)



6.0 Acoustic Standards and Guidelines

6.1 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.

6.2 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) was first published in March 2012. This document replaced the existing Planning Policy Guidance Note 24 (PPG24) “Planning and Noise”. A new edition of NPPF was published in July 2021 and comes into effect immediately.

The following paragraphs are from the NPPF (published July 2021):

185. 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.

187. 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 185 also references the Noise Policy Statement for England (NPSE). 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.”

The NPPF document does not refer to any other documents or British Standards regarding noise other than the NPSE.

Paragraph 2 of the NPPF states that *“planning law required that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise.”*

Paragraph 12 of the NPPF states that *“The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed.”*

6.3 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



Perception	Examples of Outcomes	Increasing effect level	Action
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

6.4 Local Authority Requirements

The site lies within the jurisdiction of London Borough of Camden (LBC from herein). Their advice regarding criteria for atmospheric noise emissions from building service plant is as follows:

6.4.1 Noise Sensitive Developments

The LBC determines within Policy A4 of their Camden Local Plan (2017) that “*noise sensitive development includes housing, schools and hospitals as well as offices, workshops and open spaces.*”.

6.4.2 Building Services Plant Noise Criteria

The site lies within the jurisdiction of the London Borough of Camden. Their policy stated within the *Camden Local Plan (2017)* regarding criteria for atmospheric noise emissions from building



service plant is as follows:

“Industrial and Commercial Noise Sources

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 or bedroom window (façade)	Day	‘Rating level’ 10dB* below background	‘Rating level’ between 9dB below and 5dB above background	‘Rating level’ greater than 5dB above background
Dwellings”	Outside bedroom window (façade)	Night	Rating level’ 10dB* below background and no events exceeding 57dBLAmax	‘Rating level’ between 9dB below and 5dB above background or noise events between 57dB and 88dB LAmax	Rating ‘Rating level’ greater than 5dB above background and/or events exceeding 88dBLAmax

**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 given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.”



6.5 BS 4142:2014 + A1:2019

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+A1:2019. 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”.



6.6 British Standard BS8233: 2014

British Standard 8233: 2014 “Guidance on sound insulation and noise reduction for buildings” provides guidance for the control of noise in and around buildings.

BS8233:2014 Section 7.7.2 titled “Internal ambient noise levels for dwellings” states:

“In general for steady external noise sources, it is desirable that internal ambient noise levels do not exceed the following guideline values:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 - 23:00	23:00 - 07:00
Resting	Living Rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

6.7 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.

7.0 Survey Methodology

7.1 Procedure

Fully automated environmental noise monitoring was undertaken by Kyungmin Kim PgDip, BMus (Hons), AMIOA from approximately 11:00 hours on Wednesday 14 February 2024 to 11:00 hours on Monday 19 February 2024 to establish full daytime and night-time noise levels over a typical weekday and weekend period.

Measurements were taken continuously of the A-weighted (dBA) L_{90} , L_{eq} and L_{max} sound pressure levels over 15-minute periods.

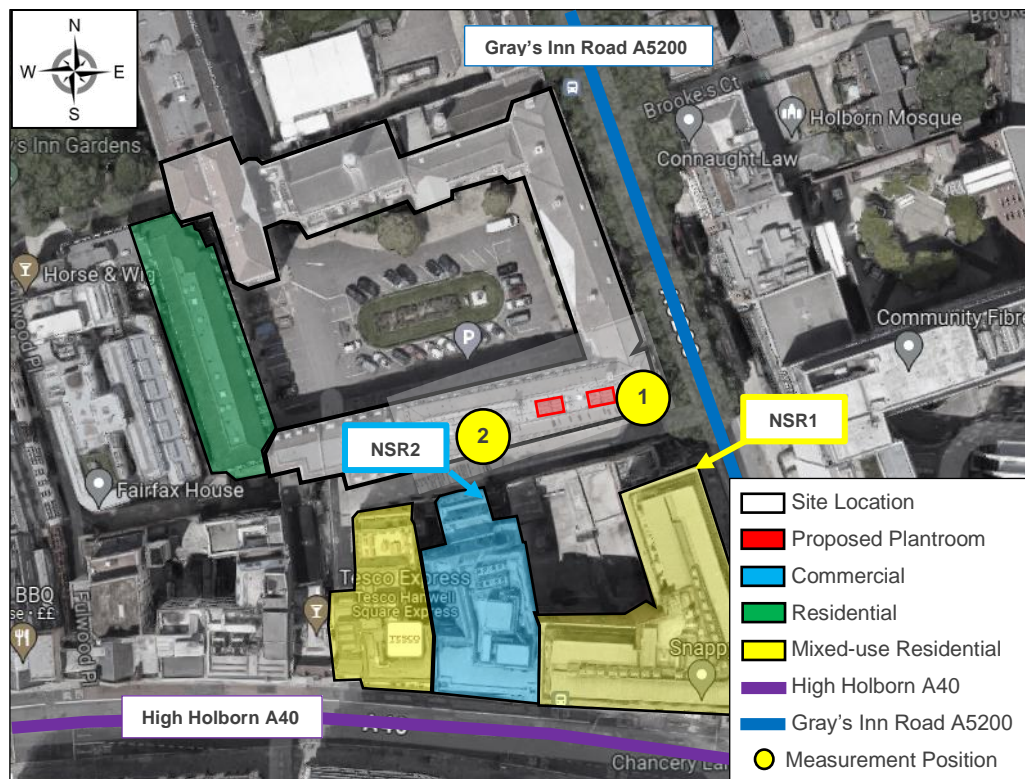


7.2 Measurement Positions

The noise level measurements were undertaken at 2no. positions as described in the table below.

Position No	Description
1	<p>The sound level meter was installed on the south westernmost side of the roof of South Square.</p> <p>The microphone was mounted to an extended pole, positioned at an approximate height of 1.5m from roof level, approximately 17m from NSR1.</p>
2	<p>The sound level meter was installed on the southernmost side of the roof of South Square.</p> <p>The microphone was mounted to an extended pole, positioned at an approximate height of 1.5m from roof level, approximately 25m from the NSR1 and 16m from NSR2</p>

The approximate measurement position is shown on the plan overleaf:



Plan Showing Unmanned Measurement Position (Map Data © 2024 Google)



7.3 Instrumentation

The instrumentation used during the survey is presented in the Table below:

Description	Manufacturer	Type	Serial Number	Calibration
Position 1 Type 1 ½" Condenser Microphone	ACO Pacific	7052E	75560	Calibration on 02/08/2023
Position 1 Preamp	SvanteK	SV18	83547	Calibration on 02/08/2023
Position 1 Type 1 Data Logging Sound Level Meter	SvanteK	971	72538	Calibration on 02/08/2023
Position 2 Type 1 ½" Condenser Microphone	ACO Pacific	7052E	67983	Calibration on 02/08/2023
Position 2 Preamp	SvanteK	SV18	71464	Calibration on 02/08/2023
Position 2 Type 1 Data Logging Sound Level Meter	SvanteK	971	80233	Calibration on 02/08/2023
Type 1 Calibrator	BrueL & Kjaer	4230	494325	Calibration on 27/07/2023

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.1 dB).

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

7.4 Weather Conditions

For the unattended survey between Wednesday 14 February 2024 to Thursday 15 February 2024, local weather reports indicated generally cloudy sky with light rainfall which took place periodically, with temperatures ranging from 5°C (night) to 10°C (day).

However, we understand that generally throughout the periods between 07:00 hours of Friday 16 February 2024 to 11:00 hours of Monday 19 February 2024, the weather conditions were relatively calm with patchy clouds.

These conditions are considered suitable for obtaining representative measurement results.

Based on the above, the survey period should be long enough to capture sufficient amount of



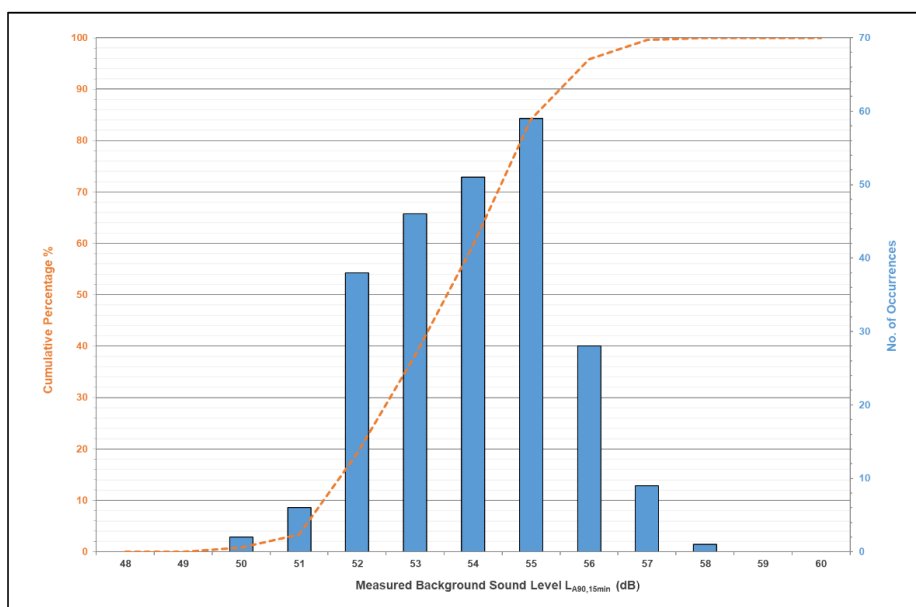
useful data representative of the noise climate around the site. As such, for the purpose of our assessment, data captured between Friday 16 February 2024 to Monday 19 February 2024 have been incorporated.

8.0 Results

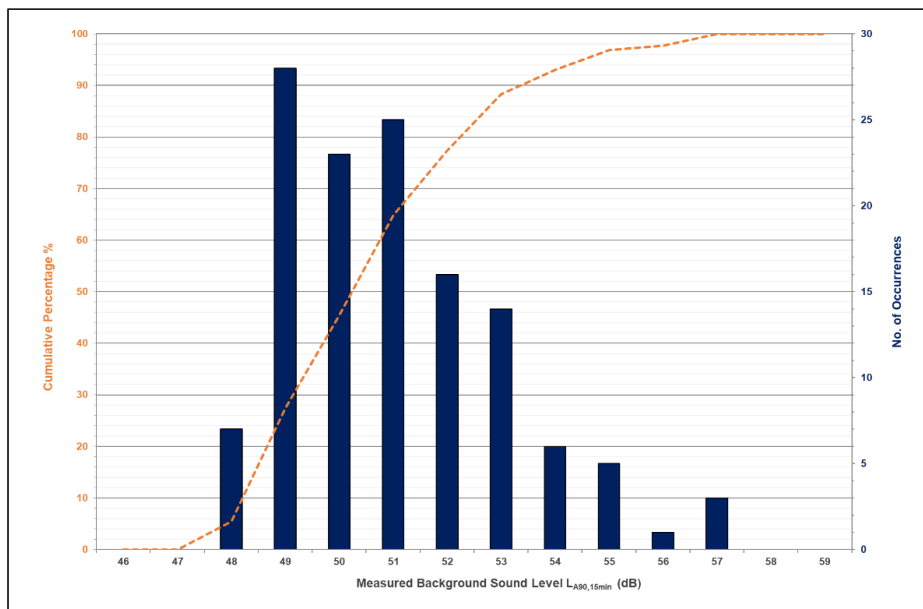
The results have been plotted on Time History Graphs 31327/TH1 and 31327/TH2 enclosed, presenting the 15-minute A-weighted (dBA) L_{90} , L_{eq} and L_{max} noise levels at each measurement position throughout the duration of the survey.

BS 4142:2014 states that “the background sound level must be reliable and suitably represent the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.” Taking this into account, the following histograms have been created which display the occurrence of each sound level (L_{90}) for the following day and night-time periods:

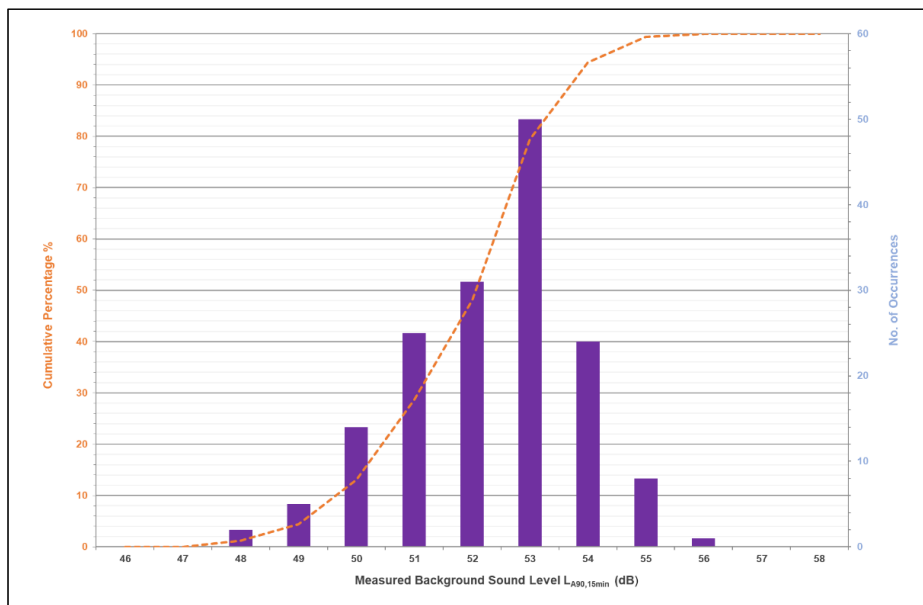
Measurement Position 1



Histogram of Measured Daytime (07:00 – 23:00) Background Noise Levels, $L_{A90,15min}$ – Position 1



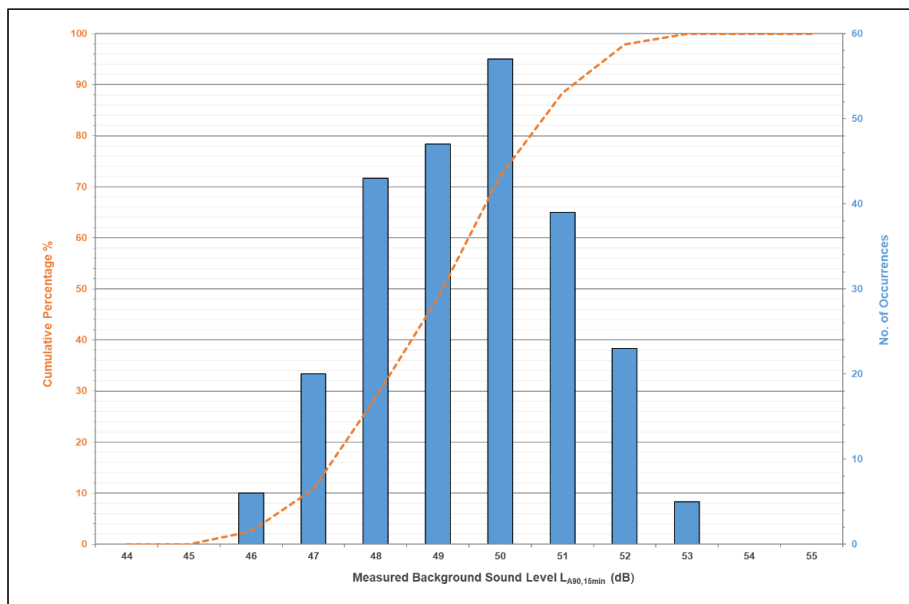
Histogram of Measured Night-time (23:00 – 07:00) Background Noise Levels, $L_{A90,15min}$ – Position 1



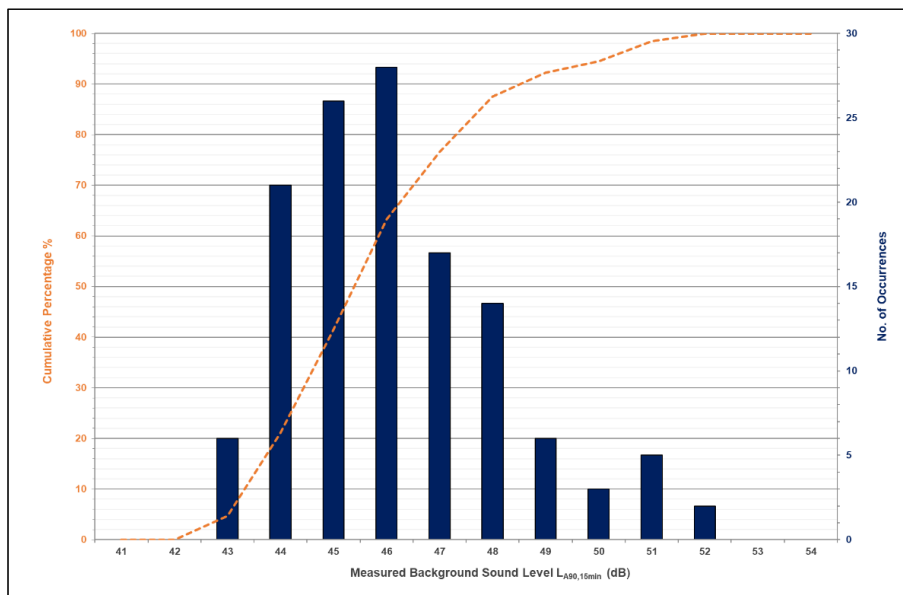
Histogram of Measured Background Noise Levels, $L_{A90,15min}$ during Proposed Operational Hours (07:00 – 18:00) – Position 2



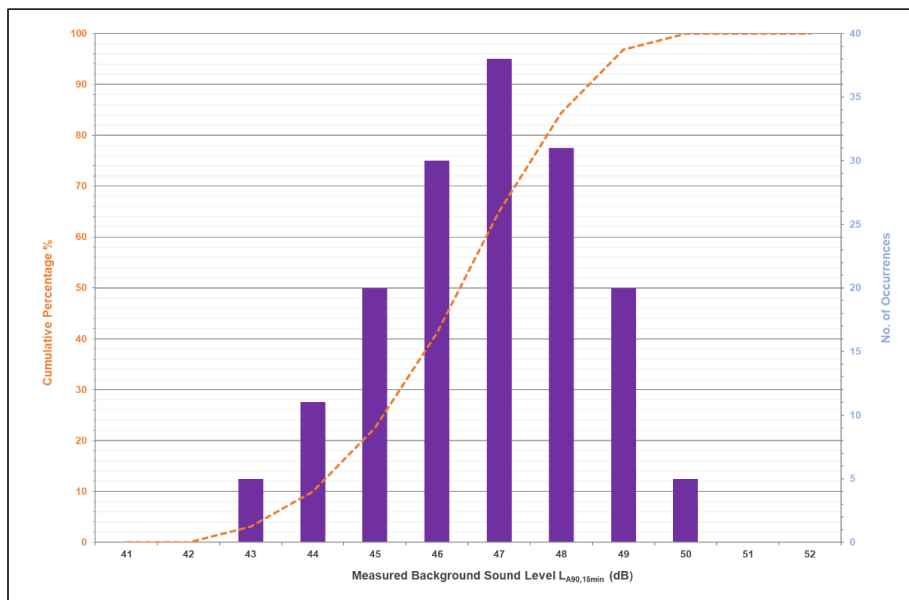
Measurement Position 2



Histogram of Measured Daytime (07:00 – 23:00) Background Noise Levels, $L_{A90,15min}$ – Position 2



Histogram of Measured Night-time (23:00 – 07:00) Background Noise Levels, $L_{A90,15min}$ – Position 2



Histogram of Measured Background Noise Levels, $L_{A90,15min}$ during Proposed Operational Hours (07:00 – 18:00) – Position 2

The following table presents the representative background noise levels (L_{90}) determined from our statistical analysis from above histograms for the following daytime, night-time and proposed operational periods:

Position	Typical Measured $L_{A90(15min)}$ Background Noise Level (dB re 2×10^{-5} Pa)		
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours	Proposed Operational Hours (07:00 – 18:00)
1	52	49	50
2	47	44	45

9.0 Discussion Of Noise Climate

Due to the nature of the survey, i.e., unattended, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However, at the beginning and end of the survey period the noise climate was noted to be dominated by road traffic noise from High Holborn A40 and Grays Inn Road A5200.

10.0 Plant Noise Emission Criteria

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

Based on the results of the noise survey, the guidance set out in BS4142:2014 + A1: 2019, and the aforementioned Local Authority criteria, we propose that the following plant noise emission



criteria be achieved at 1 meter from nearest noise sensitive receptor windows.

Position	Plant Noise Emission Criteria (dB re 2 x 10 ⁻⁵ Pa)		
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours	Proposed Operational Hours (07:00 – 18:00)
1	42	39	40
2	37	34	35

The above criteria are to be achieved with all of the proposed plant operating simultaneously. It should be noted that the above is subject to the final approval of the Local Authority.

11.0 Plant Noise Impact Assessment

The proposed plant items comprise 8No. condenser units – Mitsubishi PURY-EP500 YNW-A, to be installed in the attic spaces with open roof and 1No. mechanical ventilation heat recovery unit (MVHR) within proposed attic Plantroom 1, with the atmospheric ductwork leading to the roof.

We understand that the above proposed plant will operate during the daytime (07:00 to 18:00 hours).

Plant Description	Location	Qty	Plant Make	Model Number
Condenser unit	Plantroom 1	4	Mitsubishi	PURY-EP500 YNW-A
Condenser unit	Plantroom 2	4	Mitsubishi	PURY-EP500 YNW-A
MVHR unit	Plantroom 1	1	Airflow	DUPLEXVENT 6500 Multi ECO

11.1 Plant Noise Data

We understand the manufacturer's noise data for the proposed equipment to be as follows:

Condenser unit

Plant Description	Sound Pressure Level (dB re 2x10 ⁻⁵ Pa) measured at 1m at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Standard operation (cooling mode)	77	68	66	61	56	54	51	44	64
Standard Operation (heating mode)	66	64	66	63	57	57	53	49	65

MVHR unit

Plant Description	A-weighted Induct Sound Power Level (dB re 10 ⁻¹² Watts) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Inlet outdoor air	48	56	64	65	60	48	39	31	68
Outlet supply air	68	74	81	87	86	80	72	61	91
Inlet extract air	47	56	63	66	58	45	30	25	68
Outlet exhaust air	59	65	75	81	80	74	67	61	85
Casing to surround	51	57	69	68	66	66	62	50	74

Sound power level at connection ports is measured in accordance with ISO 5136.

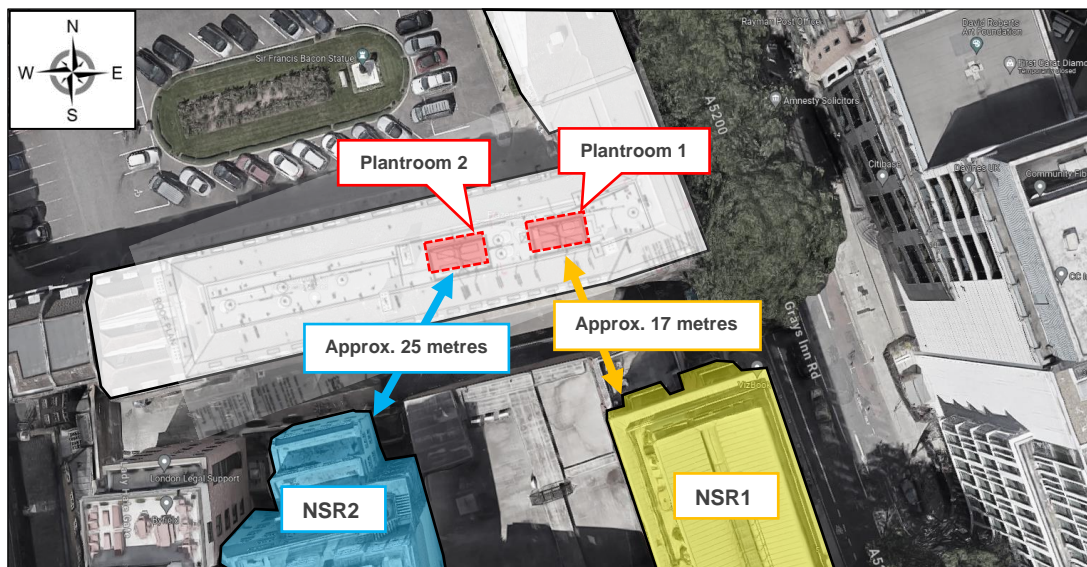
11.2 Source & Receiver Locations

We understand the worst affected nearest noise sensitive residential window (NSR1) is located to the southeast of the site, on the 7th floor of rear façade of the mixed-use residential building on the corner of High Holborn and Gray's Inn Road. The next nearest noise sensitive receptor (NSR2 from herein) is a commercial receptor located on the top floor of 16 High Holborn.

The NSR1 is approximately 17 metres away, with direct line of sight to the roofs of proposed attic plantrooms.

The NSR2 is approximately 25 metres away, with direct line of sight to the roofs of proposed attic plantrooms. For the purpose of robustness, we have considered both receptors into our assessment.

The approximate locations of plant items relative to the NSRs are shown in the site plan below.



Site Plan Indicating Approximate Plantrooms and NSR1 & NSR2 Locations (Map Data © 2024 Google)

11.3 Mitigation Measures

In order to suitably control the atmospheric plant noise emissions in line with the Local Authority requirements, our preliminary assessment indicates, as a minimum, the following noise mitigation measures or equivalent will be required for the proposed plant selections:

MVHR unit

The MVHR unit proposed should be provided with suitable atmospheric attenuators. The following table presents the minimum dynamic insertion loss values required:

Description	Minimum Dynamic Insertion Loss at Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Fresh Air Intake (atmospheric)	3	7	14	21	27	26	18	12
Exhaust (atmospheric)	5	11	19	29	36	37	29	18

Condenser units

The proposed condenser units should be attenuated by at least 18dBA.

This level of attenuation could typically be achieved by incorporating suitably a specified acoustic enclosure (individual or combined) providing at least 18dBA attenuation. Alternatively, the proposed condenser units could be reselected to be quieter to achieve the same amount of noise reduction.



Please find attached our Acoustic Specification for Acoustic Enclosures and a List of Suitable Suppliers.

11.4 Plant Noise Impact Assessment

The following table summarises our predictions of atmospheric noise emissions from the proposed plant items within attic plantrooms to NSR1: the worst affected nearest noise sensitive residential window, incorporating our recommended mitigation measures in Section 11.3.

Plantroom	Item	L_w/L_p	Sound Level at Octave Band Centre Frequency (Hz)								dBA
			63	125	250	500	1k	2k	4k	8k	
Plantroom 1	PURY-EP500 YNW-A at 1m	L_p	66	64	66	63	57	57	53	49	65
	4No. Qty Correction		+6								
	16m distance loss		-18								-
	Suitable Acoustic Enclosure (See Section 11.3)		-18								
	Façade effect		+3								-
	Calculated Noise Level at 1m from NSR1		39	37	39	36	30	30	26	22	38
	DuplexVent 6500 MVHR Fresh Air Intake	L_w	74	72	73	68	60	47	38	32	
	In-duct Attenuator (See Section 11.3)		5	11	19	29	36	37	29	18	
	End Reflection Loss		-7	-4	-1	-	-	-	-	-	-
	16m distance loss (L_w to L_p)		-32								-
	Façade Effect		+3								-
	Calculated Noise Level at 1m from NSR1		35	33	29	20	4	-7	-7	-8	23
	DuplexVent 6500 MVHR Exhaust	L_w	85	81	84	84	80	73	66	62	85
	In-duct Attenuator (See Section 11.3)		3	7	14	21	27	26	18	12	
	End Reflection Loss		-7	-4	-1	-	-	-	-	-	-
	16m distance loss (L_w to L_p)		-32								-
	Façade Effect		+3								-
	Calculated Noise Level at 1m from NSR1		44	38	35	28	15	8	9	16	30
Plantroom 2	PURY-EP500 YNW-A at 1m	L_p	66	64	66	63	57	57	53	49	65
	4No. Qty Correction		+6								
	25m distance loss		-23								-
	Suitable Acoustic Enclosure (See Section 11.3)		-18								
	Façade effect		+3								-
	Calculated Noise Level at 1m from NSR1		34	32	34	31	25	25	21	17	33
Cumulative Noise Level At 1m from NSR1			46	42	42	38	31	31	27	24	40



The following table summarises our predictions of atmospheric noise emissions from the proposed plant items within attic plantrooms to NSR2: next nearest noise sensitive receptor (commercial), incorporating our recommended mitigation measures in Section 11.3.

Plantroom	Item	L_w/L_p	Sound Level at Octave Band Centre Frequency (Hz)								dBA
			63	125	250	500	1k	2k	4k	8k	
Plantroom 1	PURY-EP500 YNW-A at 1m	L_p	66	64	66	63	57	57	53	49	65
	4No. Qty Correction		+6								
	32m distance loss		-18								-
	Suitable Acoustic Enclosure (See Section 11.3)		-18								
	Façade effect		+3								-
	Calculated Noise Level at 1m from NSR2		32	30	32	29	23	23	19	15	31
	DuplexVent 6500 MVHR Fresh Air Intake	L_w	74	72	73	68	60	47	38	32	
	In-duct Attenuator (See Section 11.3)		5	11	19	29	36	37	29	18	
	End Reflection Loss		-7	-4	-1	-	-	-	-	-	-
	35m distance loss (L_w to L_p)		-39								-
	Façade Effect		+3								-
	Calculated Noise Level at 1m from NSR2		28	26	22	13	-3	-15	-15	-16	16
	DuplexVent 6500 MVHR Exhaust	L_w	85	81	84	84	80	73	66	62	85
	In-duct Attenuator (See Section 11.3)		3	7	14	21	27	26	18	12	
	End Reflection Loss		-7	-4	-1	-	-	-	-	-	-
	35m distance loss (L_w to L_p)		-39								-
	Façade Effect		+3								-
	Calculated Noise Level at 1m from NSR2		37	31	28	20	9	0	1	8	23
Plantroom 2	PURY-EP500 YNW-A at 1m	L_p	66	64	66	63	57	57	53	49	65
	4No. Qty Correction		+6								
	25m distance loss		-23								-
	Suitable Acoustic Enclosure (See Section 11.3)		-18								
	Façade effect		+3								-
	Calculated Noise Level at 1m from NSR2		34	32	34	31	25	25	21	17	33
Cumulative Noise Level At 1m from NSR2			40	36	37	33	27	27	23	19	35



Our calculations indicate that, in conjunction with our recommended mitigation measures in Section 11.3, the cumulative noise levels from the proposed attic plantrooms meet the respective plant noise emission requirements of the Local Authority outlined in Section 10.0 during the intended operating hours.

12.0 Conclusions

An environmental noise survey has been 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 receptors.

Suitable mitigation measures have been recommended to meet the requirements of Local Authority.

The assessment indicates that the proposed plant, in conjunction with our recommended mitigation measures, should be capable of achieving the proposed plant noise emission criteria at the nearest noise sensitive receptors.

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).

Appendix B

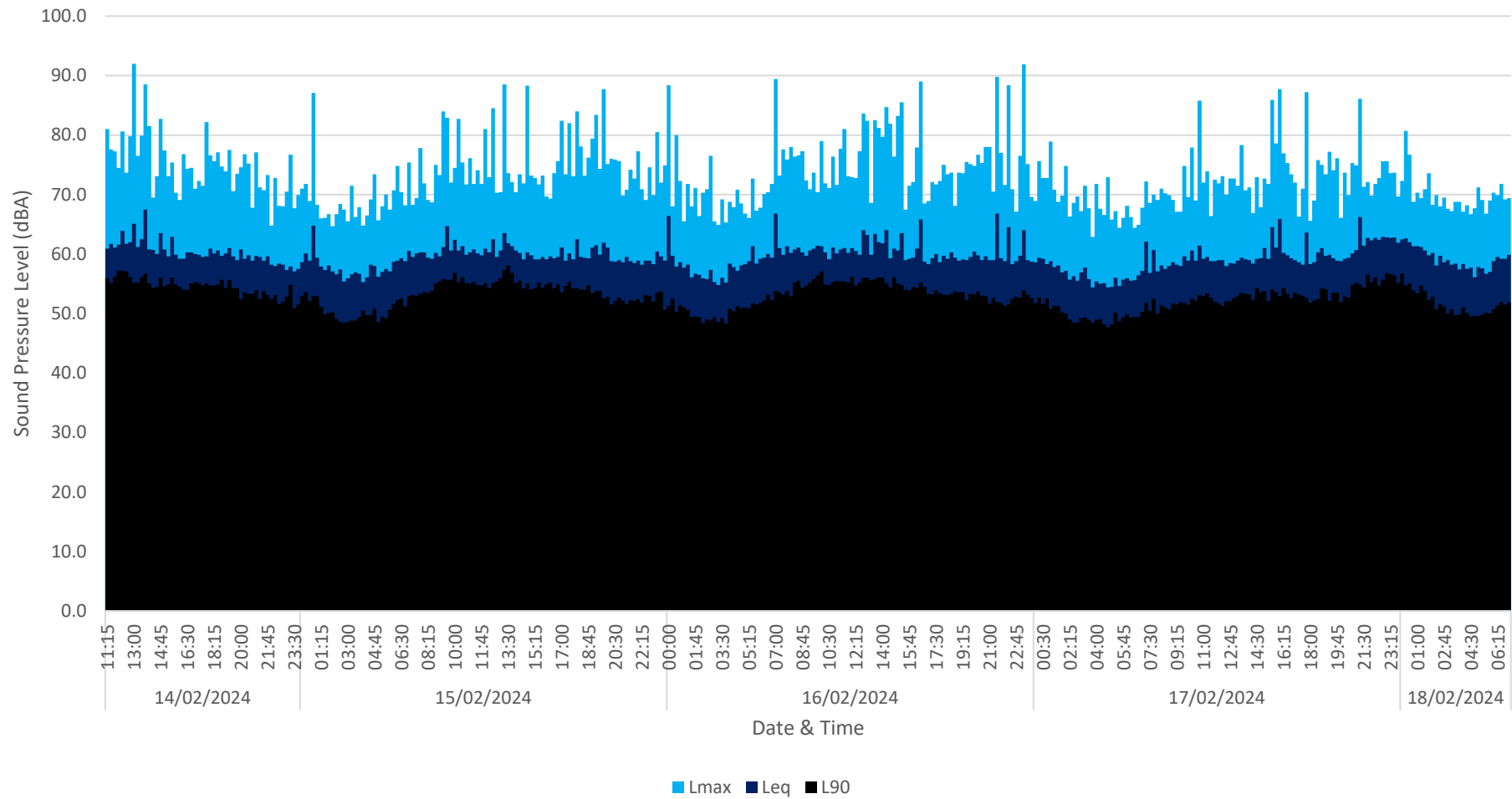
Time History Graphs

3-4 South Square, Gray's Inn London WC1

Position 1

L_{eq} , L_{max} and L_{90} Noise Levels

Wednesday 14 February 2024 to Sunday 18 February 2024

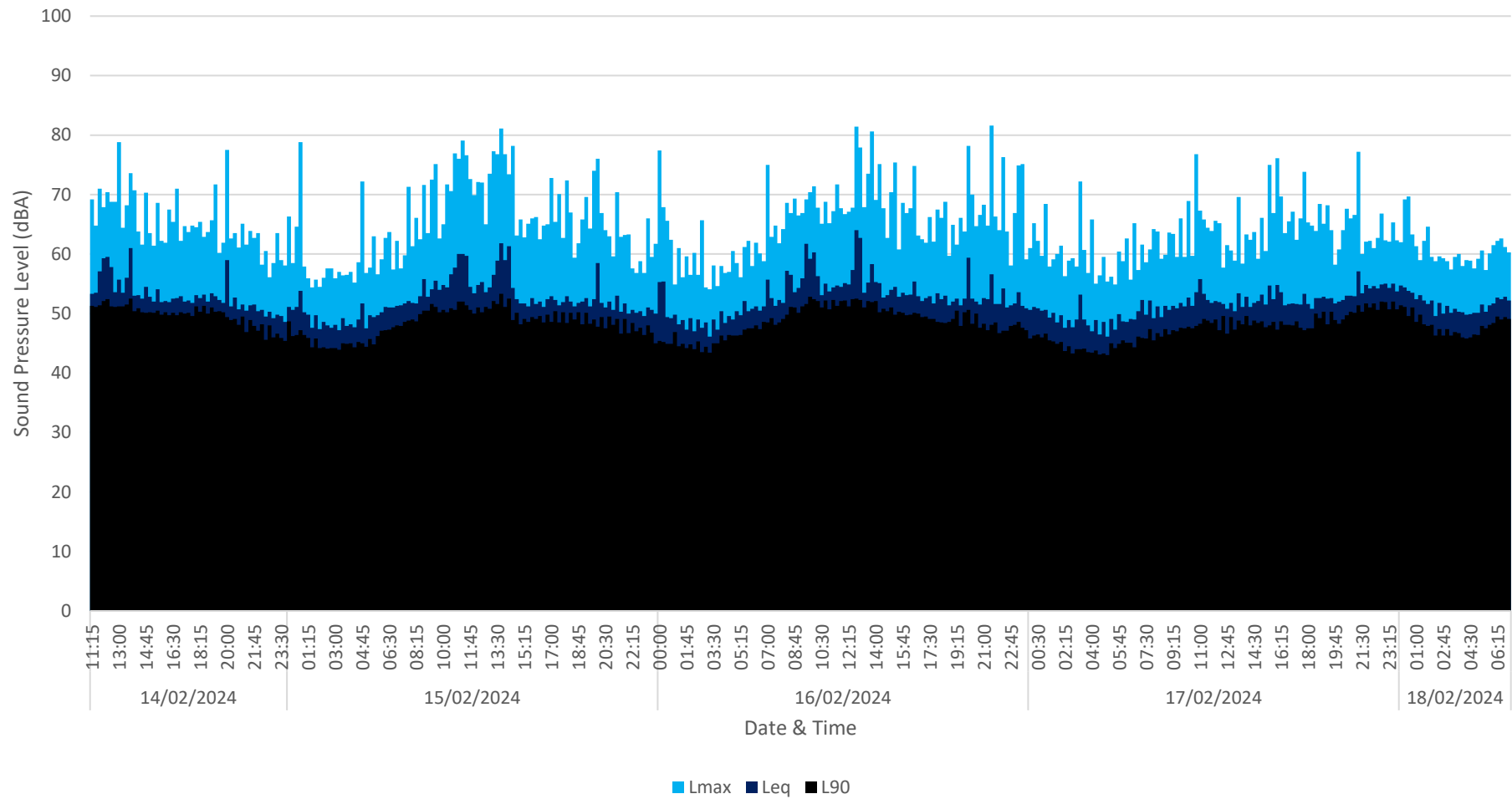


3-4 South Square, Gray's Inn London WC1

Position 2

L_{eq} , L_{max} and L_{90} Noise Levels

Wednesday 14 February 2024 to Sunday 18 February 2024

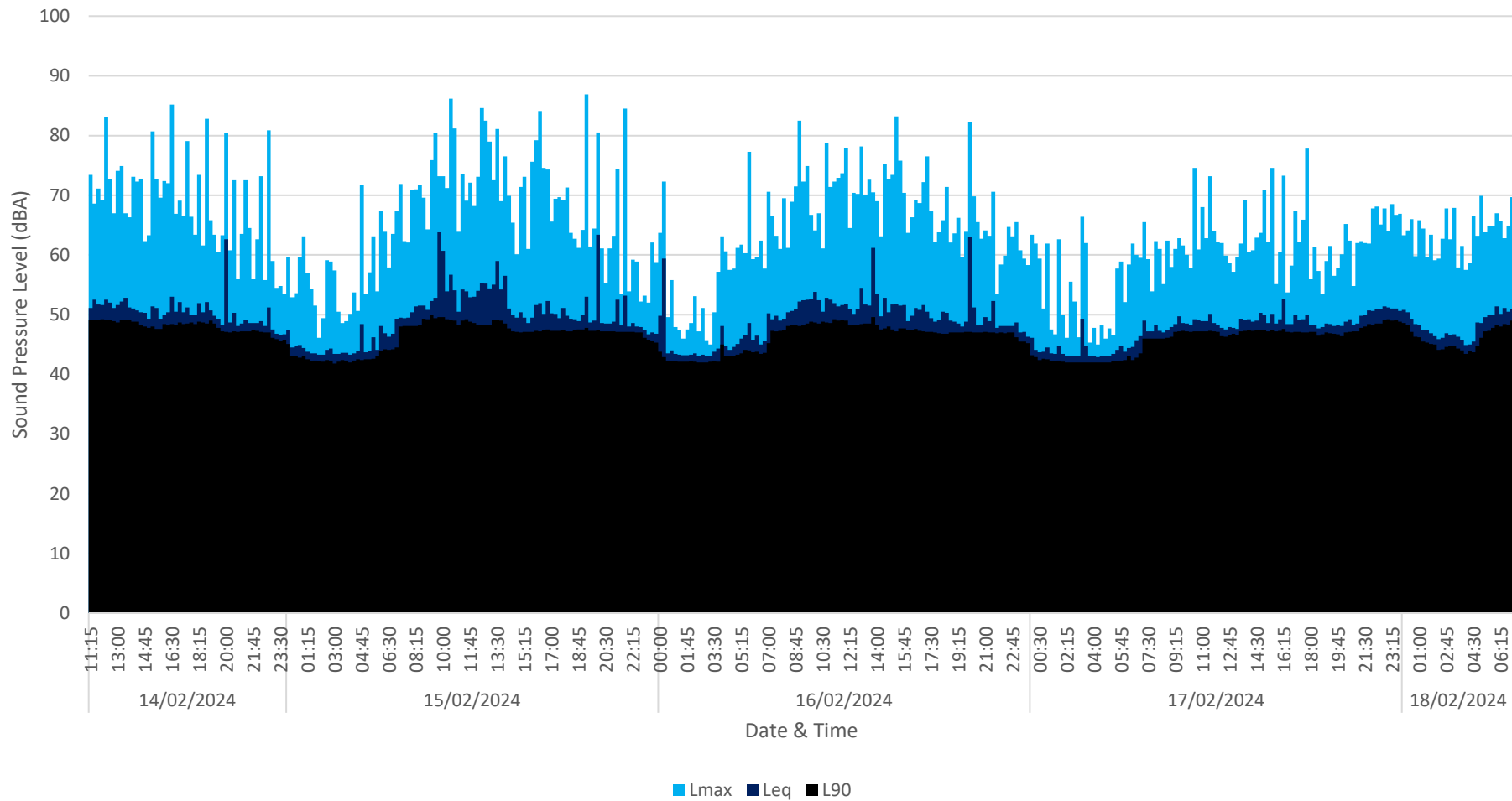


3-4 South Square, Gray's Inn London WC1

Position 3

L_{eq} , L_{max} and L_{90} Noise Levels

Wednesday 14 February 2024 to Sunday 18 February 2024



Appendix C

SPECIFICATION

FOR

ACOUSTIC ENCLOSURES

Each condenser unit shall be 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) and in any horizontal or vertical direction under any load conditions.

Duty/Time	A-weighted Limiting Sound Pressure Level @ 1m (dB re 2×10^{-5} Pa)
Daytime Operating Hours 07:00 – 18:00 hours	47
Night – 23:00 – 07:00 hours	No operation

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/m³. 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.

Appendix D

SUITABLE SUPPLIERS

of

ACOUSTIC ENCLOSURES

Name & Address	Telephone Number	Contact
Environ Technologies Ltd Regus House 1010 Cambourne Business Park Cambourne CB3 6DP	0870 383 3344	Steve Cox
Acoustic Engineering Services (UK) Ltd The Redwood Suite Guardian House Borough Road Godalming Surrey GU7 2AE	01483 495963	Barry Austin Mark Stagg