Kilburn Building
University of Manchester

Plant Sound
Assessment Report
1228/PSA1

9 April 2024

For:

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1.0 Introduction

Lighthouse Acoustics has been appointed by Wilson Mason LLP to undertake an environmental sound survey at the Kilburn Building, University of Manchester and to assess operational sound emissions from the proposed 4No. condenser units to serve the building.

The survey methodology, results and assessments are presented in this report.

2.0 Objectives

To establish the Local Authority's acoustic requirements for the proposed development.

To visit site to undertake a detailed environmental sound survey in order to establish existing environmental sound levels at the site.

To undertake an assessment of atmospheric sound emissions from the proposed 4No. condenser units to the nearest noise sensitive receptor and propose mitigation measures if required in order to achieve the requirements of the Local Authority.

3.0 Site Description

The site is situated at the Kilburn Building, Oxford Road, Manchester and comprises an existing 4 storey detached building. The site is bound by university buildings to the north east, Wilton Street to the south east, Oxford Road to the south west and Dalton Street to the north west.

The surrounding buildings are all understood to be university buildings.

The 4No. condenser units are proposed on the roof of the existing building towards the southern corner.

The nearest noise sensitive receptor is understood to be the windows in the north west elevation of the adjacent Jean McFarlane Building situated to the south east.

The site plan below indicates the extent of the site and the surrounding environment.



Site plan indicating the extent of the site and the surrounding environment

4.0 Local Authority Requirements

With regard to noise and vibration from fixed plant/equipment, Section 3.7.1.5 of the Planning & Noise Technical Guidance document (dated October 2022) produced by Manchester City Council states the following:

> *"The noise assessment should be based on BS 4142: 2014 and any application for fixed plant, equipment or machinery must demonstrate that:*
>
> ***Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location."***

5.0 Environmental Sound Survey

5.1 Measurements

Automated environmental sound measurements were undertaken from 16:00 hours on Wednesday 3 April 2024 to 16:00 hours on Thursday 4 April 2024. During this period the L_{Amax}, L_{Aeq} and L_{A90} sound pressure levels were measured continuously over 15 minute periods.

5.2 Weather Conditions

At the start of the survey period there was a gentle westerly breeze (<5.0m/s) and the sky was overcast. There was no rainfall and road surfaces were dry. The temperature was approximately 10°C.

At the end of the survey period there was a light westerly breeze (<3.0m/s) and the sky was scattered cloud. There was no rainfall and road surfaces were dry. The temperature was approximately 12°C.

Based on publicly available weather data for the survey period it is understood that weather conditions remained similar for the duration of the survey with no periods of significant rainfall or strong breezes. The weather conditions during the survey period are therefore considered to be suitable for undertaking measurements of sound levels.

5.3 Measurement Position

Environmental sound levels were measured at a single position on-site as described in the table below.

Position	Description
A	Microphone situated towards the southern corner of the building at 1.2m above roof level.

The measurement position is shown on the site plan below.



Site plan showing measurement position

Measurement Position A was selected in order to assess typical environmental sound levels representative of those at the nearest noise sensitive receptor to the proposed 4No. condenser units.

5.4 Equipment

The following equipment was used to undertake the environmental sound survey.

Equipment	Manufacturer	Model	Serial No.	Calibration Date
Class 1 Sound Level Meter	Casella	633C	0721320	07/11/2023
Preamplifier	Casella	495	001414	07/11/2023
Microphone	Casella	251	1025	07/11/2023
Class 1 Sound Calibrator	Casella	120/1	3864878	01/11/2023
Environmental Noise Kit	Casella	6847	-	-
Microphone Extension Cable	Casella	C6717/5	-	-
Weather Protection System	Casella	6737	-	-

Field calibration checks were performed on the sound level meter prior to and on completion of the survey and were found to be within acceptable tolerance limits.

5.5 Results

5.5.1 Time History Graph

The results of the environmental sound survey are presented on Time History Graph 1228/THG1 enclosed at the rear of the report.

5.5.2 L_{A90} Background Sound Levels

The lowest representative daytime and night-time $L_{A90,15min}$ background sound levels measured during the survey period are detailed in the table below.

Position	Lowest Representative $L_{A90,15min}$ Background Sound Levels (dB)	
	Daytime (07:00–23:00)	Night-time (23:00–07:00)
A	54	48

5.5.3 Discussion of Sound Climate

At the start and end of the survey period the dominant sound source at Position A was noted to be frequent road traffic along Oxford Road along with road traffic from the surrounding road network and low level building services from the surrounding buildings.

Whilst we are unable to comment on dominant sound sources or individual sound events during the survey period, based on the surrounding environment it is likely that road traffic remained the dominant sound source.

6.0 BS 4142:2014

BS 4142:2014 "Methods for rating and assessing industrial and commercial sound", describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- sound from industrial and manufacturing processes;
- sound from fixed installations which comprise mechanical and electrical plant and equipment;
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

Sound of an industrial and/or commercial nature does not include sound from the passage of vehicles on public roads and railway systems.

It should be noted that the determination of noise amounting to a nuisance is beyond the scope of BS 4142.

The likely impact is indicated by subtracting the existing background sound level from the rating level of the industrial and/or commercial sound. The standard states that:

> *"a) Typically, the greater this difference, the greater the magnitude of the impact.*
> *b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
> *c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.*
> *d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*
>
> *Note 2 Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."*

The industrial and/or commercial sound is expressed as the specific sound level and given as a $L_{Aeq,Tr}$ sound level. Should the specific sound level exhibit any acoustic features (i.e. tonality, irregularity or impulsiveness) a character correction is applied. The rating level is the specific sound level with character correction applied (if applicable) and is given as a $L_{Ar,Tr}$ sound level.

The existing background sound level is given as a L_{A90}, T sound level. The reference time interval, T_r, is 1 hour during the daytime period (07:00 to 23:00 hours) and 15 minutes during the night-time period (23:00 to 07:00 hours).

7.0 Plant Sound Emission Assessment

7.1 Plant Sound Data

Atmospheric building services sound levels have been assessed based on the manufacturers sound data received for the proposed 4No. condenser units which indicates octave band sound data as detailed in the tables below.

1No. Mitsubishi PUZ-ZM71VHA2

Sound Pressure Level at 1m (dB) at Octave Band Centre Frequency (Hz)								dBA
63	125	250	500	1k	2k	4k	8k	
53	52	53	44	43	39	33	27	49

3No. Mitsubishi PUZ-ZM100VKA2

Sound Pressure Level at 1m (dB) at Octave Band Centre Frequency (Hz)								dBA
63	125	250	500	1k	2k	4k	8k	
54	54	53	49	46	42	36	29	51

Whilst it is not possible to assess plant irregularity or impulsiveness based on manufacturer's sound data, BS 4142: 2014 provides an objective method for assessing the audibility of tones in sound. The one-third octave method states that if the level of a one third octave band exceeds the level of both adjacent one third octave bands by the following amounts, then a tonal component may be identified as present:

- 15dB in the low-frequency one-third-octave bands (25Hz to 125Hz);
- 8dB in the mid-frequency one-third-octave bands (160Hz to 400Hz);
- 5dB in the high-frequency one-third-octave bands (500Hz to 10kHz).

However, one third octave band sound data is rarely available from manufacturers as is the case in this instance.

By applying the same principal to the octave band sound data in the tables above, a review indicates that these items are unlikely to exhibit a tonal component. As such, no character correction has been applied to the specific sound level for these items.

Should one third octave band sound data become available a revised assessment should be undertaken.

7.2 Operating Hours

It is understood that the proposed 4No. condenser units have the potential to operate 24 hours a day.

In order to undertake a worst case assessment, it is assumed that the proposed 4No. condenser units will operate for the full 1 hour daytime and 15 minute night-time assessment periods.

7.3 Plant Location

It is understood that the proposed 4No. condenser units are to be situated at roof level of the existing building towards the southern corner.

7.4 Nearest Receptor

It is understood that the nearest noise sensitive receptor are the windows in the north west elevation of the adjacent Jean McFarlane Building situated approximately 20m to the south east of the proposed 4No. condenser units.

7.5 Assessment

The tables below detail the calculated L_{Ar} rating levels for the proposed plant items at the nearest noise sensitive receptors along with the lowest representative daytime and night-time L_{A90} background sound levels and the differences between them.

Daytime Assessment

Descriptor	Plant Item	
	PUZ-ZM71VHA2	PUZ-ZM100VKA2
Sound Pressure Level $L_{Aeq,T}$ at 1m (dB)	49	51
Percentage on-time (%)	100	100
On time correction (dB)	0	0
Sound Pressure Level $L_{Aeq,1hour}$ at 1m (dB)	49	51
Number of Units (#)	1	3
Correction (dB)	0	+5
Distance to Receptor (m)	20	20
Distance Attenuation (dB)	-26	-26
Screening Attenuation (dB)	0	0
Specific Sound Level $L_{Aeq,1hour}$ at Receptor (dB)	23	30
Character Correction (dB)	0	0
Rating Level $L_{Ar,1hour}$ at Receptor (dB)	23	30
Combined Rating Level $L_{Ar,1hour}$ at Receptor (dB)	31	
Representative Background Sound Level $L_{A90,15min}$ at Receptor (dB)	54	
Difference (dB)	-23	

The calculated L_{Ar} rating level for the proposed plant items at the nearest noise sensitive receptor is 23dB below the lowest representative daytime L_{A90} background sound level.

The assessment therefore indicates that atmospheric plant sound emissions from the proposed plant items are likely to have a low impact at the nearest noise sensitive receptor and achieve the requirements of the Local Authority during the daytime period.

Night-time Assessment

Descriptor	Plant Item	
	PUZ-ZM71VHA2	PUZ-ZM100VKA2
Sound Pressure Level $L_{Aeq,T}$ at 1m (dB)	49	51
Percentage on-time (%)	100	100
On time correction (dB)	0	0
Sound Pressure Level $L_{Aeq,15min}$ at 1m (dB)	49	51
Number of Units (#)	1	3
Correction (dB)	0	+5
Distance to Receptor (m)	20	20
Distance Attenuation (dB)	-26	-26
Screening Attenuation (dB)	0	0
Specific Sound Level $L_{Aeq,15min}$ at Receptor (dB)	23	30
Character Correction (dB)	0	0
Rating Level $L_{Ar,15min}$ at Receptor (dB)	23	30
Combined Rating Level $L_{Ar,15min}$ at Receptor (dB)	31	
Representative Background Sound Level $L_{A90,15min}$ at Receptor (dB)	48	
Difference (dB)	-17	

The calculated L_{Ar} rating level for the proposed plant items at the nearest noise sensitive receptor is 17dB below the lowest representative night-time L_{A90} background sound level.

The assessment therefore indicates that atmospheric plant sound emissions from the proposed plant items are likely to have a low impact at the nearest noise sensitive receptor and achieve the requirements of the Local Authority during the night-time period.

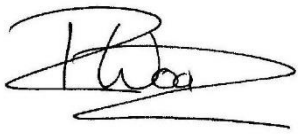
8.0 Conclusion

The Local Authority's acoustic requirements for the proposed development have been established.

A detailed environmental sound survey has been undertaken in order to establish existing environmental sound levels at the site.

An assessment of atmospheric sound emissions from the proposed 4No. condenser units to the nearest noise sensitive receptor has been undertaken.

The assessment indicates that atmospheric plant sound emissions from the proposed 4No. condenser units are likely to have a low impact at the nearest noise sensitive receptor and achieve the requirements of the Local Authority.



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1228/THG1

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Time History Graph - Wednesday 3 April 2024 to Thursday 4 April 2024

$L_{Amax,15min}$, $L_{Aeq,15min}$ & $L_{A90,15min}$ Noise Levels at Position A

