SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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3 April 2020

24-26 West Street, London

Noise survey and plant noise assessment report

London, Manchester, Edinburgh, Birmingham, Belfast, Stevenage

post@sandybrown.com
www.sandybrown.com

Sandy Brown Associates LLP
Registered in England & Wales No. OC 307504

Registered Office: 55 Charterhouse Street, London EC1M 6HA

Version	Date	Comments	Author	Reviewer
A	3 Apr 20		Yale Sherlock	Steven Wheeler

Summary

Sandy Brown has been commissioned by The West Street Trustee Limited to provide acoustic advice in relation to the proposed refurbishment of 24-26 West Street, Seven Dials, London, WC2H 9NA.

An environmental noise survey has been carried out to determine the existing sound levels in the area. The noise survey was performed between 11:30 on 13 March 2020 and 12:00 on 20 March 2020.

The representative background sound levels measured outside of the noise-sensitive receptor (ie, the residential unit on first floor, 26 West Street) during the survey were $L_{A90,15min}$ 57 dB during the daytime and $L_{A90,15min}$ 48 dB at night.

As part of the refurbishment, it is proposed to replace the existing outdoor air-conditioning units with a new single unit. The unit will be installed within the rear lightwell of 26 West Street and will only operate during the office hours (ie, 07:00 – 19:00, Monday to Friday).

As the existing noise climate at the worst-affected noise-sensitive receptor is determined by the existing air conditioning units, the replacement unit must not result in a noise egress of greater than $L_{Aeq,15min}$ 57 dB.

An assessment of the replacement unit has been undertaken, which has shown that the unit is capable of meeting the required noise limit when operated with the low-noise mode engaged permanently, or with standard mode engaged and an acoustic attenuation package installed.

Contents

1 Introduction

Sandy Brown has been commissioned by The West Street Trustee Limited to provide acoustic advice in relation to the proposed refurbishment project at 24-26 West Street, Seven Dials, London, WC2H 9NA.

As part of this, an environmental noise survey is required, the purpose of which is to establish the existing background sound levels in the vicinity of nearby noise-sensitive premises and to set appropriate limits for noise egress from building services plant.

This report presents the survey method and results, and a discussion of acceptable limits for noise emissions from building services plant. An assessment of the proposed condenser unit is also included.

2 Site description

2.1 The site and its surrounding

The site location in relation to its surroundings is shown in Figure 1.

24 West Street is a commercial property. 26 West Street is a mixed commercial and residential property, where the ground and basement floors are offices and the first, second and third floors are residential.

Figure 1 Aerial view of 24-26 West Street (courtesy of Google Earth Pro)

2.2 Adjacent premises

The worst-affected noise-sensitive receptor is deemed to be the residential unit on the first floor of 26 West Street, which has windows facing into the lightwell.

3 Development proposals

It is proposed to remove all existing outdoor air-conditioning units located within the 26 West Street rear lightwell (Figure 2), those on the 24 West Street rear facade (Figure 2) and those on the south gable wall (Figure 4). The units will be replaced with a new single unit (Manufacturer: Mitsubishi, model: PURY-P900YSNW) within the rear lightwell on 26 West Street.

Figure 2 Existing outdoor air-conditioning units located in 26 West Street rear lightwell to be removed/replaced

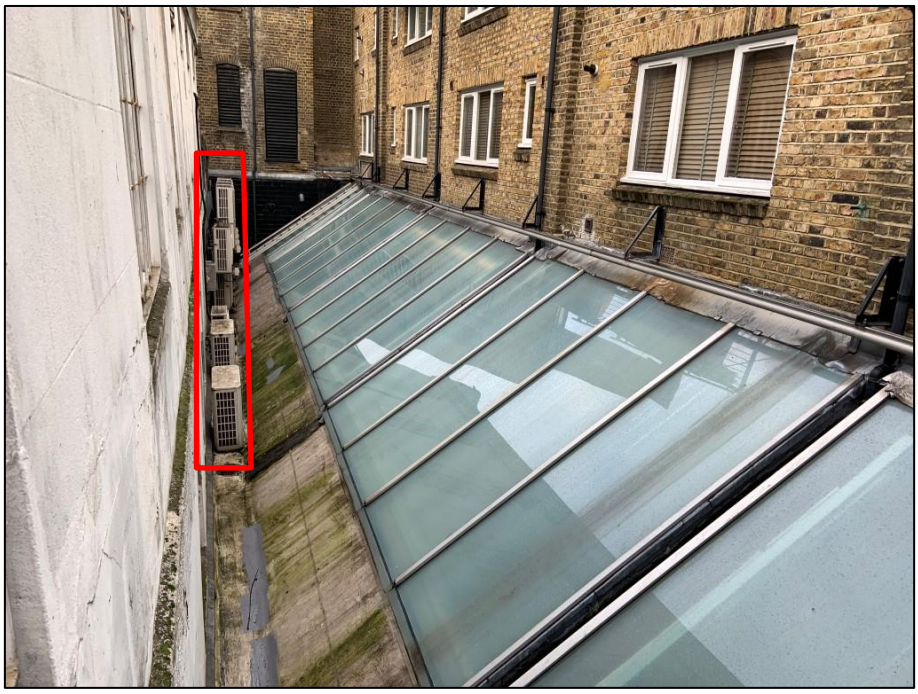


Figure 3 Existing outdoor air-conditioning units located on 24 West Street rear facade to be removed/replaced

Figure 4 Existing outdoor air-conditioning units located on 24 West Street south gable wall to be removed/replaced

4 Building services noise egress criteria

4.1 Standard guidance

BS 4142:2014:+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS 4142) provides a method for assessing noise from items such as building services plant against the existing background sound levels at nearby noise-sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

4.2 Local Authority criteria

Camden local plan 2017, policy A4 noise and vibration, states that '…The Council will seek to ensure that noise and vibration is controlled and managed. Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3)…' and '…We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development…'

Appendix 3 of Camden local plan 2017 set out following:

> *"For '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).'*
>
> *'…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.'*
>
> *'There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection.*

In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted $L_{eq,5mins}$ noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area."

5 Noise survey method

The survey included unattended noise measurements.

5.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 4 days.

Details of the equipment used and the noise indices measured are provided in Appendix A.

The unattended measurements were taken over 15-minute periods between 11:30 on 13 March 2020 and 12:30 on 17 March 2020. The equipment was installed by Mason Ford and Yale Sherlock and collected by John Sails and Yale Sherlock.

The measurement position used during the survey is indicated in Figure 1, denoted by the letter 'L1'. A photograph showing the measurement location is provided in Figure 5. This location was chosen to be reasonably representative of noise levels above the area of the lightwell and outside the worst-affected noise-sensitive premises.

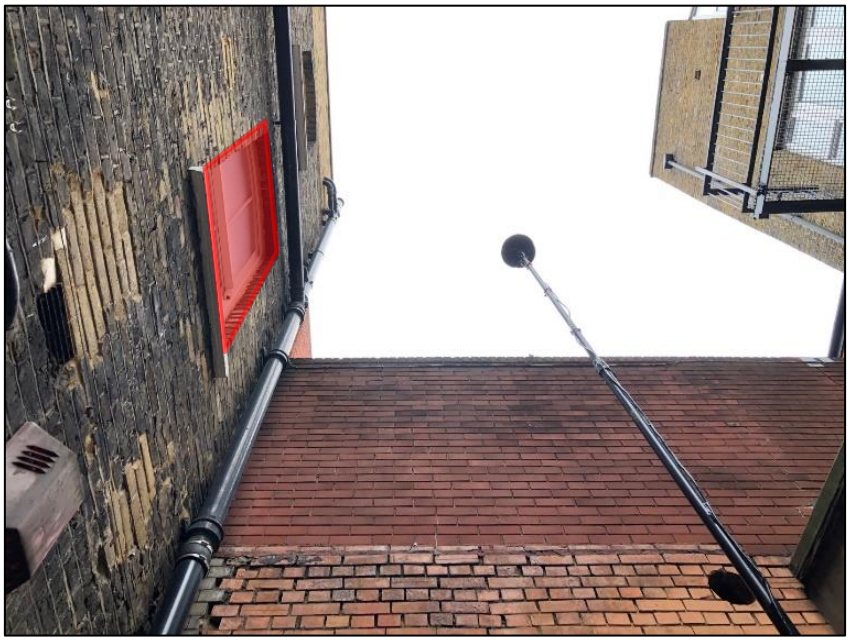


Figure 5 Photograph showing measurement Location 'L1', nearest noise-sensitive window highlighted in red

5.2 Weather conditions

Weather conditions during the survey are described in Appendix A.

6 Noise survey results

6.1 Observations

The dominant noise sources observed at the site during the survey was plant noise from the existing outdoor air-conditioning units located in the lightwell.

Less significant noise sources included road traffic on Shaftesbury Avenue and aircraft traffic.

6.2 Unattended measurement results

A graph showing the results of the unattended measurements is provided in Appendix B.

Day and night-time ambient noise levels measured during the unattended survey are presented in Table 1.

Table 1 Ambient noise levels measured during the unattended survey

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Friday 13 March 2020	-[1]	50
Saturday 14 March 2020	53	49
Sunday 15 March 2020	51	49
Monday 16 March 2020	56	50
Average	53	49

[1] Measurement not made over full period due to monitoring start and end time; hence not included in the average.

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Daytime and night time statistical analysis of representative values for the site are given in Figure 6 and Figure 7.

From this analysis, the representative background sound levels measured during the survey were $L_{A90,15min}$ 57 dB during the daytime and $L_{A90,15min}$ 48 dB at night.

With reference to the results graph included in Appendix B, it is clear that background noise levels were dominated by the exiting plant during the workday (Friday 13 March and Monday 16 March 2020) and the representative background noise level during those periods agrees with $L_{A90,15min}$ 57 dB.

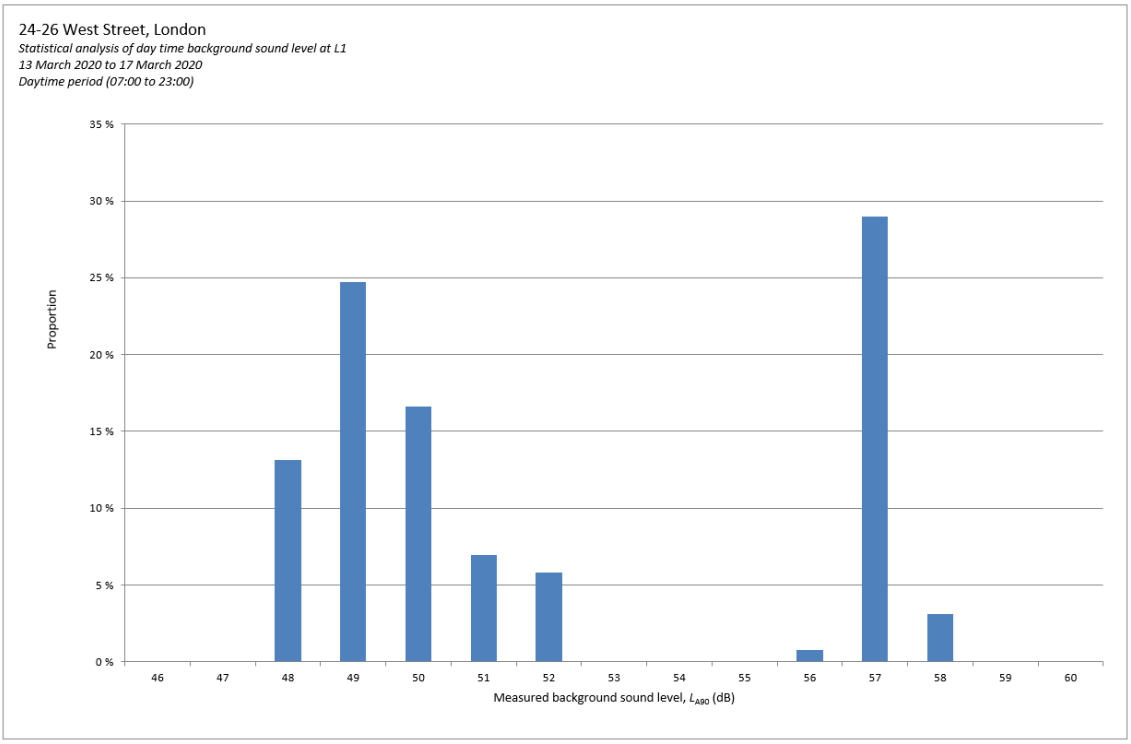


Figure 6 Daytime statistical analysis of representative values

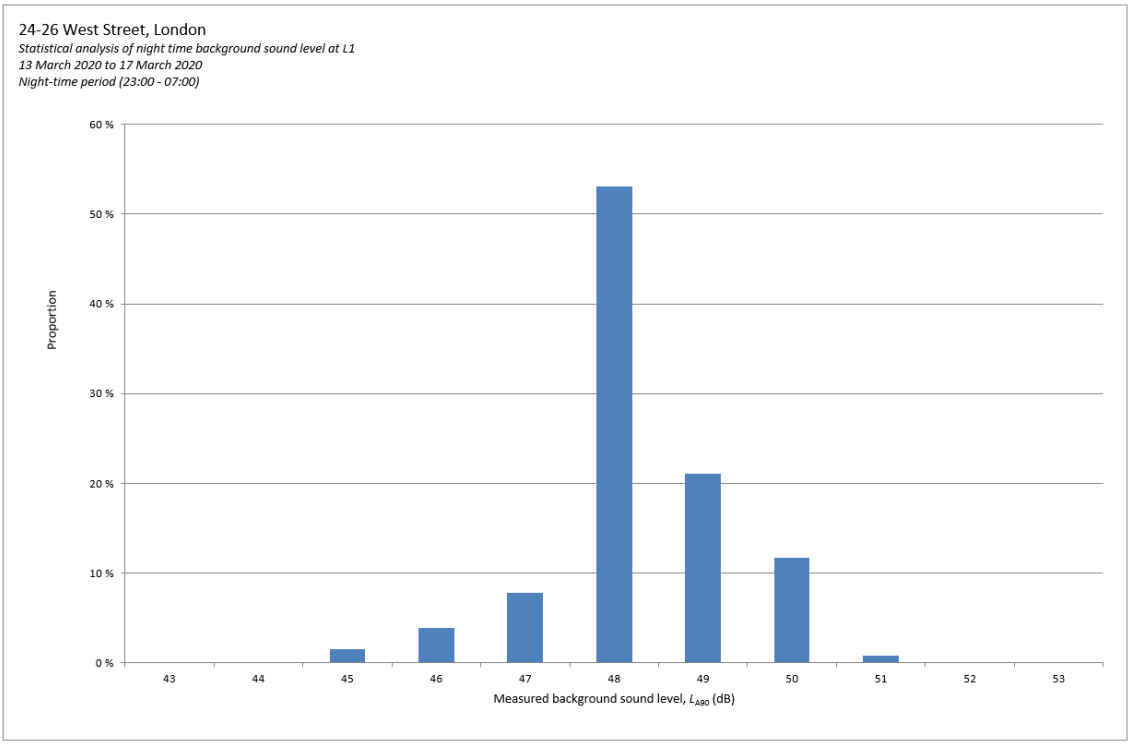


Figure 7 Night time statistical analysis of representative values

6.3 Basic limits

The existing daytime background noise levels are dominated by the outdoor air-conditioning units, which are to be replaced with the new single unit. In order not to increase the existing background noise level, the cumulative noise level from the operation of the replacement plant should not exceed the limits set out in Table 2. The limits apply at 1 m from the worst affected windows of the nearest noise-sensitive premises and are presented as facade levels.

Table 2 Plant noise limits at 1 m from the nearest noise-sensitive premises

Time of day	Maximum sound pressure level at 1 m from noise-sensitive premises, $L_{Aeq,15min}$ (dB)
Daytime (07:00-23:00)	57[1]
Night-time (23:00-07:00)	N/A[2]

[1] The limits set out in Table 2 do not include any attention catching features. Penalty corrections for attention catching features may be significant and will need to be considered as the building services design progresses. This is discussed in Appendix C.

[2] Proposed plant will not operate during this time period.

7 Plant noise assessment

The new air-conditioning unit is proposed to be located at basement level of the lightwell within 26 West Street, as indicated in Figure 8.

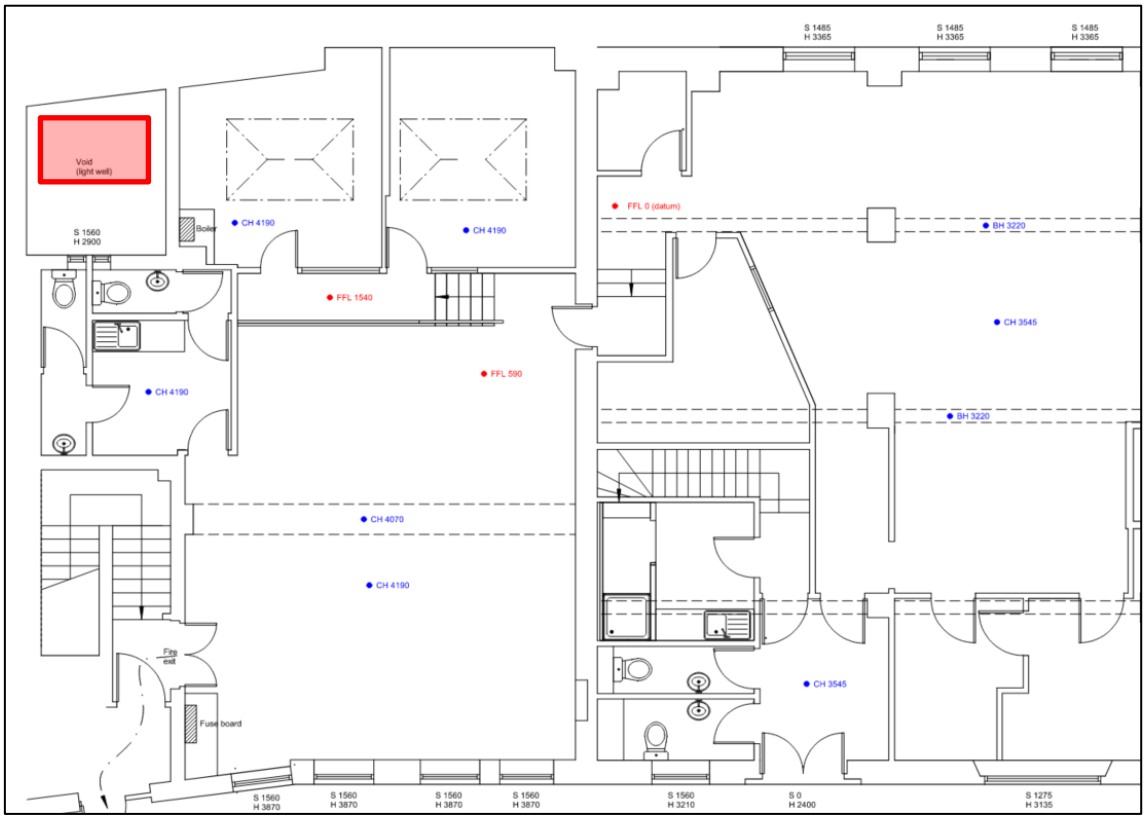


Figure 8 Basement level plan indicating proposed condenser location (lightwell), courtesy of EMP Chartered Surveyors

7.1.1 Plant sound levels

Table 3 lists the sound pressure levels for the air conditioning unit.

Table 3 Plant noise data: sound pressure level

Item	Model	Mode	Sound pressure level [1]
Air conditioning unit	Mitsubishi PURY-P900YSNW	Standard	69 dBA
		Low-noise	56 dBA
Attenuation package	Mitsubishi acoustic kit		-8 dBA

[1] The sound pressure level measured at 1 m, octave band noise data in Appendix D

7.1.2 Noise prediction at nearest noise-sensitive receptor

Noise egress from the unit to a point 1 m from the worst-affected noise-sensitive windows has been calculated, taking into account distance attenuation and reflections off the surrounding surfaces. The predicted noise levels are summarised in Table 4.

Table 4 Predicted noise egress

Plant operation	Sound pressure level 1 m from windows
Standard	L_{Aeq} 64 dB
Low-noise mode	L_{Aeq} 51 dB
Standard (with attenuation package[1])	L_{Aeq} 56 dB
Low-noise (with attenuation package[1])	L_{Aeq} 43 dB

[1] Attenuation package details in Appendix D

In order to meet the noise criterion at the receptor of L_{Aeq} 57 dB, it will be necessary to operate the new unit with the low-noise mode engaged permanently, or alternatively, with the normal mode engaged but with the attenuation package installed.

8 Conclusion

The representative background sound levels from the noise survey were $L_{A90,15min}$ 57 dB during the working day, and $L_{A90,15min}$ 48 dB during the night.

The relevant noise limit for the replacement plant item at the worst affected existing noise-sensitive premises is $L_{Aeq,16h}$ 57 dB during the day, the plant will not operate at night.

If the new plant item contains tonal or attention catching features, the limit will be more stringent than that set out above. If the plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied.

An initial assessment of the proposed plant item associated with the refurbishment has been carried out. As long as the recommended mitigation measures are incorporated within the design, the proposed plant item is expected to comply with the relevant noise limits.

Appendix A

Survey details

Equipment

The unattended noise measurements were taken using a Rion NL-32 sound level meter.

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-32/00423756	Rion	20 Nov 20	TCRT18/1923
Microphone	UC-53A/319228	Rion	20 Nov 20	TCRT18/1923
Pre-amp	NH-21/36631	Rion	20 Nov 20	TCRT18/1923
Calibrator	NC-74/34625670	Rion	20 Nov 20	TCRT18/1922

Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meter used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{ASmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a slow time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures.*

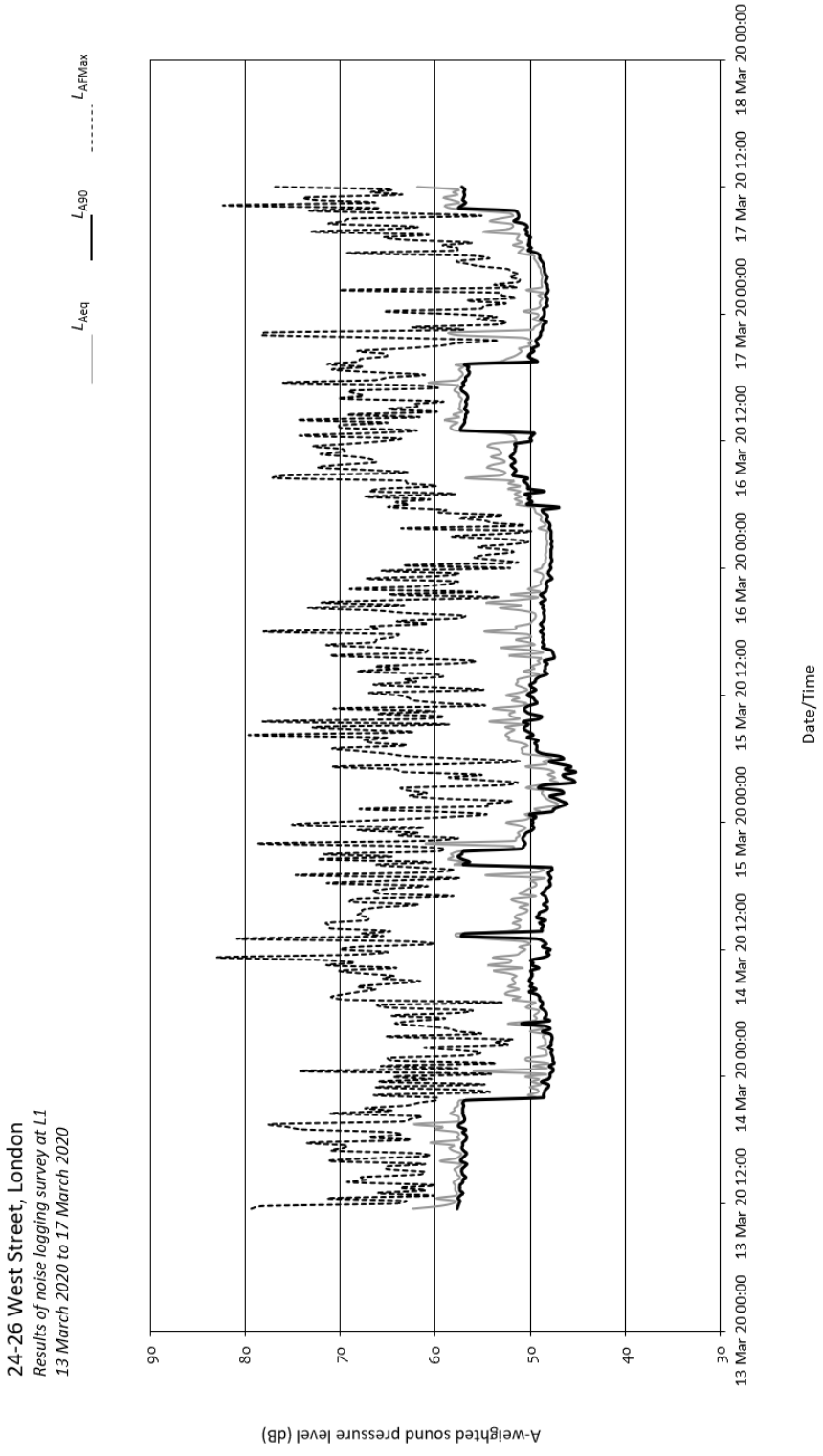
Weather conditions

During the unattended noise measurements, weather reports for the area indicated that conditions were dry, temperatures varied between 6°C at night and 14°C during the day, and the wind speed was less than 8.3 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements at Location ‘L1’


24-26 West Street, London
Results of noise logging survey at L1
13 March 2020 to 17 March 2020
L_{Aeq}
L_{A90}
L_{AFMax}
A-weighted sound pressure level (dB)
90
80
70
60
50
40
30
13 Mar 20 00:00
13 Mar 20 12:00
14 Mar 20 00:00
14 Mar 20 12:00
15 Mar 20 00:00
15 Mar 20 12:00
16 Mar 20 00:00
16 Mar 20 12:00
17 Mar 20 00:00
17 Mar 20 12:00
18 Mar 20 00:00
Date/Time

Appendix C

BS 4142 corrections for attention catching features

The following applies where plant noise is assessed in accordance with BS 4142:2014+A1:2019.

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), penalty corrections should be applied based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible.

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible.

For noise which is equally both impulsive and tonal, then both features can be accounted for by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment of tonality is not appropriate, an objective assessment can be made by analysis of time-averaged, third-octave band sound pressure levels. A noise source is deemed to be tonal if the level in a third-octave band exceeds the level in adjacent third-octave bands by the level differences given below:

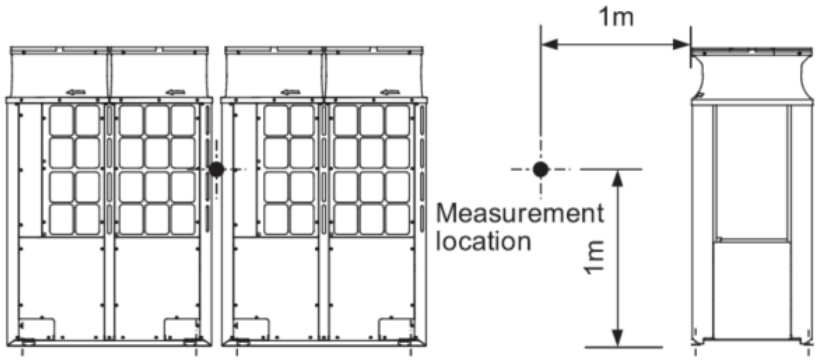
- 15 dB in the low frequency third-octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency third-octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency third-octave bands (500 Hz to 10000 Hz).

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

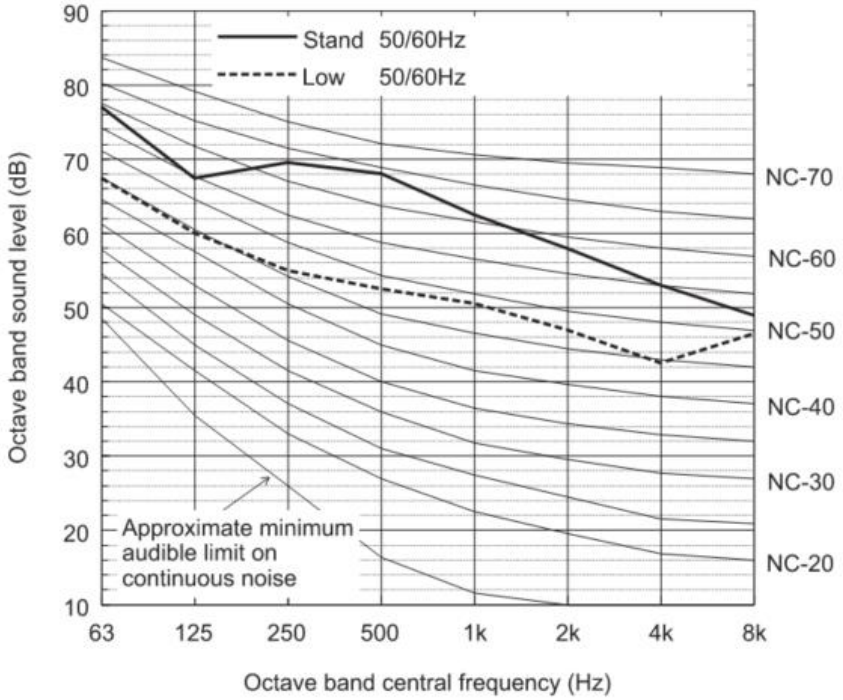
Appendix D

Plant noise data and attenuation package

Measurement condition
PURY-P700, 750, 800, 850, 900YSNW-A(-BS)



Sound level of PURY-P900YSNW-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	77.0	67.5	69.5	68.0	62.5	58.0	53.0	49.0	68.5
Low noise mode	50/60Hz	67.5	60.0	55.0	52.5	50.5	47.0	42.5	46.5	56.0

When Low noise mode is set,the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

Air Conditioning

Product Information

Acoustic Kits

PUHY and PURY series units (YJM)

Making a World of Difference

A range of Acoustic Kits designed for noise reduction. An industry first, these kits offer up to an 8dBA noise level reduction from standard.

Key Features

- Up to 8dBA noise reduction
- Manufacturer approved
- From £607 to £2326*1

*1 May vary slightly depending on application and size of order
*2 Colour for representation only, real colour is matched to standard outdoor unit colour (off white)

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

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Air Conditioning

Product Information

Acoustic Kits

PUHY and PURY series units (YJM)

Making a World of Difference

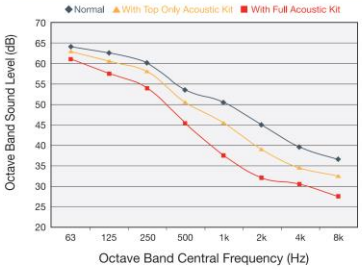
TYPES OF KIT

Both a 'full kit' and 'top only' kit are available. The 'full kit' comprises left, right and back louvres with a top attenuator. The 'top only' has a top attenuator only.

If space is an issue, then the 'top only' kit is available which can still reduce the noise level by up to 4dBA.

The noise level is calculated from an average of the noise at a height of 1m and distance of 1m from the front, back, left, right and 1m above the top. All noise measurements are performed in an anechoic chamber.

PURY-EP200YJM-A ACOUSTIC NOISE LEVEL DATA*



* Indication only

SUPPLY AND/OR INSTALLATION

Please contact Ambient Acoustics directly for supply and installation costs.

Installation costs will vary depending on location and number of units to be fitted with acoustic kits.

Ambient Acoustics Ltd
PO Box 1585, Wedmore, Somerset, BS28 4WZ
Tel: 01934 712802
Fax: 01934 710420
Email: sales@ambientacoustics.co.uk

Ambient Acoustics is an independent supplier of acoustic attenuation products, all warranties and liabilities rest with Ambient Acoustics Ltd. The acoustic attenuation kits have been tested and approved by Mitsubishi Electric UK.

BASIC ACOUSTIC KIT COSTS

S-module L-module XL-module

For all PUHY and PURY Series (YJM)

3 models are available, small, large and extra large. Small fits on the S-module outdoor units, large fits on the L-module outdoor units and extra large on the XL-module outdoor units.

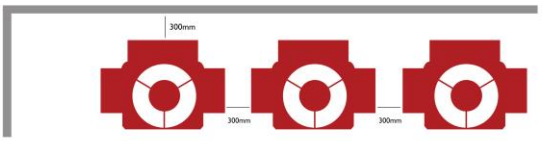
S-module	Complete acoustic kit target price Top attenuator only target price	£1452 £607
L-module	Complete acoustic kit target price Top attenuator only target price	£1585 £648
XL-module	Complete acoustic kit target price Top attenuator only target price	£2326 £1102

All costs include delivery.

INSTALLATION

Due to the wrap around coil of the YJM, the louvres are attached to 3 sides of the unit. Therefore, when installing multiple module systems, a 300mm gap between each louvre is required.

See diagram below.



1 full kit per outdoor unit is required, unless specifying top attenuator only. In this case, space units as normal.

MITSUBISHI ELECTRIC
Changes for the Better

Telephone: 01707 282880
email: airconditioning@meuk.mee.com web: www.mitsubishielectric.co.uk/aircon

UNITED KINGDOM Mitsubishi Electric Europe Living Environmental Systems Division
Travellers Lane, Hatfield, Hertfordshire, AL10 8XB, England General Enquiries Telephone: 01707 282880 Fax: 01707 278881
IRELAND Mitsubishi Electric Europe Westgate Business Park, Ballymount, Dublin 24, Ireland
Telephone: Dublin (01) 419 8800 Fax: Dublin (01) 419 8890 International code: (003531)

Green Gateway
www.greengateway.mitsubishielectric.co.uk
Mitsubishi Electric's commitment to the environment