

**Proposed Installation of
Mechanical Plant**

**160-161 Drury Lane,
London, WC2B 5PN**

Environmental Noise Assessment



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Proposed Installation of Mechanical Plant	
Project Address:	160-161 Drury Lane, London WC2B 5PN
Project Reference:	104432

Issue/Revision Record			
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Author:		Phil Huffer	Principal Consultant	03/05/2023
Reviewer:		Andy Dodd	Senior Consultant	03/05/2023

1. INTRODUCTION

- 1.1 Acoustics Plus Ltd (APL) is an independent firm of multi-disciplinary acoustic engineers. APL is engaged by both private and public sector clients. APL is a registered member of The Association of Noise Consultants (ANC) and the author is a corporate member of The Institute of Acoustics (IOA).
- 1.2 APL has been instructed by the applicant MCALEER & RUSHE CONTRACTS UK LIMITED, to consider and advise upon the noise implications of a proposed installation of mechanical plant.
- 1.3 It is understood that it is the intention to install a new climate control system which will consist of a number of roof mounted condenser units.
- 1.4 It is understood the London Borough of Camden (LBC) require further information on noise levels from the proposed installation in order to fully assess the noise impact upon the surrounding neighbourhood. This report provides the response to the LBC, on behalf of the Applicant.
- 1.5 This report has been prepared by Acoustics Plus Limited (APL) with all reasonable skill, care, and diligence in accordance with generally accepted acoustic consultancy principles and taking account the services and terms agreed between APL and our client.
- 1.6 Any information provided by third-parties and referred to herein may not have been checked or verified by APL unless expressly stated otherwise. Certain statements made in the report are predictions based on reasonable assumptions and good industry practice.
- 1.7 Such statements involve risk and uncertainty which could cause measured and predicted results to differ materially. APL does therefore not guarantee or warrant any prediction contained in this report.

2. BASELINE SITUATION

- 2.1 The Application Site (the “site”) is situated at 160-161 Drury Lane, London, WC2B. A site location plan is shown in Diagram 1.

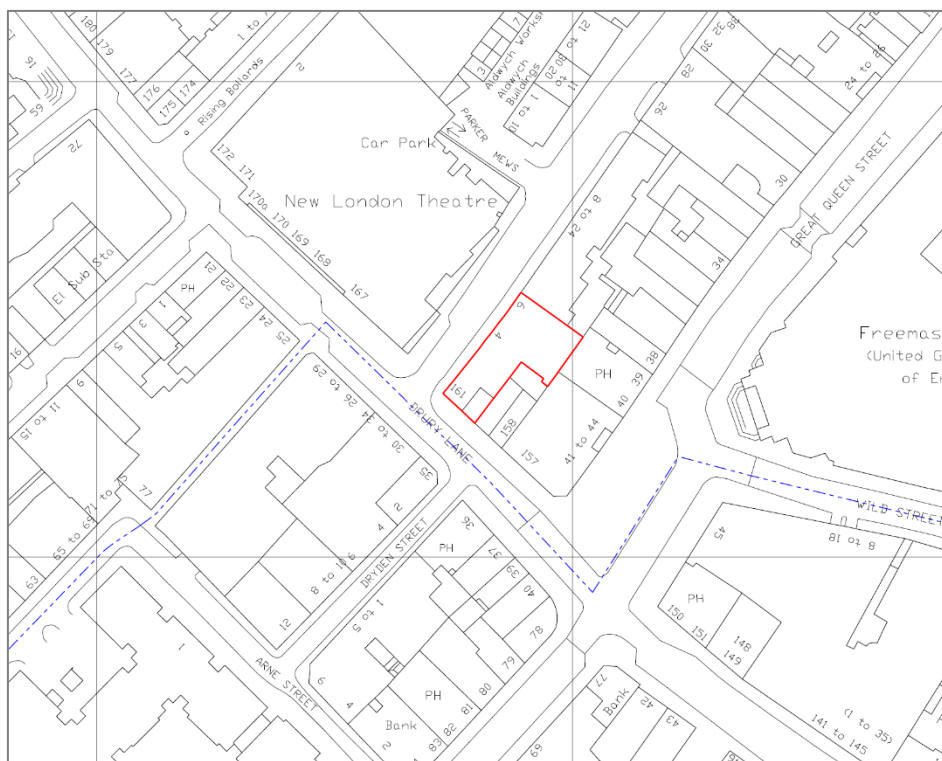


Diagram 1

- 2.2 The site is an existing office building arranged over lower ground, ground and four upper storeys. The lightwell at the rear of the building and roof level is shown in Figures 1 to 32 attached. It is noted that there is a large amount of plant in the lightwell at the rear of the building (not related to the application site) which includes condenser units, air handling units and extraction ducts.
- 2.3 It is the proposal to refurbish and develop the site which will include the addition of a 5th floor level. As part of the proposed development, a new climate control system will be installed which will require the installation of 9No. external condenser units (and the removal of the existing plant). The units will be arranged on the rear 1st floor roof and within an open topped plant enclosure at main roof level. The proposed arrangements can be seen in Diagram 2 and 3.

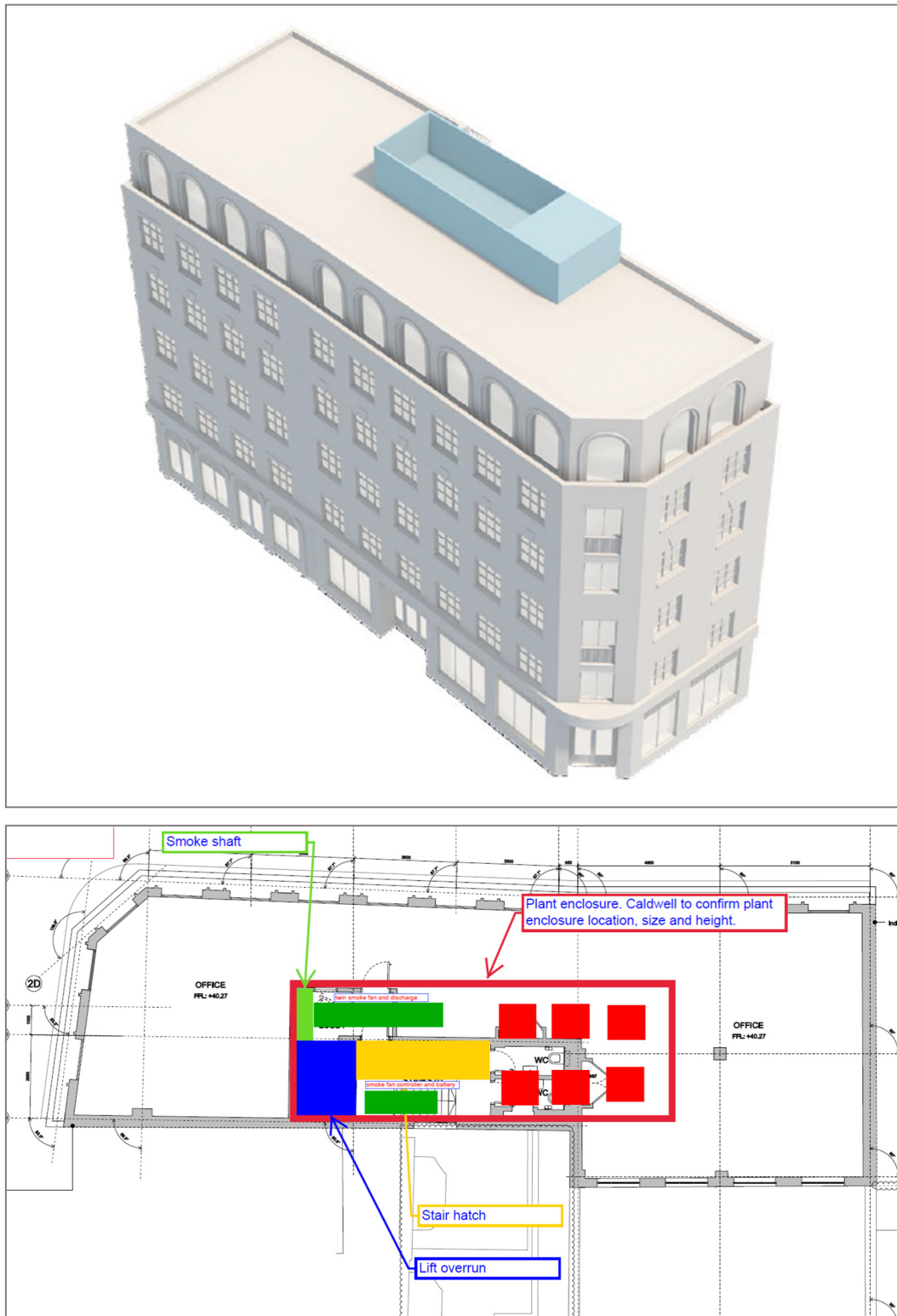


Diagram 2

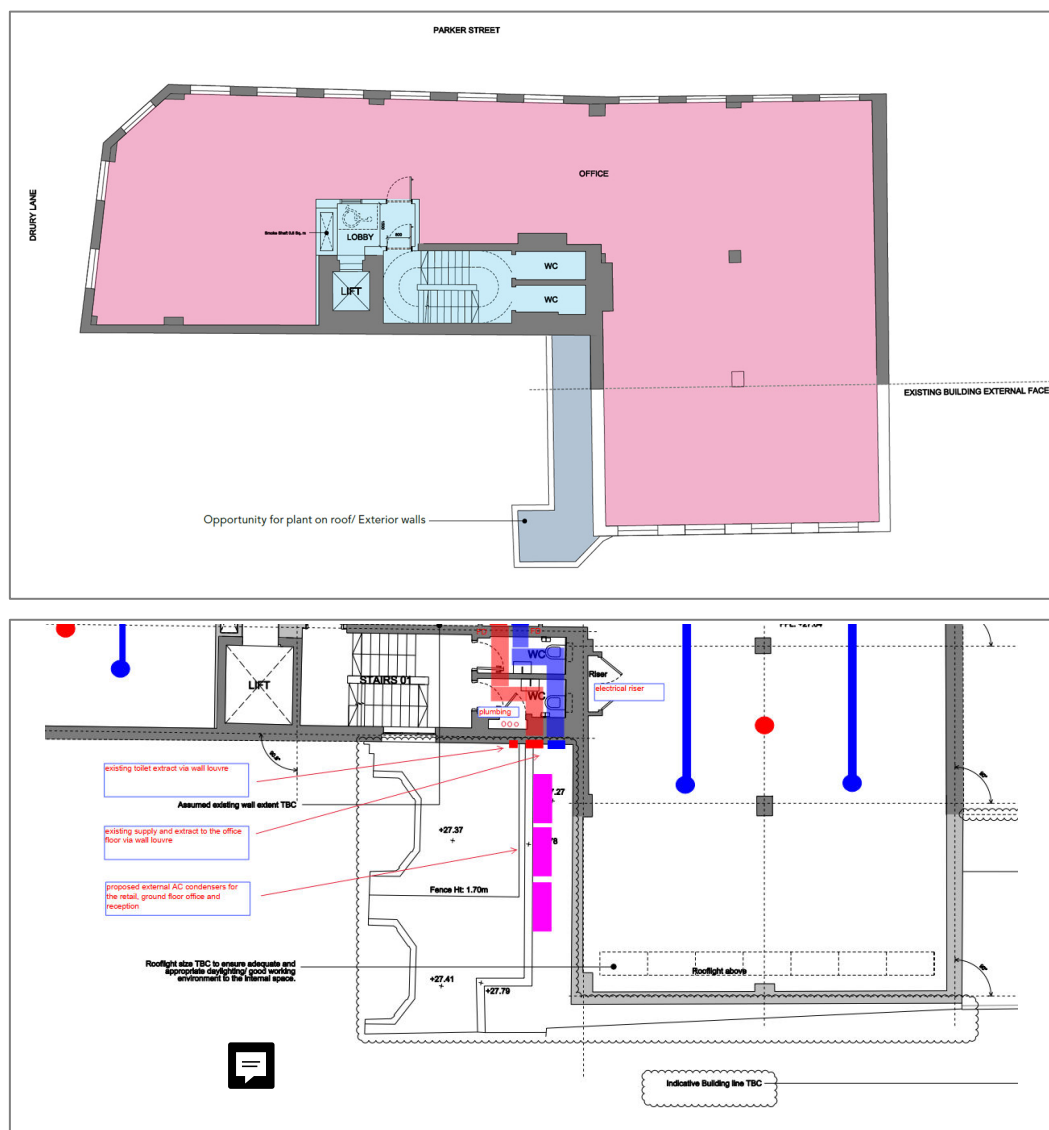


Diagram 3

2.4 The proposed equipment schedule together with advised operational hours is detailed in Table 1 and 2 below.

1 st floor terrace	Make & Model No.	Operational hours
Ground floor retail	Mitsubishi PUMY-P112YKM	09:00-22:00hrs
Ground floor office	Mitsubishi PUMY-P112YKM	07:00-21:00hrs
Ground floor reception	Mitsubishi PUMY-P112YKM	07:00-21:00hrs

Table 1

Upper 5 th floor level plantroom	Make & Model No.	Operational hours
First floor office	Mitsubishi PURY-EM200YNW	07:00-21:00hrs
Second floor office	Mitsubishi PURY-EM200YNW	07:00-21:00hrs
Third floor office	Mitsubishi PURY-EM200YNW	07:00-21:00hrs
Fourth floor office	Mitsubishi PURY-EM200YNW	07:00-21:00hrs
Fifth floor office	Mitsubishi PURY-EM200YNW	07:00-21:00hrs
Hot water	Mitsubishi PURY-EM200YNW	07:00-21:00hrs

Table 2

- 2.5 It is anticipated that the nearest noise sensitive façade to the 1st floor roof terrace is located as shown in Diagram 4 below. These façades are exposed to significant air handling noise from the installation shown in Diagram 5.



Diagram 4



Diagram 5

- 2.6 The nearest noise sensitive façades are the rear upper levels of properties located on Great Queen Street and Parker Street, notably 39 & 40 Great Queen Street and 8-24 Parker Street. These façades will be located circa 10m from condensers located on the 1st floor roof terrace.

- 2.7 It is anticipated that the nearest noise sensitive façade to the 5th floor plant room is located as shown in Diagram 6 below. These are upper floor windows of properties on both Great Queen Street and Drury Lane. These façades are also exposed (although to a lesser degree) to air handling noise from the installation shown in Diagram 5.



Diagram 6

- 2.8 The nearest noise sensitive façades are located circa 14m from the condensers proposed to be contained within the 5th floor plantroom.

3. NOISE OUTLINE

- 3.1 In order to produce an environmental noise assessment, consideration must be given to the prevailing background noise in the locality of the installation.
- 3.2 Measurements of background noise were obtained over a 48 hour period at a location deemed representative of background noise levels experienced at the nearest noise sensitive façades. The measurements obtained during the exercise were obtained at roof level to minimise the impact of adjacent plant noise.
- 3.3 As the building is largely unoccupied, the influence from roof mounted plant (highlighted below) was considered to be insignificant.

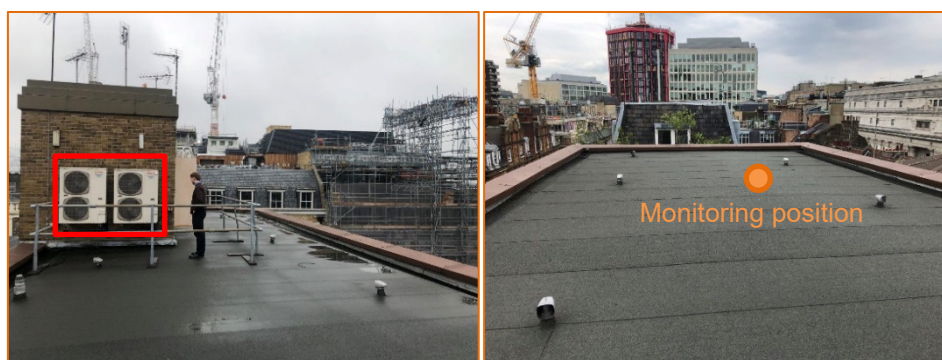
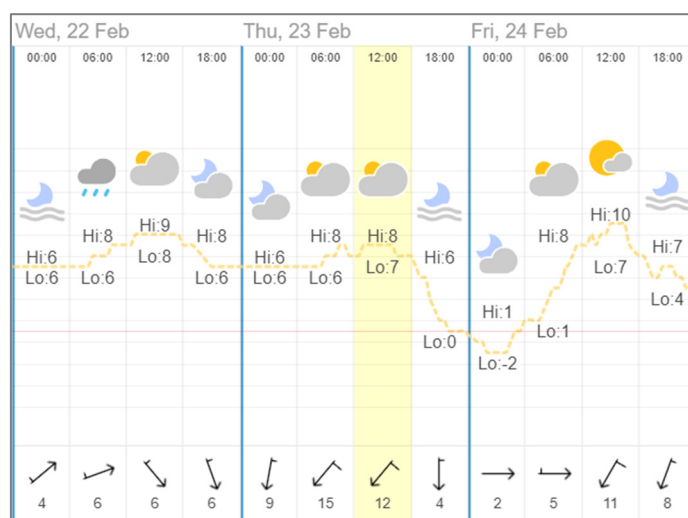


Diagram 7

- 3.4 The particulars of the measurement exercise are recorded below:

Date: 22nd – 24th February 2023
Start Time: 11:15 hrs
Location: Roof level, 160-161 Drury Lane
Weather: appropriate to monitor environmental noise



- 3.5 Minimum background and average noise levels obtained at the roof level are shown in Table 3 below with the full level vs time history shown in Diagram 8 (L_{Aeq} and L_{A90}).

Measurements obtained at roof level		
Time period	Lowest $L_{A90,15min}$	Average $L_{Aeq,T}$
07:00-23:00hrs	46 dB	55 dB
23:00-07:00hrs	43 dB	48 dB

Table 3



Diagram 8

- 3.6 A previous measurement exercise undertaken in July 2018 indicated that the ambient noise levels around the first floor terrace are a little higher than at roof level. On this basis, the roof level ambient noise will be used to determine the noise emission criteria, ensuring that the worst case scenario is considered.

4. DESIGN CRITERIA

- 4.1 Information regarding the noise levels not to be exceeded by the proposed installation was extracted from the London Borough of Camden's Local Plan Policy A4 adopted 3 July 2017 (Appendix 3 Noise thresholds). Please see extract below:

"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 57dB L _{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L _{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dB L _{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 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."

4.2 The procedure contained in BS4142 is to quantify the “specific sound level”, which is the measured or predicted level of sound from the source in question over a one-hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.

4.3 The specific sound level is converted to a rating level by adding penalties to account for either tonality or impulsivity. The standard sets out objective methods for determining the presence of tones or impulsive elements but notes that it is acceptable to subjectively determine these effects.

4.4 The penalty for tonal elements is between 0dB and 6dB, and the standard notes:

“Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.”

4.5 The penalty for impulsive elements is between 0dB and 9dB, and the standard notes:

“Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.”

4.6 The background sound level should be established in terms of the LA90 noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. This should not normally be less than 15-minute intervals. The standard states that:

“A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value.”

4.7 The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

*a) Typically, the greater this difference, the greater the magnitude of the impact.
b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
c) A difference of around +5 dB 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.
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.”*

4.8 The standard goes on to note that:

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

- 4.9 In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

“An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.”

- 4.10 The background noise levels were assessed using statistical analysis of the measured data, as directed in BS4142. The histogram for the operational hours of the proposed plant can be seen in Diagram 10.

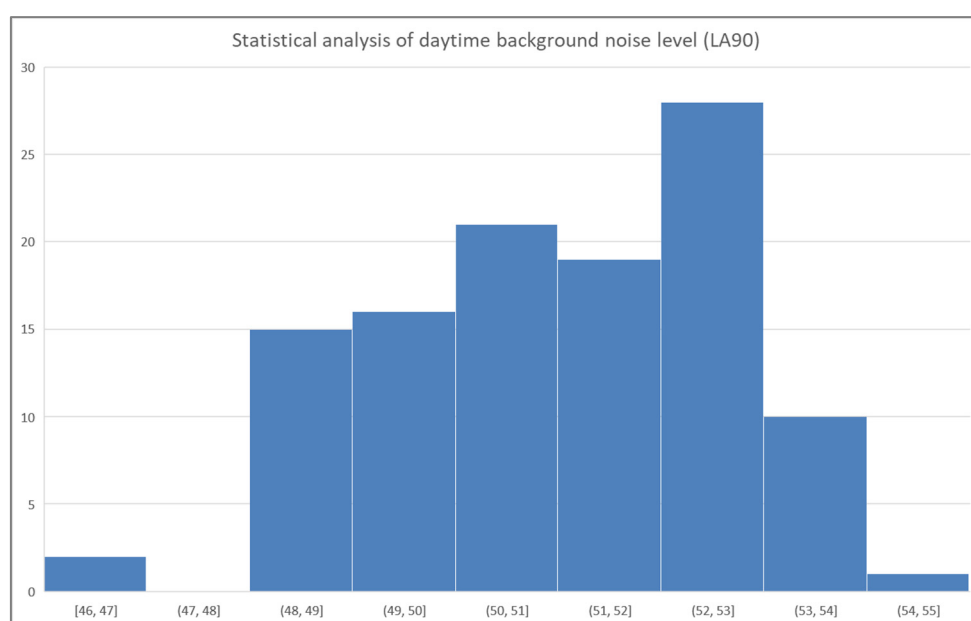


Diagram 10

- 4.11 In this instance the most commonly occurring daytime background noise level was 6dB higher than the lowest background noise level. In the context in which the sound occurs, 52dB $L_{A90,15min}$ is considered as representative for daytime levels at roof level.
- 4.12 The plant noise emission criteria that should not be exceeded is therefore based on the statistical analysis and is shown in Table 4 below. This level should not be exceeded at the nearest noise sensitive façade and is representative of the LOAEL value.

Noise emission limit for mechanical plant
Daytime limit for 6 th floor plantroom
L_{Aeq} 42dB

Table 4

- 4.13 The noise level of the considered mechanical plant that is to be installed within the 5th floor roof plant room and 1st floor terrace area was established from the data sheets provided (Appendix A) as follows:

Plant item	Make & Model No.	Noise level
Condenser unit	Mitsubishi PUMY-P112YKM	51dBA @ 1m
Condenser unit	Mitsubishi PURY-EM200YNW	59dBA @ 1m

Table 5

- 4.14 The octave band sound levels of the units (see Appendix A) do not indicate any tonal component. As the units are inverter driven, the units should not exhibit a marked onset of noise when the units turn on. Therefore, it is considered that no corrections are necessary for tonality or impulsivity.

5. EQUIPMENT

- 5.1 All measurements were obtained using the following equipment:
- NTi XL2 Sound Level Meter Class 1 Serial No. A2A-14612-E0
 - Rion Calibrator Type NC-74 Class 1 Serial No. 00410215
- 5.2 The relevant equipment carries full and current traceable calibration. The equipment, where necessary, was calibrated prior to and after the measurements were carried out.

6. NOISE IMPACT OF PLANT

6.1 In order to predict the noise impact of the proposed installation of plant, consideration has been given to the following impacts:

- a) Noise egress from 5th floor plantroom;
- b) Noise egress from 1st floor terrace;

6.2 Where necessary, mitigation measures have been incorporated into the calculation exercise to ensure that compliance with the LBC criteria is obtained. These mitigation measures are identified separately in the body of the report and are an essential requirement in meeting the LBC criteria.

6.3 The calculation exercise utilised information provided by Caldwell Consulting (copy of the data sheets is provided in Appendix A).

6.4 In order to predict the noise impact of the condenser units, consideration has been given to noise egress from the condenser units to the nearest noise sensitive façades. It has been assumed that the condenser units will only be operational during the period 07:00-23:00hrs.

6.5 A correction for reflecting planes was accounted for in the calculation exercise. A further correction to account for building edge diffraction was also considered. This was extracted from the Department of Energy and Climate Change Planning Standard MCS020. The planning standard MCS020 states the following (Note 5):

*“Note 5: Barriers between the heat pump and the assessment position (STEP 5)
A correction should be made for attenuation due to barriers between the air source heat pump and an assessment position. A correction will be necessary if an installer is unable to see an assessment position from the top edge of the air source heat pump. Use the following instructions to determine whether a correction is appropriate:*

- For a solid barrier (e.g. a brick wall or a fence) that completely obscures an installer's vision of an assessment position from the top edge of the air source heat pump attenuation of -10 dB may be assumed.*
- Where a solid barrier completely obscures an installer's vision of an assessment position from the top or side edges of the air source heat pump, but moving a maximum distance of 25 cm in any direction to the air source heat pump allows an assessment position to be seen, attenuation of -5 dB may be assumed.*
- If it is possible for an installer to see any part of an assessment position from the top or side edges of the air source heat pump no attenuation may be assumed. “*

6.1 The following acoustic feature corrections were used to determine a rating level:

Results	Penalty	Relevant clause	Commentary
Acoustic feature corrections BS4142	+3dB	9.2	Other acoustic characteristics

Table 6

- 6.2 The noise impact assessment of the proposed installation is shown in Table 7 and 8.

5 th floor plantroom	Noise impact calculation
Mitsubishi PURY-EM200YNW	59dBA @ 1m
6No. Mitsubishi PURY-EM200YNW	67dBA @ 1m
Distance attenuation	-23dB
BS4142 Acoustic corrections	+3dB
Reflecting plane (x1)	+3dB
MCS020 screening	-10dB
Total Rated Level	40dBA
LPA requirement (based on daytime L _{A90})	≤42dB

Table 7

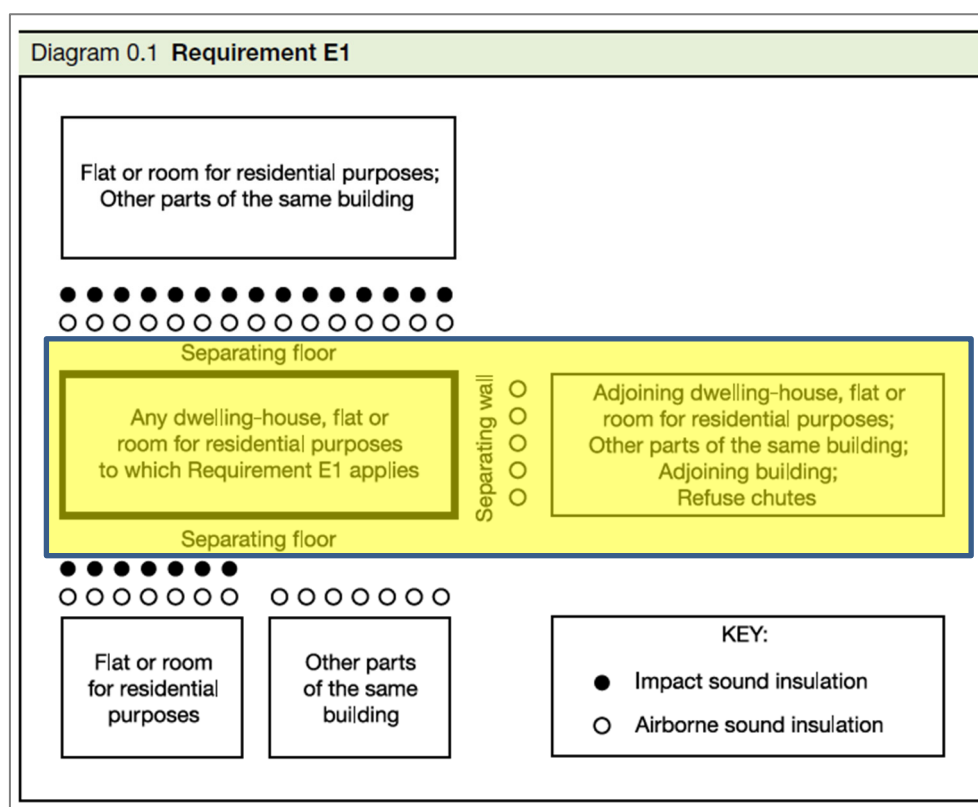
1 st floor terrace	Noise impact calculation
Mitsubishi PUMY-P112YKM	51dBA @ 1m
3No. Mitsubishi PUMY-P112YKM	56dBA @ 1m
Distance attenuation	-20dB
BS4142 Acoustic corrections	+3dB
Reflecting plane (x1)	+3dB
Total Rated Level	42dBA
LPA requirement (based on daytime L _{A90})	≤42dB

Table 8

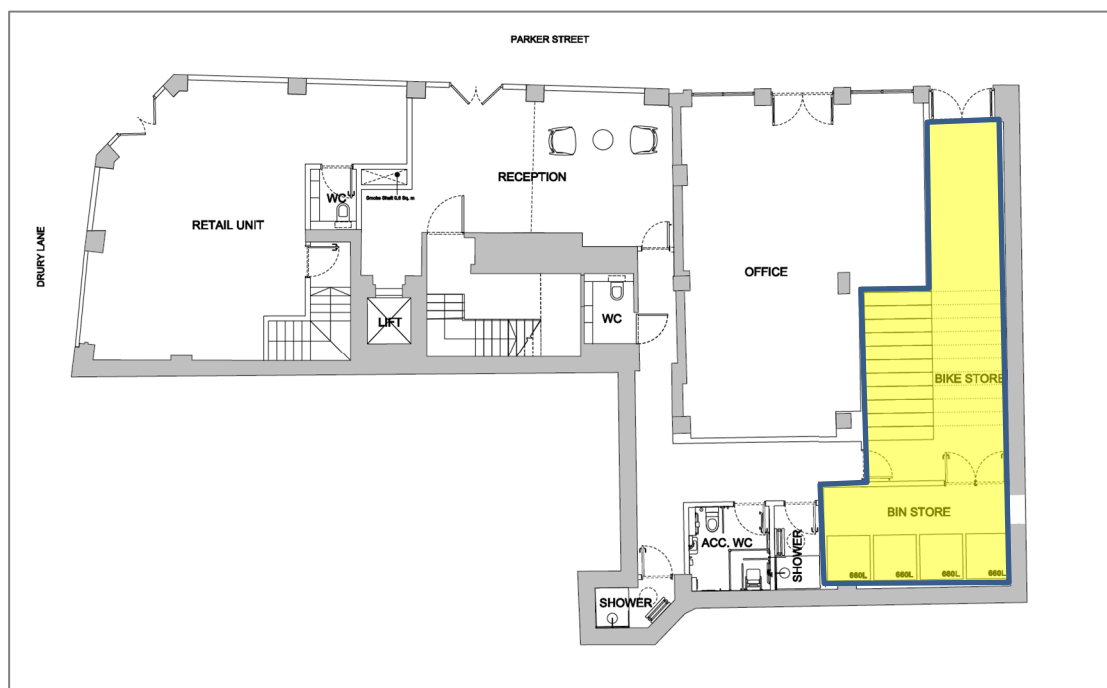
- 6.3 Any noise from the installation of the 5th floor plantroom enclosure that contains the external condenser units related to climate control of the offices should not exceed a level of 42dBA at the nearest noise sensitive façade.
- 6.4 Any noise from the installation of the 1st floor terrace external condenser units related to climate control of the retail unit, reception and ground floor office should not exceed a level of 42dBA at the nearest noise sensitive façade.
- 6.5 The calculation exercise (Tables 7 and 8) demonstrates that the plant noise impact meets Local Plan Policy A4 adopted 3 July 2017 (Appendix 3 Noise thresholds) as reproduced in para 4.1 above. The noise impact meets the LOAEL LPA criteria.

7. ADDITIONAL COMMENTS

- 7.1 It is understood that the residents of Market House are concerned with noise impacts from the servicing of waste and bicycles coming in and out of storage given the proposed location of the entrance to this part of the building (proposed on Great Parker Street).
- 7.2 Requirement E1 of Approved Document E of The Building Regulations requires that the wall separating any dwelling-house from an adjoining building (see diagram below) meets a minimum sound insulation value of $43\text{dB } D_{nT,w} + C_{tr}$.



- 7.3 It is further understood that the wall separating No.8 Market House from the adjacent commercial use is a cavity masonry wall. This will readily meet the minimum requirements of Approved Document E.
- 7.4 Notwithstanding the above, given the potential for structure-borne sound through the floor slab (e.g. from bicycles being placed on a bike rack or bin wheels across the floor), it is recommended that a resilient floor covering is used. This should be placed in the area identified in the plan overleaf:



- 7.5 In addition, consideration should be given to an acoustic wall lining along the full length of the separating wall to provide an enhanced level of sound insulation (over and above the requirements of the Building Regulations).

8. CONCLUSION

- 8.1 The foregoing assessment indicates that the proposed installation will meet the specific noise threshold requirements from Appendix 3 of Camden Council's Local Plan referenced in Policy A4. Further mitigation measures, other than those identified, will not be required. The mitigation measures that must be implemented are as follows:
- Building edge diffraction is provided by screening the line of sight between the condenser units and the adjacent residential façades. This will occur due to the positioning of the plantroom and mitigation provided by implementing considerate acoustic design
- 8.2 It should be noted that the proposed scheme will remove a number of existing units at both 1st floor level (in the lightwell) and at roof level which is likely to improve the existing amenity of adjacent noise sensitive occupiers.
- 8.3 A resilient floor covering should be provided in the bike/bin store area to minimise structure borne sounds egressing to the adjacent residential property at No.8 Market House. The existing cavity masonry wall together with the addition of an acoustic wall lining system will provide enhanced sound insulation well in excess of that required under the Building Regulations.

Figures

160-161 Drury Lane, London



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



Figure 7



Figure 8

160-161 Drury Lane, London



Figure 9



Figure 10



Figure 11



Figure 12



Figure 13



Figure 14



Figure 15



Figure 16

160-161 Drury Lane, London



Figure 17



Figure 18



Figure 19



Figure 20



Figure 21



Figure 22

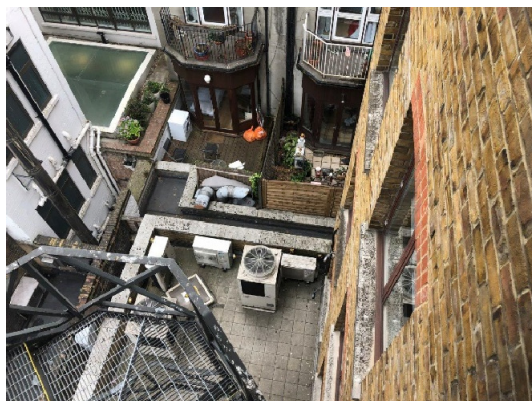


Figure 23

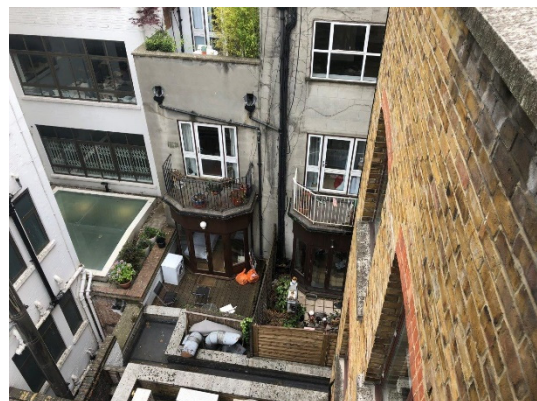


Figure 24

160-161 Drury Lane, London



Figure 25



Figure 26



Figure 27



Figure 28



Figure 29



Figure 30

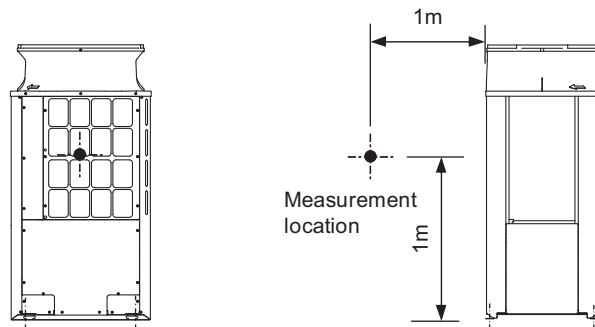
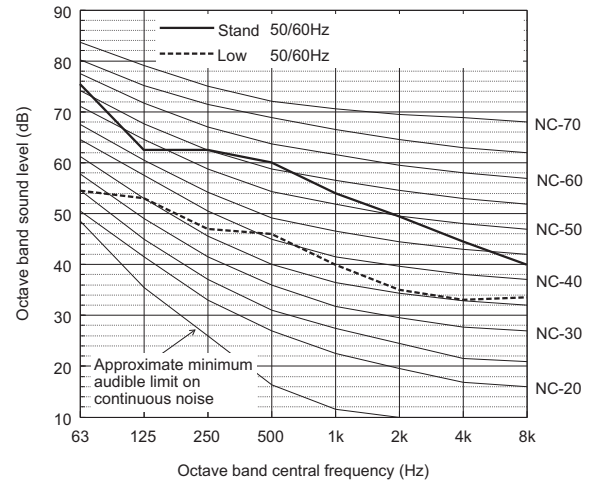


Figure 31



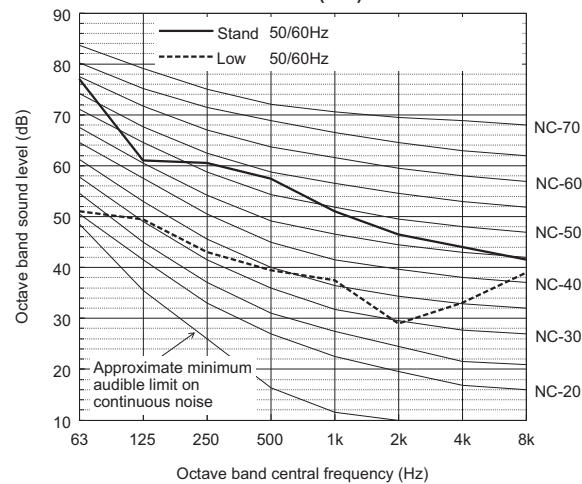
Figure 32

Appendix A

Measurement condition
PURY-EM200, 250, 300YNW-A(-BS)

Sound level of PURY-EM300YNW-A(-BS)


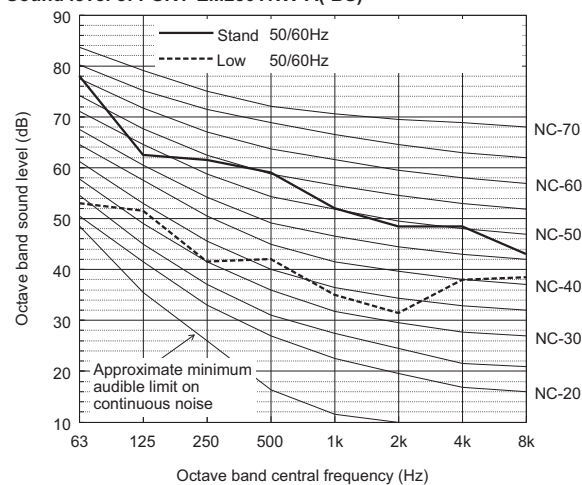
		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard Cooling	50/60Hz	75.5	62.5	62.5	60.0	54.0	49.5	44.5	40.0	61.0
Low noise mode	50/60Hz	54.5	53.0	47.0	46.0	40.0	35.0	33.0	33.5	47.0

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.

Sound level of PURY-EM200YNW-A(-BS)


		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	77.0	61.0	60.5	57.5	51.0	46.5	44.0	41.5	59.0
Low noise mode	50/60Hz	51.0	49.5	43.0	39.5	37.5	29.0	33.0	39.0	44.0

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.

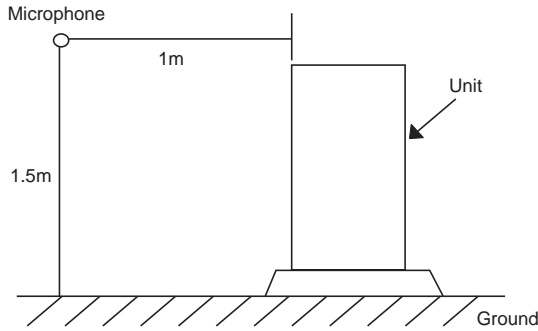
Sound level of PURY-EM250YNW-A(-BS)


		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	78.0	62.5	61.5	59.0	52.0	48.5	48.5	43.0	60.5
Low noise mode	50/60Hz	53.0	51.5	41.5	42.0	35.0	31.5	38.0	38.5	45.0

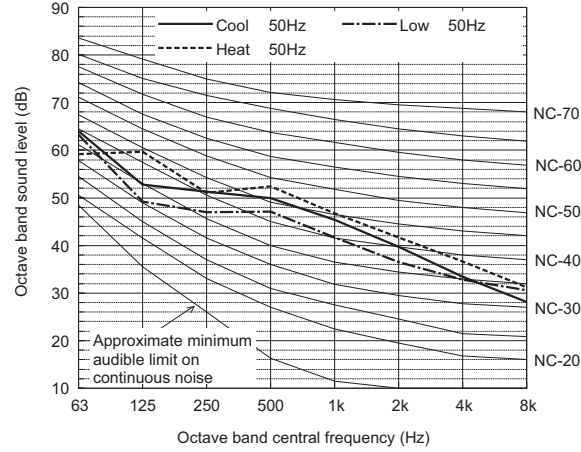
When Low noise mode is set, the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

- Depending on the operation conditions, the unit generates noise caused by valve actuation, refrigerant flow, and pressure changes when operating normally. Please consider to avoid location where quietness is required.
- For HBC controller, it is recommended to be installed in places such as ceilings of corridor, rest rooms and plant rooms.

Measurement condition
PUMY-P112, 125, 140VKM1
PUMY-P112, 125, 140YKM1



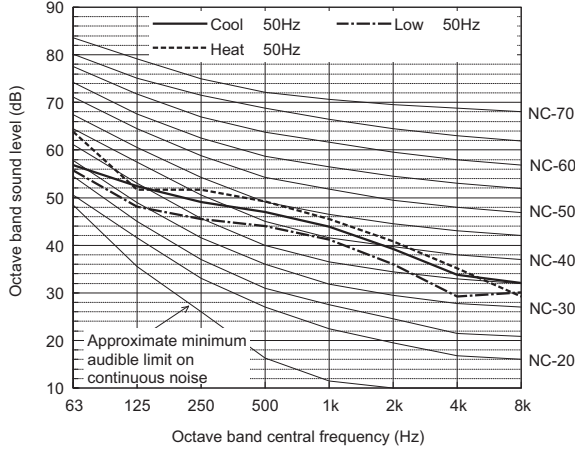
Sound level of PUMY-P140VKM1,YKM1(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard Cooling	50Hz	64.0	52.8	51.3	50.0	45.4	39.7	33.5	28.2	51.0
Standard Heating	50Hz	59.2	59.7	51.1	52.4	46.8	41.7	36.7	31.2	53.0
Low noise mode	50Hz	63.2	49.2	47.0	47.1	41.6	36.5	32.8	30.6	48.0

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.

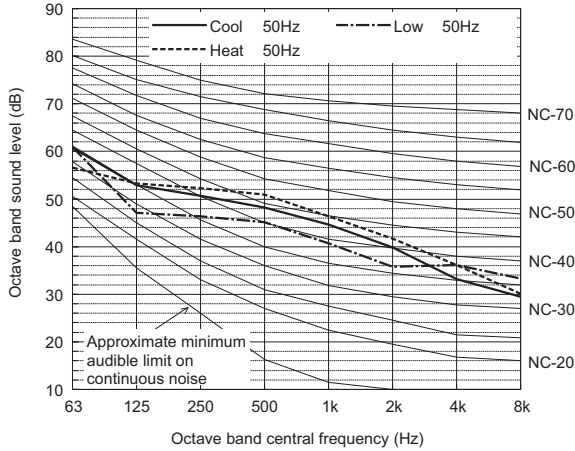
Sound level of PUMY-P112VKM1,YKM1(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard Cooling	50Hz	56.9	52.4	49.0	46.9	44.0	39.2	33.7	32.1	49.0
Standard Heating	50Hz	63.9	51.6	51.6	49.2	45.5	40.8	35.1	29.3	51.0
Low noise mode	50Hz	55.8	48.1	45.5	44.0	41.2	36.0	29.2	30.0	46.0

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.

Sound level of PUMY-P125VKM1,YKM1(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard Cooling	50Hz	60.8	52.8	50.6	48.2	44.7	39.9	33.2	29.5	50.0
Standard Heating	50Hz	56.6	53.3	52.2	50.9	46.4	41.7	36.2	30.1	52.0
Low noise mode	50Hz	60.9	47.1	46.3	45.2	40.7	35.7	36.1	33.4	47.0

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.