



Report Ref. **CLI0309/R1/Rev.B**

Post Completion Noise Survey for Two Existing Air Conditioning Units to Support Planning Application for Noise

21 Cressy Road, Hampstead NW3 2NB

22 December 2021

Report prepared for:

Graham Rosser

RM Architectural Consultants Ltd

Report prepared by:

Alex Hancock (PG Dip (IOA), MIOA)

Climate Acoustics

Croxtons Mill, Blasford Hill,
Little Waltham, Chelmsford,
Essex

CM3 3PJ

United Kingdom

www.climateacoustics.com

info@climateacoustics.com

01245 800105

Document Information

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Client	Graham Rosser
Company	RM Architectural Consultants Ltd
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Author	Alex Hancock PG Dip (IOA), MIOA
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Summary

An existing air conditioning system comprising of x2 No. air conditioning (condenser) units have been installed inside a timber storage unit to the rear garden serving a residential property at 21 Cressy Road, Hampstead NW3 2NB.

Climate Acoustics has been appointed to complete a noise survey and assessment to determine the noise impact on neighbouring residents and comply with the 'Reason for Refusal 1' of the decision notice ref: 2020/4238/P (see Section 2.1.1 of this report for more details) and the 'Officer Delegated Report (Refusal)' (see Section 2.1.2 of this report). The noise survey was completed between Thursday 2nd December to Monday 6th December 2021.

The air conditioning system (condenser units x 2 No.) operation is expected to run 24-hours, Monday to Sunday.

British Standard BS 4142 – Commercial Plant Noise Levels

Section 2.1.2 of this report shows that London Borough of Camden Council has local planning policy and guidance for plant noise, as set out in the 'Officers Delegated Report (Refusal)':

“noise levels applicable to plant and machinery and requires noise levels to be 10dB below background levels and no events exceeding 57dB_{L_{Amax}}”

Therefore, the noise level from the condenser units will be required to meet a rating noise level of 10dB(A) or greater below the minimum background.

As the minimum measured background noise level at daytime/ evening equals 35 dB $L_{A90,1-hour}$ and 32 dB $L_{A90,15-minutes}$ during the night-time at the nearest noise sensitive premises. Therefore, the existing air conditioning units (x2 units) will need to achieve a rating noise criteria level equal or below **25 dB $L_{Ar,Tr,1-hour}$** during the daytime/ evening and equal or below **22 dB $L_{Ar,Tr,15-minutes}$** during the night.

Noise Control Measures

To control noise levels, Section 4.2.1 of this report shows that the new air conditioning unit housed to the rear of the premises should have an acoustic enclosure fitted to control noise.

With the noise control measures applied (as outlined in Section 4.2), the new proposed plant is predicted to achieve the required rating noise emission criteria/ limits. Appendix B shows the calculation tables achieve London Borough of Camden Council's noise criteria of **25 dB $L_{Ar,Tr,1-hour(day)}$** and **22 dB $L_{Ar,Tr,15-min(night)}$** (Section 4.1.1) at 1-metre from the nearest noise sensitive bedroom windows Receptor R1 and Receptor R2. Note: This is 10 dB below the minimum daytime & night-time background noise levels.

Therefore, predicted noise levels detailed in Appendix B achieved the following at 1 metre from the nearest residential receptors windows:

- **Receptor R1: 21 dB $L_{Ar,Tr,15-minutes}$** at 1 metre from Receptor R1 window
- **Receptor R2: 18 dB $L_{Ar,Tr,15-minutes}$** at 1 metre from Receptor R2 window

These predicted noise levels achieve London Borough of Camden Council's noise criteria (i.e. rating noise level 10 dB or greater below the minimum external background noise level), detailed in Section 2.1 of this report. As per British Standard BS 4142:2014+A1:2019 (Section 2.3.1 of this report), guidance, this gives **“an indication of the specific sound source having a low impact”** at the nearest noise-sensitive residential receptor window.

This meets London Borough of Camden Council's rating noise criteria for daytime/ evening (equal or below 25 dB $L_{Ar,Tr,1-hour(day)}$) and night-time (equal or below 22 dB $L_{Ar,Tr,15-minutes(night)}$), full details of the noise criteria are provided in Section 2.1 and 4.1.1 of this report.

British Standard BS 8233 – Predicted Internal Noise Levels

The nearest residents' windows with a partially open window for ventilation offers 10 decibels (dB) attenuation. The calculation tables in Appendix B shows the predicted internal noise levels with the x2 No. AC units operating simultaneously is expected to be:

- **Receptor R1:** 11 dB $L_{Aeq,8-hour}$ inside Receptor R1 during the night.
- **Receptor R2:** 8 dB $L_{Aeq,8-hour}$ inside Receptor R2 during the night.

These predicted levels with noise control measures implemented (detailed in Section 4.2 of this report) will comfortably meet the acceptable internal noise levels in bedrooms for resting during the night-time (30 dB $L_{Aeq,8-hour}$), as per British Standard BS 8233: 2014 (Section 2.3.2 of this report), and complaints are therefore unlikely.

Based on the above, the requirements of London Borough of Camden Council's external plant rating noise emission limits (Section 2.1.2 of this report) in accordance with British Standard BS 4142:2014+A1:2019 should, therefore, be achieved, and the proposed plant should satisfy 'Reason for Refusal 1' for noise of the Decision Notice (Application ref: 2020/4238/P).

Table of Contents

Document Information	2
Summary.....	3
Table of Contents.....	5
1 Introduction	7
1.1. Site Description.....	7
2 Noise Criteria and Planning Policy	8
2.1. Local Planning Policy.....	8
2.1.1. Reason for Refusal 1 (Decision Notice Ref: 2020/4238/P)	8
2.1.2. Officer Delegated Report (Refusal) (Application Number: 2020/4238/P)	8
2.1.3. Camden Local Plan 2017.....	9
2.1.4. London Borough of Camden Council – Camden Development Policies 2010-2025, Local Development Framework.....	10
2.2. National Planning Policy	11
2.2.1. The National Planning Policy Framework (NPPF)	11
2.2.2. National Planning Practice Guidance (NPPG).....	11
2.3. British Standards & Guidance.....	14
2.3.1. British Standard BS 4142:2014+A1:2019 – Guidance on Assessing Industrial and Commercial Noise.....	14
2.3.2. British Standard BS 8233:2014 – Guidance on Internal Noise Criteria.....	14
3 Existing Noise Climate	15
3.1. Survey Details	15
3.1.1. Personnel present.....	15
3.1.2. Instrumentation and Calibration	15
3.1.3. Equipment operation, including the times and dates.	15
3.1.4. Weather conditions	15
3.2. Location of Noise Monitoring Equipment	16
3.3. Methodology	17
3.4. Uncertainty	17
3.5. Noise Climate.....	17
3.6. Noise Measurement Results.....	18
3.6.1. Unattended Noise Monitoring Results (Location U1):	18
3.6.2. Attended Noise Monitoring Results (Location A1):.....	18

4	Noise Impact Assessment	19
4.1.	Noise Impact Assessment for Existing Plant Noise Sources to Nearest Residents.....	19
4.1.1.	Noise Emission Criteria/ Limit as per London Borough of Camden Council’s Planning Guidance (Officer Delegated Report (Refusal), Application Number: 2020/4238/P)	19
4.1.2.	Existing Air Conditioning Plant Equipment.....	19
4.1.3.	Existing Noise Impact Assessment Parameters	21
4.2.	Noise Control Measures to Air Conditioning Units (x2 No. Condenser Units) Noise Sources.....	22
4.2.1.	Noise Control to Air Conditioning Units (x2 No. Condenser Units)	22
4.3.	Existing Plant Noise Impact to Nearest Noise Sensitive Bedrooms with Noise Control Measures	23
	Appendix A – Noise Measurement Graph and Table	24
	Appendix A1 – Unattended Noise Survey Graph.....	24
	Appendix A2 – Attended Noise Survey	25
	Appendix B – Calculations	26
	Appendix B1 – Calculated Noise Level from Air Conditioning Plant to Residential Receptor R1 (Night).....	26
	Appendix B2 – Calculated Noise Level from Air Conditioning Plant to Residential Receptor R2 (Night).....	27
	Appendix C – Technical Datasheets.....	28
	Appendix C1 – Air Conditioning Unit 1 Datasheet, ‘Fujitsu, Model No. AOYG12LALL’	28
	Appendix C2 – Air Conditioning Unit 2 Datasheet, ‘Fujitsu, Model No. AOYG09LMCA’	32
	Appendix C3 – Acoustic Enclosure Technical Datasheet, ‘Allaway Acoustics, Model No. L120E’	37

1 Introduction

An existing air conditioning system comprising of x2 No. air conditioning (condenser) units have been installed inside a timber storage unit to the rear garden serving a residential property at 21 Cressy Road, Hampstead NW3 2NB.

Climate Acoustics has been appointed to complete a noise survey and assessment to determine the noise impact on neighbouring residents and comply with the 'reason for refusal 1' of the decision notice ref: 2020/4238/P (see Section 2.1.1 of this report for more details). The noise survey was completed between Thursday 2nd December to Monday 6th December 2021.

London Borough of Camden Council has outline noise emission criteria and based on our understanding and the technical information for the air conditioning units (x2 No. AC Units) have been included in this report.

Climate Acoustics will assess the likely increase in noise due to the AC Unit's (x2 No.) operation. If required, suggest appropriate noise control measures to reduce noise emissions.

1.1. Site Description

Figure 1 shows the site boundary where the existing residential premises is located.

The x2 No. AC units must be assessed against the current noise climate to avoid noise disturbance at the nearby noise-sensitive residential receptors to comply with London Borough of Camden Council's planning requirements for noise.

The dominant noise sources at the site include the surrounding road network, including Constantine Road, Cressy Road and Agincourt Road (B518). Along with intermittent rail noise from trains passing to the north of the site.

Figure 1 –Google Earth™ image showing the site description.



2 Noise Criteria and Planning Policy

2.1. Local Planning Policy

2.1.1. Reason for Refusal 1 (Decision Notice Ref: 2020/4238/P)

“The Council has considered your application and decided to refuse planning permission for the following reason(s):

Reason(s) for Refusal

- 1 The applicant has failed to provide sufficient information to demonstrate that the proposed plant would operate in accordance with the Council's minimum noise and vibration standards and that the plant, when operating at full capacity, would be capable of doing so without causing noise disturbance and harm to the local residential environment, contrary to policies A1 (Managing the impact of development) and A4 (Noise and vibration), of the London Borough of Camden Local Plan 2017.”***

2.1.2. Officer Delegated Report (Refusal) (Application Number: 2020/4238/P)

As detailed in the ‘Officer Delegated Report (Refusal)’ issued in November 2021 (Application Number 2020/4238/P), the London Borough of Camden Council has threshold noise criteria set to control the plant noise to demonstrate that the plant won’t cause noise disturbance and harm the local residential environment. Specific noise guidance for the fixed plant is highlighted in **bold** below and reference is made to ‘Camden Planning Guidance – Amenity 2021’:

“4.1 Policies A1 and A4 seek to protect the amenity of Camden’s residents by ensuring the impact of development is fully considered and would not harm the amenity of neighbouring residents. This includes privacy, outlook, noise, daylight and sunlight.

4.2 The proposals would not impact residential amenity by way of loss of outlook, daylight, or privacy. The principal consideration is the noise disturbance which would arise from use of the condenser units.

4.3 Policy A1 notes in paragraph 6.20 that when development that is likely to generate noise is proposed, the Council will require an acoustic report to accompany the application. Policy A4 seeks to ensure that noise sensitive uses (such as residential homes) are not negatively impacted by noise and vibration and states that the Council will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. In assessing applications likely to generate noise, the Council will have regard to noise and vibration thresholds, set out in Appendix 3 of the Local Plan and other relevant national and regional policy and guidance and British Standards.

4.4 Appendix 3 sets out Camden’s noise thresholds which reflect observed effect levels outlined in National Planning Practice Guidance. The thresholds set noise levels for:

- noise sensitive development in areas of existing noise; and*
- noise generating development in areas sensitive to noise.*

4.5 As the proposals involve the installation of new noise generating machinery in a residential area sensitive to noise, it is the thresholds set out in relation to the second point which is relevant in the assessment of the proposals. Table C of appendix 3 sets out noise levels applicable to plant and machinery and requires noise levels to be 10dB below background levels and no events exceeding 57dB_{L Amax}.

4.6 The applicant’s supporting document submitted with the application assesses the development against the thresholds for noise sensitive development in areas of existing noise (i.e. the creation of new homes in a busy town centre location or industrial area – the first criteria in para. 4.4 above) and states that the condenser units ‘do not exceed 55dB_L’. The submission includes manufacturers details of the plant and a predicted noise output level, but a noise impact assessment has not been submitted with the application. As such, there is no assessment of

background noise levels, and it is not possible to determine whether the proposed equipment would comply with the requirement to be 10dB below background noise levels.

4.7 In the absence of this information, it is not possible to determine whether the plant could be operated without causing harm to amenity, and as such, the development would be contrary to policies A1 (Managing the impact of development) and A4 (Noise and Vibration), and it is recommended that planning permission is refused for this reason.”

2.1.3. Camden Local Plan 2017

Policies A1 and A4 of the London Borough of Camden Local Plan 2017 are referred to here:

“Policy A1 Managing the impact of development

The Council will seek to protect the quality of life of occupiers and neighbours. We will grant permission for development unless this causes unacceptable harm to amenity.

We will:

- a. seek to ensure that the amenity of communities, occupiers and neighbours is protected;
- b. seek to ensure development contributes towards strong and successful communities by balancing the needs of development with the needs and characteristics of local areas and communities;
- c. resist development that fails to adequately assess and address transport impacts affecting communities, occupiers, neighbours and the existing transport network; and
- d. require mitigation measures where necessary.

The factors we will consider include:

- e. visual privacy, outlook;
- f. sunlight, daylight and overshadowing;
- g. artificial lighting levels;
- h. transport impacts, including the use of Transport Assessments, Travel Plans and Delivery and Servicing Management Plans;
- i. impacts of the construction phase, including the use of Construction Management Plans;
- j. noise and vibration levels;**
- k. odour, fumes and dust;**

Policy A4 Noise and vibration

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). We will not grant planning permission for:

- a. development likely to generate unacceptable noise and vibration impacts; or**
- b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.**

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.”

2.1.4. London Borough of Camden Council – Camden Development Policies 2010-2025, Local Development Framework

Policy DP28: Noise and Vibration states:

“The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:

- a. development likely to generate unacceptable noise pollution; or*
- b. development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.*

Development that exceeds Camden’s Noise and Vibration Thresholds will not be permitted.

The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds. The Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact.”

Policy DP28 Table E sets out the following noise limits which are relevant for this development:

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dBL _{Aeq}

2.2. National Planning Policy

2.2.1. The National Planning Policy Framework (NPPF)

The latest revision of NPPF (July 2021) sets out the Government's vision for sustainable development through economic, environmental, and social planning policies for England.

Paragraph 174. *"Planning policies and decisions should contribute to and enhance the natural and local environment by:*

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of ... noise pollution ..."

Paragraph 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 this 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;"

NPPF also sets out that any planning policies and decisions should ensure that new development can be integrated effectively.

Paragraph 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."*

2.2.2. National Planning Practice Guidance (NPPG)

The Department for Communities and Local Government (DCLG) released a web-based resources at the time of the planning application relate to *'Planning Practice Guidance'*. The guidance advises the following:

"How can noise impact be determined?"

Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

- whether or not a significant adverse effect is occurring or likely to occur;*
- whether or not an adverse effect is occurring or likely to occur; and*
- whether or not a good standard of amenity can be achieved.*

In line with the Explanatory note of the noise policy statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy."

"What are the observed effect levels?"

- Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur.*

- *Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected.*
- *No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.*

Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs."

"How can it be established whether noise is likely to be a concern?"

At the lowest extreme, when noise is not noticeable, there is by definition no effect. As the noise exposure increases, it will cross the no observed effect level as it becomes noticeable. However, the noise has no adverse effect so long as the exposure is such that it does not cause any change in behaviour or attitude. The noise can slightly affect the acoustic character of an area but not to the extent there is a perceived change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.

As the exposure increases further, it crosses the lowest observed adverse effect level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

Increasing noise exposure will at some point cause the significant observed adverse effect level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring.

This table summarises the noise exposure hierarchy, based on the likely average response."

Response	Examples of outcomes	Increasing effect level	Action
Not present	No Effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

2.3. British Standards & Guidance

2.3.1. British Standard BS 4142:2014+A1:2019 – Guidance on Assessing Industrial and Commercial Noise

British Standard BS 4142:2014+A1:2019 “Methods for Rating and Assessing Industrial and Commercial Sound” is used to assess the potential for adverse impact due to the agricultural noise sources at the relevant noise-sensitive property. The existing noise source levels are measured/calculated and compared to the existing background noise level (L_{A90}).

Depending on the noise source characteristics (tonal, intermittent, or impulsive), the noise source is given a rating noise level (penalty additions) and compared to the ‘lowest’ background noise level (during operating hours). The significance of the existing noise sources can then be given a likelihood of adverse impact, which follows British Standard BS 4142:2014+A1:2019 advice:

“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.

- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB 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.”*

2.3.2. British Standard BS 8233:2014 – Guidance on Internal Noise Criteria

Residential Internal Design Criteria

British Standard BS 8233:2014 ‘Guidance on Sound Insulation and Noise Reduction for Buildings’ contains guidance for internal design criteria, as shown in the following table.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	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 $L_{Aeq, 8hour}$

Residential External Amenity Design Criteria

For outdoor areas, such as gardens, courtyards, and balconies, BS 8233:2014 states:

“It is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.”

3 Existing Noise Climate

3.1. Survey Details

3.1.1. Personnel present

Alex Hancock – Climate Acoustics

3.1.2. Instrumentation and Calibration

Cirrus CR:811C – Sound Level Meter (*calibration certificates available upon request.).

Larson Davis CAL200 – Calibrator (*calibration certificates available upon request.).

Climate Acoustics Calibrated Equipment

Unattended Noise Meter (Cirrus CR:811C)

Class 1 Sound Level Meter	Cirrus CR:811C – Serial Number D21386FD (Date of Calibration: 13/07/2020*)
Microphone	Cirrus UK224 – Serial Number 20043419 (Date of Calibration: 13/07/2020*)
Preamplifier	Cirrus MV200D – Serial Number 1474 (Date of Calibration: 13/07/2020*)

Calibrator (Larson Davis CAL200)

Calibrator	Larson Davis – CAL200 - Serial Number 6003 (Date of Calibration: 20/10/2021*)
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3.1.3. Equipment operation, including the times and dates.

11:38 am on Thursday 2nd December 2021 to 14:30 am on Monday 6th December 2021

3.1.4. Weather conditions

The weather conditions during noise monitoring at the proposed site are as follows.

Date	Temperature (°C)	Weather Conditions	Wind
Thursday 2 December 2021	0°C - 5°C	Cold, dry with scattered clouds and sunny intervals with approx. 0%-50% cloud cover	Light wind (<5m/s)
Friday 3 December 2021	1°C - 9°C	Cold, dry with scattered clouds and sunny intervals with approx. 0%-50% cloud cover	Calm (<5m/s)
Saturday 4 December 2021	4°C - 8°C	Cold, dry with scattered clouds and sunny intervals and occasional rain with approx. 50%-100% cloud cover	Gentle Breeze (<5m/s)
Sunday 5 December 2021	4°C - 6°C	Cold, dry with scattered clouds and sunny intervals and occasional rain with approx. 50%-100% cloud cover	Gentle Breeze (<5m/s)

Date	Temperature (°C)	Weather Conditions	Wind
Monday 6 December 2021	2°C - 7°C	Cold, dry with scattered clouds and sunny intervals and occasional rain with approx. 50%-100% cloud cover	Light wind (<5m/s)

3.2. Location of Noise Monitoring Equipment

Figure 2 shows the location of the unattended and attended noise monitoring equipment (Locations A1 & U1).

Figure 2 – Image showing proposed site noise monitoring location (Source: Google Earth™)



3.3. Methodology

Unattended Noise Monitoring:

Figure 2 shows the unattended sound level meter location U1.

The sound level meter microphone at positions U1 was set up on a tripod at the 2.2-metres height at an equivalent location nearest the residential noise-sensitive premises boundary.

Attended Noise Monitoring:

Figure 2 shows the attended sound level meter location A1.

The sound level meter microphone at positions A1 was set up at a height of 1.5 metres on a tripod at 1-metre distance from the face of the existing air conditioning units (x2 No.) located on the garden wall in the rear garden.

Calibration Procedure:

The calibration procedure before and after the noise survey, the Cirrus CR:811C sound level meters were calibrated using the Larson Davis CAL200, respectively, and no significant drift was measured (accuracy within ± 0.3 dB).

3.4. Uncertainty

For accurate measurements, the noise monitoring equipment is calibrated by traceable lab calibration:

- a Class 1 sound level meter and microphone are calibrated once every two years.
- a Class 1 calibrator is calibrated once every year.

Note: any measurement taken was by a Class 1 sound level meter, a margin on uncertainty of +/- 1.1 decibels typically apply because of the equipment's tolerances.

The uncertainty with the noise prediction calculations is limited, as using our experience and factors including distance, direct line of sight and reflections have been considered. The manufacturer's octave band noise datasheets are assumed to be reliable and correct. In this instance, they have been included in the predicted noise level calculations.

3.5. Noise Climate

The dominant noise sources at the site include the surrounding road network, including Constantine Road, Cressy Road and Agincourt Road (B518). Along with intermittent rail noise from trains passing to the north of the site.

The operating hours of the x2 No. air conditioning units (21 Cressy Road, Hampstead NW3 2NB) are as follows:

- 24-hours, Monday to Sunday

3.6. Noise Measurement Results

3.6.1. Unattended Noise Monitoring Results (Location U1):

The unattended baseline measured noise levels at Location U1 (Figure 2) are summarised in the table below for the day/ evening and night baseline noise levels. Appendix A1 shows the unattended noise survey data presented in a graphical format.

Unattended U1 Site Garden	
Operating Hours	
Minimum Day/ Evening Background Noise Level, $L_{A90,1\text{-hour}}$ (Day/ Evening)	35*
Minimum Background Noise Level, $L_{A90,15\text{-minutes}}$ (Night)	32*

* Both AC units were switched off for the duration of the unattended noise survey, and only switched on upon request on Thursday 2nd December 2021 between 11:56 to 12:10 (shown in Section 3.6.2 of this report).

The minimum day/ evening background noise level measured between 7 am to 11 pm, Monday to Sunday equals **35 dB $L_{A90,1\text{-hour}}$** (day). The minimum night-time background noise level measured between 11 pm to 7 am, Monday to Sunday equals **32 dB $L_{A90,15\text{-minutes}}$** (night), measured during the quietest time of operation, i.e. between 1 am – 2 am on Monday 6 December 2021 (06/12/2021).

3.6.2. Attended Noise Monitoring Results (Location A1):

The two AC units (x2 No.) measured data in Eco Mode fan speeds at Location A1 (Figure 2) are summarised in the table below. Appendix A2 shows the attended noise survey data presented in a tabulated format.

Measured Sound Pressure Level of Air Conditioning Unit (Location A1):

Date	Time	No. Units/ Fan Speed	Sound Pressure Level at 1 metres, L_p								L_p^* dB(A)
			Frequency, Hz								
			L_{ZFeq} 63	L_{ZFeq} 125	L_{ZFeq} 250	L_{ZFeq} 500	L_{ZFeq} 1000	L_{ZFeq} 2000	L_{ZFeq} 4000	L_{ZFeq} 8000	
02/12/2021	11:56	x2 AC Units / Eco Mode	54	49	49	44	36	35	37	29	46
	12:08	x2 AC Units / Eco Mode	54	49	48	45	41	38	36	28	47

The typical AC unit noise sources level from both unit (x2 No.) measured during the day equals **47 dB $L_{Aeq,5\text{-minutes}}$** (Eco Mode) at 1 metre from the face of the unit (facing southerly direction).

4 Noise Impact Assessment

4.1. Noise Impact Assessment for Existing Plant Noise Sources to Nearest Residents

4.1.1. Noise Emission Criteria/ Limit as per London Borough of Camden Council's Planning Guidance (Officer Delegated Report (Refusal), Application Number: 2020/4238/P)

The noise levels applicable to the noise-sensitive residential premises nearby has the following equivalent minimum background noise level measured (Location U1) during the day/ evening background noise level equals **35 dB $L_{A90,1\text{-hour}}(\text{day})$** . The minimum night-time background noise level equals **32 dB $L_{A90,15\text{-minutes}}(\text{night})$** , measured during the quietest time of operation, i.e. night between 1 am – 2 am on Monday 6 December 2021 (06/12/2021).

Plant Noise Criteria/ Threshold

Section 2.1.2 of this report shows that London Borough of Camden Council has local planning policy and guidance for plant noise, as set out in the '*Officers Delegated Report (Refusal)*':

"noise levels applicable to plant and machinery and requires noise levels to be 10dB below background levels and no events exceeding 57dB L_{Amax} "

Therefore, the noise level from the condenser units will be required to meet a rating noise level of 10dB(A) or greater below the minimum background.

As the minimum measured background noise level at daytime/ evening equals 35 dB $L_{A90,1\text{-hour}}$ and 32 dB $L_{A90,15\text{-minutes}}$ during the night-time at the nearest noise sensitive premises. Therefore, the existing air conditioning units (x2 units) will need to achieve a rating noise criteria level equal or below **25 dB $L_{Ar,Tr,1\text{-hour}}$** during the daytime/ evening and equal or below **22 dB $L_{Ar,Tr,15\text{-minutes}}$** during the night.

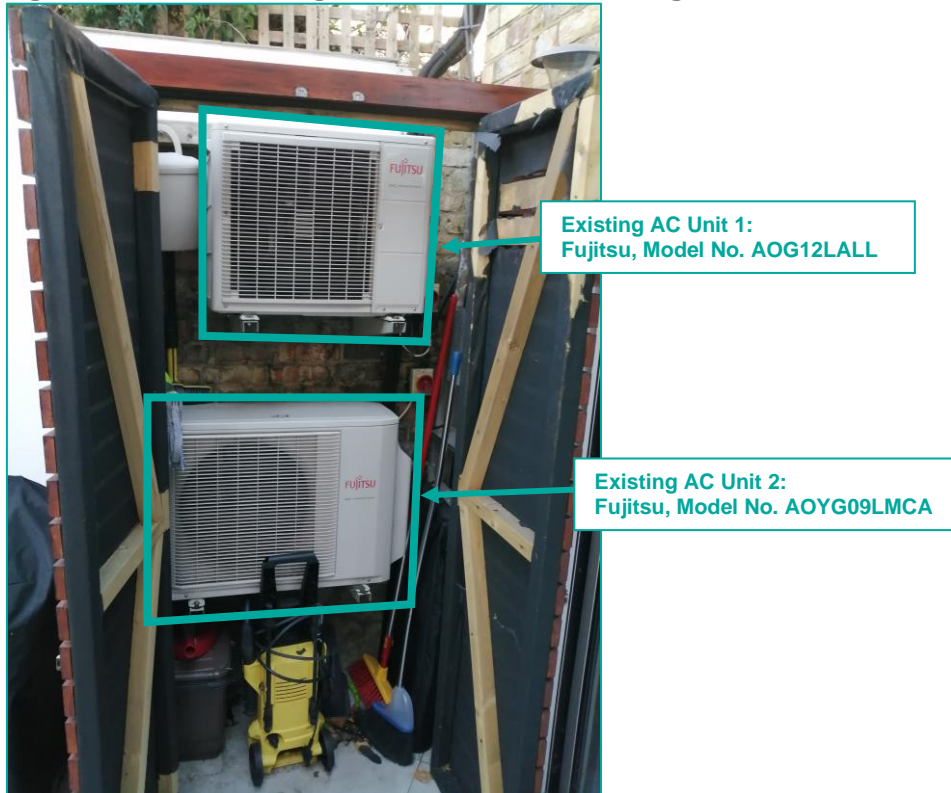
4.1.2. Existing Air Conditioning Plant Equipment

Figure 3 shows the x2 air conditioning units (condenser units) housed inside a timber storage unit on the flank brick wall to the garden of the premises at 21 Cressy Road, Hampstead NW3 2NB. The units are expected to operate during the operating for 24-hours, Monday to Sunday.

Existing Plant: The current plant list below is as follows:

- **Air Conditioning/ Heat Pump Unit (AC Units) x1 No.** – x1 No. 'Fujitsu, Air Conditioning Inverter Heat Pump, Model No. AOG12LALL' (Appendix C1) is housed inside a timber storage unit to the rear garden serving a residential property, as shown in Figure 3 and Figure 4 of this report.
- **Air Conditioning/ Heat Pump Unit (AC Units) x1 No.** – x1 No. 'Fujitsu, Air Conditioning Inverter Heat Pump, Model No. AOYG09LMCA' (Appendix C2) is housed outside of the commercial premises on the flat roof towards the west façade of the building, as shown in Figure 3 and Figure 4 of this report.

Figure 3 – Photo showing the Location of the Existing AC Unit Noise Sources (x2 No.)



The table below shows the maximum spectral sound pressure level noise data from the datasheets detailed in Appendix C1 & C2 of this report at 1-metre from the front of the AC units casing (facing southerly direction).

Maximum Octave Band Sound Pressure Levels from AC Units (Fan Speed: Max Setting)

Plant Make & Model	Sound Pressure Level at 1 metre, L_p (Fan Speed - High)								L_p^* dB(A)
	Frequency, Hz								
	L_{zFreq} 63	L_{zFreq} 125	L_{zFreq} 250	L_{zFreq} 500	L_{zFreq} 1000	L_{zFreq} 2000	L_{zFreq} 4000	L_{zFreq} 8000	
AC Unit 1 (Fujitsu, Model No. AOG12LALL)									
Cooling Mode, Max Setting	53	48	47	49	46	42	34	25	51
Heating Mode, Max Setting	54	48	46	48	47	42	33	25	51
AC Unit 2 (Fujitsu, Model No. AOYG09LMCA)									
Cooling Mode, Max Setting	52	45	48	43	40	37	33	22	46
Heating Mode, Max Setting	49	47	48	42	39	38	34	26	46

Figure 4 below shows the distance in metres between the nearest noise-sensitive residential receptor boundaries R1 & R2 and the x2 No. existing AC Unit plant noise sources (highlighted in red below). The air conditioning equipment plant datasheets are detailed in Appendix C.

Figure 4 – Google Earth™ Maps View - Location of the Noise Source and Nearest Residents (R1 & R2)



4.1.3. Existing Noise Impact Assessment Parameters

Calculations predicted to the nearest noise-sensitive residential receptors boundary consider the following:

- **Octave Band Calculation Format:** Calculated using measured noise levels in the table above, as per the Table in Section 4.1.1 of this report above.
- **Line of Sight:** The x2 No. existing air conditioning units face towards noise-sensitive residential receptor R1 (residential window) and has a direct line of sight (**0 decibel correction**). A partial line of sight (**-5 decibel correction**) exists from the air conditioning units to the noise-sensitive window receptor R2 (residential window) as the unit has a brick wall between it and the window.
- **Directivity:** The existing air conditioning unit has a directivity of 180°.
- **Distance from AC Unit to Receptor R1 & R2 Locations:** Figure 4 shows the location of the existing plant to the nearest noise-sensitive windows:
 - **Receptor R1:** The air conditioning unit is 6.5 metres distance from R1 window.
 - **Receptor R2:** The air conditioning unit is 9 metres distance from R2 window.
- **British Standard BS 4142: 2014+A1:2019 and British Standard BS 8233: 2014** – British Standards BS 4142:2014+A1:2019 & British Standard BS 8233:2014 considered in calculations given in Section 4.2 and Appendix B of this report. Following British Standard BS 4142:2014+A1:2019, noise penalties were no applied for tonality, intermittency, and impulsivity. However, it has been determined that the equipment could attract attention at the nearest noise sensitive window, **therefore, a +3dB penalty correction applies to the AC unit plant for other sound characteristics (hum noise).**

4.2. Noise Control Measures to Air Conditioning Units (x2 No. Condenser Units) Noise Sources

The predicted noise impact calculations provided in Appendix B shows that noise control measures are necessary. The noise control measures to the x2 No. AC units are detailed in Section 4.2 of this report.

4.2.1. Noise Control to Air Conditioning Units (x2 No. Condenser Units)

To achieve a cumulative rating noise criteria level equal to or below **25 dB $L_{Ar,Tr,1-hour}$** during the daytime/ evening and equal or below **22 dB $L_{Ar,Tr,15-minutes}$** during the night-time (10 dB or greater below minimum external background noise level), mitigation is required to control noise emission levels from the existing x2 No. air conditioning units:

As there is expected to be excessive noise from the air conditioning units at maximum setting (cooling/ heating), an acoustic enclosure is needed to the casing of the two air conditioning units (x2 No.). Following calculations carried out in Appendix B of this report, the minimum sound attenuation required by the acoustic enclosure is detailed in the table shown below in Section 4.2.1:

- **Air Conditioning Unit Acoustic Enclosure (x1 No. Acoustic Enclosure):**

Example of acoustic enclosure product – ‘Allaway Acoustics, L120E Acoustic Enclosure’

LzF _{eq} Frequency Spectral Data (dB) at 1m								
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Minimum Attenuation from Acoustic Enclosure	7	8	13	19	33	39	37	30

Note: Acoustic Enclosure attenuation provided is detailed in Appendix C3 technical datasheet.

For equivalent acoustic performance, there are custom-made acoustic enclosures products available from the following suppliers:

- Allaway Acoustics (<https://www.allawayacoustics.co.uk/>)
- Environmental Equipment Corporation Ltd (EEC) (<http://eec.co.uk/>)
- IAC Acoustics UK Ltd (<https://www.iacacoustics.global/acoustic-louvres/>)

Important: We recommend that before selecting and purchasing the required acoustic enclosure, the main contractor, architect, or client should contact their acoustic consultant to clarify if the chosen acoustic enclosure’s acoustic performance is sufficient.

4.3. Existing Plant Noise Impact to Nearest Noise Sensitive Bedrooms with Noise Control Measures

British Standard BS 4142 – Plant Noise Levels

To control noise levels, Section 4.2.1 of this report shows that the new air conditioning unit housed to the rear of the premises should have an acoustic enclosure fitted to control noise.

With the noise control measures applied (as outlined in Section 4.2), the new proposed plant is predicted to achieve the required rating noise emission criteria/ limits. Appendix B shows the calculation tables achieve London Borough of Camden Council's noise criteria of **25 dB $L_{Ar,Tr,1-hour(day)}$** and **22 dB $L_{Ar,Tr,15-min(night)}$** (Section 4.1.1) at 1-metre from the nearest noise sensitive bedroom windows Receptor R1 and Receptor R2. Note: This is 10 dB below the minimum daytime & night-time background noise levels.

Therefore, predicted noise levels detailed in Appendix B achieved the following at 1 metre from the nearest residential receptors windows:

- **Receptor R1:** **21 dB $L_{Ar,Tr,15-minutes}$** at 1 metre from Receptor R1 window
- **Receptor R2:** **18 dB $L_{Ar,Tr,15-minutes}$** at 1 metre from Receptor R2 window

These predicted noise levels achieve London Borough of Camden Council's noise criteria (i.e. rating noise level 10 dB or greater below the minimum external background noise level), detailed in Section 2.1 of this report. As per British Standard BS 4142:2014+A1:2019 (Section 2.3.1 of this report), guidance, this gives ***“an indication of the specific sound source having a low impact”*** at the nearest noise-sensitive residential receptor window.

This meets London Borough of Camden Council's rating noise criteria for daytime/ evening (equal or below 25 dB $L_{Ar,Tr,1-hour(day)}$) and night-time (equal or below 22 dB $L_{Ar,Tr,15-minutes(night)}$), full details of the noise criteria are provided in Section 2.1 and 4.1.1 of this report.

British Standard BS 8233 – Predicted Internal Noise Levels

The nearest residents' windows with a partially open window for ventilation offers 10 decibels (dB) attenuation. The calculation tables in Appendix B shows the predicted internal noise levels with the x2 No. AC units operating simultaneously is expected to be:

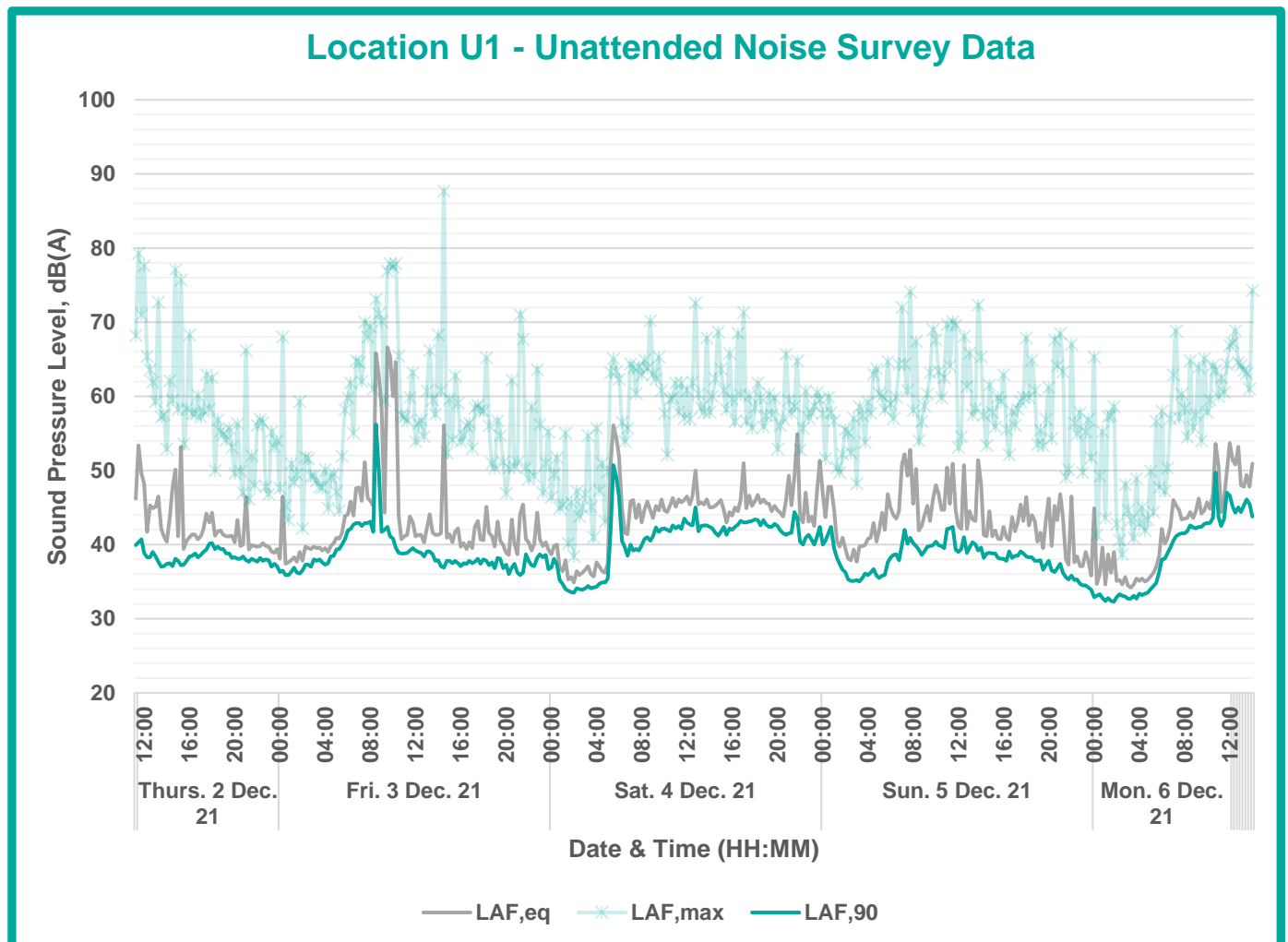
- **Receptor R1:** **11 dB $L_{Aeq,8-hour}$** inside Receptor R1 during the night.
- **Receptor R2:** **8 dB $L_{Aeq,8-hour}$** inside Receptor R2 during the night.

These predicted levels with noise control measures implemented (detailed in Section 4.2 of this report) will comfortably meet the acceptable internal noise levels in bedrooms for resting during the night-time (30 dB $L_{Aeq,8-hour}$), as per British Standard BS 8233: 2014 (Section 2.3.2 of this report), and complaints are therefore unlikely.

Based on the above, the requirements of London Borough of Camden Council's external plant rating noise emission limits (Section 2.1.2 of this report) in accordance with British Standard BS 4142:2014+A1:2019 should, therefore, be achieved, and the proposed plant should satisfy 'Reason for Refusal 1' for noise of the Decision Notice (Application ref: 2020/4238/P).

Appendix A – Noise Measurement Graph and Table

Appendix A1 – Unattended Noise Survey Graph



Appendix A2 – Attended Noise Survey

Table of Attended Noise Survey Data (02/12/2021) – Daytime (Location A1)

Measured Sound Pressure Level of Air Conditioning Unit (Location A1):

Time	Duration	Fan Speed	Sound Pressure Level at 1 metre, L_p								L_p^* dB(A)
			Frequency, Hz								
			L_{zFreq} 63	L_{zFreq} 125	L_{zFreq} 250	L_{zFreq} 500	L_{zFreq} 1000	L_{zFreq} 2000	L_{zFreq} 4000	L_{zFreq} 8000	
11:56	6 mins	Eco Mode	54	49	49	44	36	35	37	29	46
12:08	2 mins	Eco Mode	54	49	48	45	41	38	36	28	47

Appendix B – Calculations

Appendix B1 – Calculated Noise Level from Air Conditioning Plant to Residential Receptor R1 (Night)

Source: Air Conditioning Unit 1 - Fujitsu Air Conditioning Unit, Model No. AOG12LALL

Predicted Noise Level at 1 metre from Bedroom Window 'R1'	Frequency Spectral Data (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
AC Unit 1 - Sound Pressure Level (L_p) - Heating Mode, Max Fan Setting	54	48	46	48	47	42	33	25	51
Distance attenuation to 1 metre from bedroom window R1 (6.5m - 1m = 5.5m)	-15	-15	-15	-15	-15	-15	-15	-15	
Direct Line of Sight (0 dB)	0	0	0	0	0	0	0	0	
AC' Unit 1 - Noise level at 1m from Bedroom Window R1 ($L_{Aeq,T}$)	39	33	31	33	32	27	18	10	36

Source: Air Conditioning Unit 2 - Fujitsu Air Conditioning Unit, Model No. AOYG09LMCA

Predicted Noise Level at 1 metre from Bedroom Window 'R1'	Frequency Spectral Data (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
AC Unit 2 - Sound Pressure Level (L_p) - Heating Mode, Max Fan Setting	49	47	48	42	39	38	34	26	46
Distance attenuation to 1 metre from bedroom window R1 (6.5m - 1m = 5.5m)	-15	-15	-15	-15	-15	-15	-15	-15	
Direct Line of Sight (0 dB)	0	0	0	0	0	0	0	0	
AC' Unit 2 - Noise level at 1m from Bedroom Window R1 ($L_{Aeq,T}$)	34	32	33	27	24	23	19	11	31

Cumulative Rating Noise Level at 1 metre from Bedroom Window 'R1'	Frequency Spectral Data (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
AC' Unit 1 - Noise level at 1m from Bedroom Window R1 ($L_{Aeq,T}$)	39	33	31	33	32	27	18	10	36
AC' Unit 2 - Noise level at 1m from Bedroom Window R1 ($L_{Aeq,T}$)	34	32	33	27	24	23	19	11	31
Cumulative Noise Level at 1m from Bedroom Window R1 ($L_{Aeq,T}$)	40	36	35	34	33	29	22	14	37
Allaway Acoustics L120E - Double Bank Louvre - Size: 600mm	7	8	13	19	33	39	37	30	
BS 4142 Acoustic Correction (Hum = +3dB)	3	3	3	3	3	3	3	3	
Cumulative Rating Noise Level at 1m from Bedroom Window R1 ($L_{Ar,T}$) with Acoustic Enclosure Installed to AC unit 1 & 2	36	31	25	18	3	-7	-12	-13	21
									21
									External Noise Criteria ($L_{A90,1-hour}$)*
									Pass

London Borough of Camden Council's Noise Criteria* 22 dB(A)

* shall be at least 10 dB below the measured background noise level $L_{A90,15-min} = 32$ dB(A)

Cumulative Noise Level Inside Bedroom R1	dB(A)
Cumulative Noise level at 1m from Bedroom Window R1 ($L_{Aeq,T}$)	21
Sound Reduction provided by partially open window	-10
Cumulative Noise level Inside Bedroom R1 ($L_{Aeq,T}$)	11
BS 8233: 2014 Internal Criteria (Bedroom, Night, $L_{Aeq,8hr}$)	30 dB(A)
Internal Noise Criteria ($L_{Aeq,8hr}$)*	PASS

Appendix B2 – Calculated Noise Level from Air Conditioning Plant to Residential Receptor R2 (Night)

Source: Air Conditioning Unit 1 - Fujitsu Air Conditioning Unit, Model No. AOG12LALL

Predicted Noise Level at 1 metre from Bedroom Window 'R2'	Frequency Spectral Data (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
AC Unit 1 - Sound Pressure Level (L_p) - Heating Mode, Max Fan Setting	54	48	46	48	47	42	33	25	51
Distance attenuation to 1 metre from bedroom window R2 (9m - 1m = 8m)	-18	-18	-18	-18	-18	-18	-18	-18	
Direct Line of Sight (0 dB)	0	0	0	0	0	0	0	0	
AC' Unit 1 - Noise level at 1m from Bedroom Window R2 ($L_{Aeq,T}$)	36	30	28	30	29	24	15	7	32

Source: Air Conditioning Unit 2 - Fujitsu Air Conditioning Unit, Model No. AOYG09LMCA

Predicted Noise Level at 1 metre from Bedroom Window 'R2'	Frequency Spectral Data (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
AC Unit 2 - Sound Pressure Level (L_p) - Heating Mode, Max Fan Setting	49	47	48	42	39	38	34	26	46
Distance attenuation to 1 metre from bedroom window R2 (9m - 1m = 8m)	-18	-18	-18	-18	-18	-18	-18	-18	
Direct Line of Sight (0 dB)	0	0	0	0	0	0	0	0	
AC' Unit 2 - Noise level at 1m from Bedroom Window R2 ($L_{Aeq,T}$)	31	29	30	24	21	20	16	8	28

Cumulative Rating Noise Level at 1 metre from Bedroom Window 'R2'	Frequency Spectral Data (Hz)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
AC' Unit 1 - Noise level at 1m from Bedroom Window R2 ($L_{Aeq,T}$)	36	30	28	30	29	24	15	7	32
AC' Unit 2 - Noise level at 1m from Bedroom Window R2 ($L_{Aeq,T}$)	31	29	30	24	21	20	16	8	28
Cumulative Noise Level at 1m from Bedroom Window R2 ($L_{Aeq,T}$)	37	32	32	31	30	25	18	10	34
Allway Acoustics L120E - Double Bank Louvre - Size: 600mm	7	8	13	19	33	39	37	30	
BS 4142 Acoustic Correction (Hum = +3dB)	3	3	3	3	3	3	3	3	
Cumulative Rating Noise Level at 1m from Bedroom Window R2 ($L_{Ar,T}$) with Acoustic Enclosure Installed to AC unit 1 & 2	33	27	22	15	0	-11	-16	-17	18
									18
									External Noise Criteria ($L_{A90,1-hour}$)*
									Pass

London Borough of Camden Council's Noise Criteria* 22 dB(A)

* shall be at least 10 dB below the measured background noise level $L_{A90,15-min} = 32$ dB(A)


Cumulative Noise Level Inside Bedroom R2	dB(A)
Cumulative Noise level at 1m from Bedroom Window R2 ($L_{Aeq,T}$)	18
Sound Reduction provided by partially open window	-10
Cumulative Noise level Inside Bedroom R2 ($L_{Aeq,T}$)	8

BS 8233: 2014 Internal Criteria (Bedroom, Night, $L_{Aeq,8\text{ hour}}$) 30 dB(A)

Internal Noise Criteria ($L_{Aeq,8hr}$)* **PASS**

Appendix C – Technical Datasheets

Appendix C1 – Air Conditioning Unit 1 Datasheet, 'Fujitsu, Model No. AOYG12LALL'




INVERTER

AIR CONDITIONER
Duct type

DESIGN & TECHNICAL MANUAL


INDOOR



AR*G12LLTB
AR*G14LLTB

AR*G18LLTB

OUTDOOR



AO*G12LALL
AO*G14LALL
AO*G18LALL

FUJITSU GENERAL LIMITED

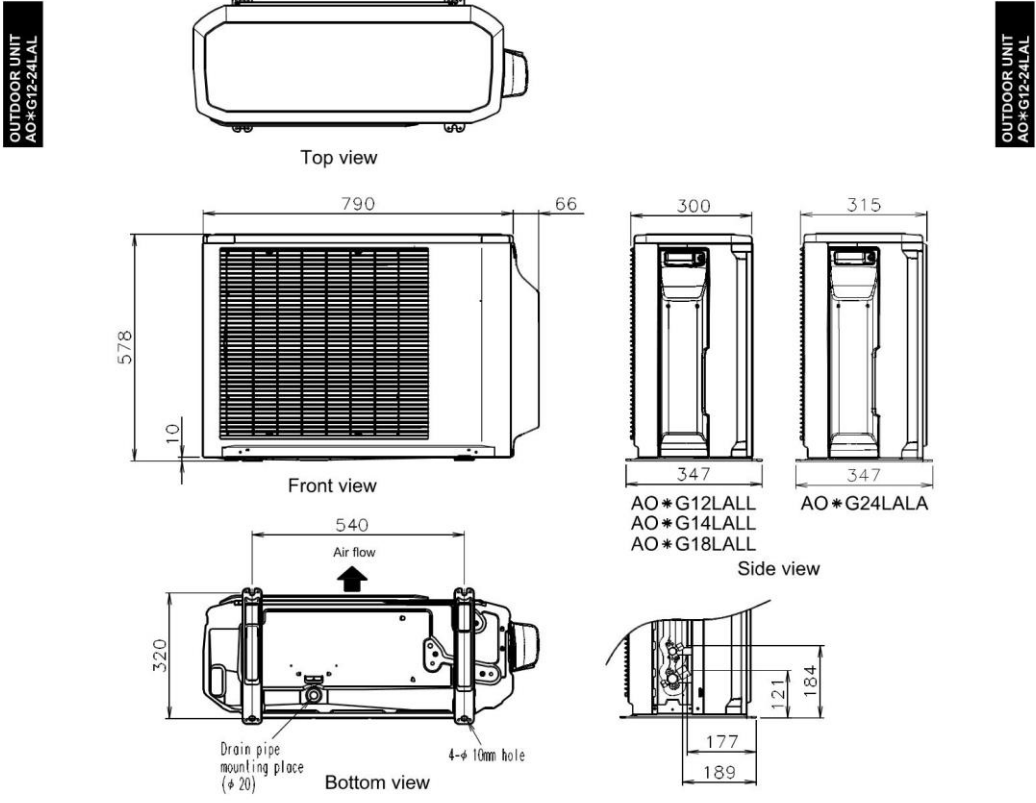
1. SPECIFICATIONS

Type		INVERTER HEAT PUMP				
Model name		AO*G12LALL	AO*G14LALL	AO*G18LALL	AO*G24LALA	
Power source		230V ~ 50Hz				
Available voltage range		196 - 264V ~ 50Hz				
Starting current		A	5.1	6.1	7.4	9.9
Fan	Airflow rate	Cooling	1780	1910	2000	2470
		Heating	1630	1740	1910	2470
Type × Qty		Propeller × 1				
Motor output		W	54	54	65	65
Sound pressure level	Cooling	dB (A)	47	49	50	52
			48	49	50	53
Sound power level	Cooling	dB (A)	61	62	62	67
			63	64	65	70
Heat exchanger type	Dimensions (H × W × D)	mm	546 × 876 × 18.2		546 × 866 × 18.2	
			546 × 842 × 18.2		546 × 832 × 18.2	
	Fin pitch	1.30		1.40		
	Rows × Stages	2 × 26		2 × 26		1 × 24
	Pipe type	Copper				
Fin Type		Aluminium				
Compressor	Type × Qty	Twin Rotary × 1				
	Motor output	W	1100			
Refrigerant	Type (Global Warming Potential)	R410A(1975)				
	Charge	g	1150	1250	1700	
Refrigerant oil	Type	POE				
Enclosure	Material	Steel sheet				
	Colour	Beige Approximate colour of MUNSELL 10YR7.5/1.0				
Dimensions (H × W × D)	Net	mm	578 × 790 × 300		578 × 790 × 315	
	Gross		648 × 910 × 380			
Weight	Net	kg	40		44	
	Gross		44		48	
Connention pipe	Size	Liquid	Ø6.35 (Ø1/4 in.)			
		Gas	Ø9.52 (Ø3/8 in.)	Ø12.70 (Ø1/2 in.)		Ø15.88 (Ø5/8 in.)
	Method	Flare				
	Pre-charge length	15				
	Max. length	m	25		30	
Max. height difference	15		20			
Operation range	Cooling	°C	-10 to 46			
	Heating		-15 to 24			

Note :
 Specifications are based on the following conditions.
 Cooling : Indoor temperature of 27 °CDB / 19 °CWB, and outdoor temperature of 35 °CDB / 24 °CWB.
 Heating : Indoor temperature of 20 °CDB / 15 °CWB, and outdoor temperature of 7 °CDB / 6 °CWB.
 Pipe length : 5.0 m, Height difference : 0 m. (Outdoor unit - Indoor unit)
 The protective function may work when using it outside the operation range.

2. DIMENSIONS

■ MODEL: AO*G12LALL, AO*G14LALL, AO*G18LALL, AO*G24LALA
 (Unit : mm)

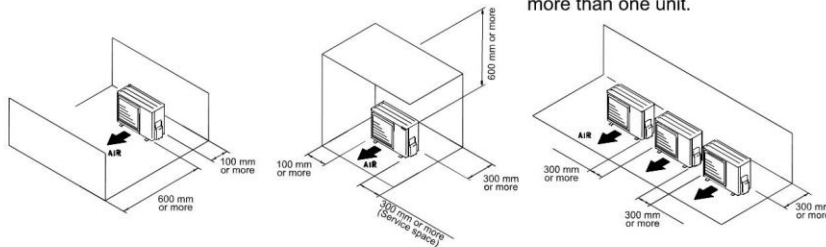


■ INSTALLATION PLACE

When there are obstacles at the back or front sides.

When there are obstacles at the back, side(s), and top.

When there are obstacles at the back, side with the installation of more than one unit.

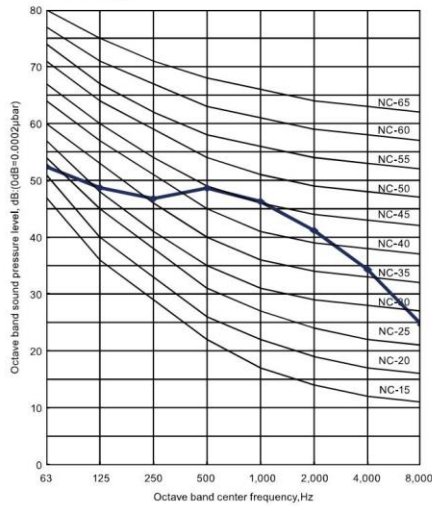


8. OPERATION NOISE (SOUND PRESSURE)

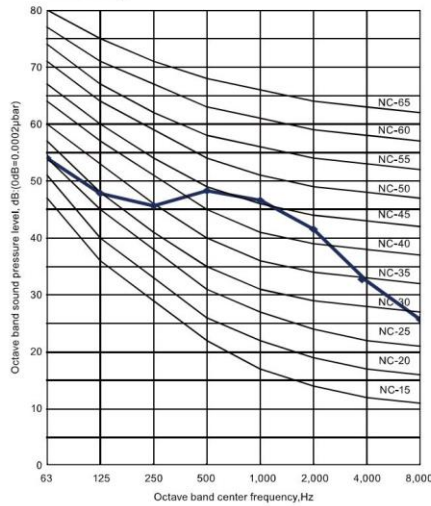
8-1. NOISE LEVEL CURVE

MODEL: AO*G12LALL

● Cooling



● Heating



Measured Sound Pressure Level of Air Conditioning Unit

Plant Make & Model	Sound Pressure Level at 1 metre, L_p (Fan Speed - High)								L_p^* dB(A)
	Frequency, Hz								
	L_{zFeq} 63	L_{zFeq} 125	L_{zFeq} 250	L_{zFeq} 500	L_{zFeq} 1000	L_{zFeq} 2000	L_{zFeq} 4000	L_{zFeq} 8000	
Fujitsu, Model No. AOG12LALL (Cooling Mode – Max Setting)	53	48	47	49	46	42	34	25	51
Fujitsu, Model No. AOG12LALL (Heating Mode – Max Setting)	54	48	46	48	47	42	33	25	51

Appendix C2 – Air Conditioning Unit 2 Datasheet, ‘Fujitsu, Model No. AOYG09LMCA’



AIR CONDITIONER

Wall mounted type

DESIGN & TECHNICAL MANUAL

INDOOR



ASYG07LMCE
 ASYG09LMCE
 ASYG12LMCE
 ASYG14LMCE

OUTDOOR



AOYG07LMCE
 AOYG09LMCE
 AOYG12LMCE



AOYG14LMCE

FUJITSU GENERAL LIMITED

DR_AS037EF_01
 2016.12.05

1. Specifications

OUTDOOR UNIT
AOYG07-14LMCE

Type		Inverter heat pump			
Model name		AOYG07LMCE	AOYG09LMCE	AOYG12LMCE	AOYG14LMCE
Power supply		230 V - 50 Hz			
Available voltage range		198 - 254 V			
Starting current		3.3	3.5	4.8	6.3
Fan	Airflow rate	1,670		1,830	1,940
	Cooling	1,470		1,600	1,700
	Heating				
Type × Qty	Propeller fan × 1				
Motor output	W	23			37
Sound pressure level *1	Cooling	45		50	
	Heating	45		50	
Sound power level	Cooling	58		61	65
	Heating	58		61	65
Heat exchanger type	Dimensions (H × W × D)	mm	650 × 504 × 18.2	642 × 504 × 36.4	896 × 504 × 36.4
	Fin pitch		1.3	1.4	1.3
	Rows × Stages		1 × 24		2 × 24
	Pipe type		Copper		
	Fin type	Type (Material)	Corrugated (Aluminium)		
		Surface treatment	Corrosion resistance (Blue fin)		
Compressor	Type × Qty	Rotary × 1			
	Motor output	W	500	610	750
Refrigerant	Type (Global warming potential)	R410A (1975)			
	Charge	g	700	850	1,050
Refrigerant oil	Type	POE (374)			
	Amount	cm ³	26		
Enclosure	Material	Steel sheet			
	Color	Base color			
Dimensions (H × W × D)	Net	mm	535 × 663 × 293		540 × 790 × 290
	Gross		595 × 790 × 395		648 × 938 × 400
Weight	Net	kg	21		26
	Gross		25		34
Connection pipe	Size	Liquid	Ø 6.35 (Ø 1/4)		
		Gas	Ø 9.52 (Ø 3/8)		Ø 12.7 (Ø 1/2)
	Method	Flare			
Pre-charge length	Pre-charge length	m	1		
	Max. length		2		
	Max. height difference		1		
Operation range	Cooling	°C	-10 to 43		
	Heating		-15 to 24		
Drain hose	Material	PP+LLDPE			
	Size	mm	Ø 13.0 (I. D.), Ø 16.0 to Ø 16.8 (O. D.)		LDPE Ø 13.0 (I. D.), Ø 16.0 to Ø 16.7 (O. D.)

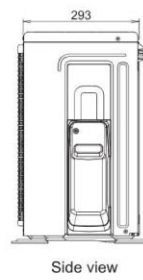
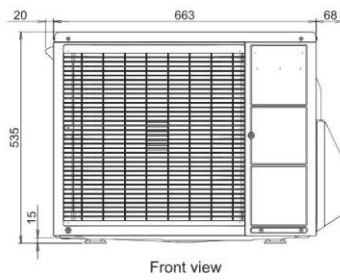
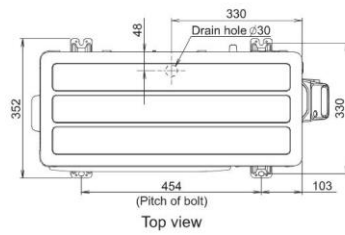
NOTES:

- Specifications are based on the following conditions:
 - Cooling: Indoor temperature of 27 °CDB/19 °CWB, and outdoor temperature of 35 °CDB/24 °CWB.
 - Heating: Indoor temperature of 20 °CDB/15 °CWB, and outdoor temperature of 7 °CDB/6 °CWB.
 - Pipe length: 5 m, Height difference: 0 m.
- Protective function might work when using it outside the operation range.
- *1: Sound pressure level
 - Measured values in manufacturer's anechoic chamber.
 - Because of the surrounding sound environment, the sound levels measured in actual installation conditions might be higher than the specified values here.

2. Dimensions

2-1. Models: AOYG07LMCE, AOYG09LMCE, and AOYG12LMCE

Unit: mm



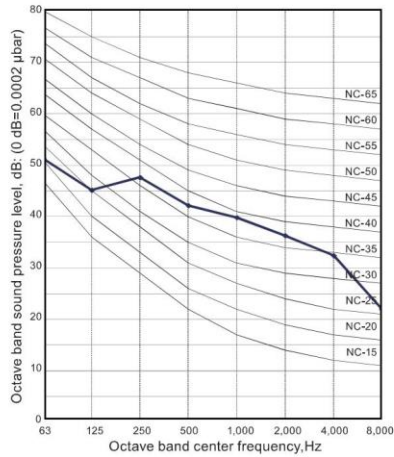
OUTDOOR UNIT
 AOYG07-14LMCE

9. Operation noise (sound pressure)

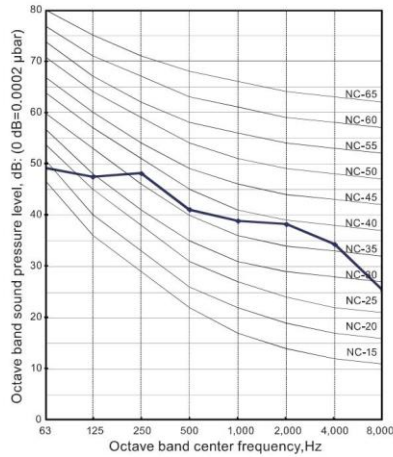
9-1. Noise level curve

Model:AOYG07LMCE

Cooling



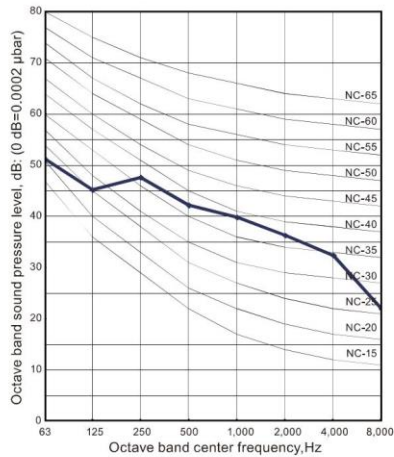
Heating



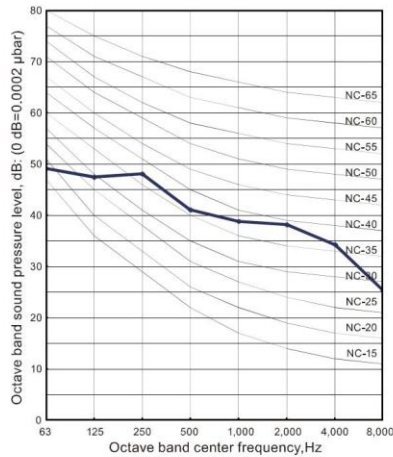
OUTDOOR UNIT
AOYG07-14LMCE

Model:AOYG09LMCE

Cooling



Heating




Measured Sound Pressure Level of Air Conditioning Unit

Plant Make & Model	Sound Pressure Level at 1 metre, L_p (Fan Speed - High)								L_p^* dB(A)
	Frequency, Hz								
	L_{zFreq} 63	L_{zFreq} 125	L_{zFreq} 250	L_{zFreq} 500	L_{zFreq} 1000	L_{zFreq} 2000	L_{zFreq} 4000	L_{zFreq} 8000	
Fujitsu, Model No. AOYG09LMCA (Cooling Mode – Max Setting)	52	45	48	43	40	37	33	22	46
Fujitsu, Model No. AOYG09LMCA (Heating Mode – Max Setting)	49	47	48	42	39	38	34	26	46

Appendix C3 – Acoustic Enclosure Technical Datasheet, ‘Allaway Acoustics, Model No. L120E’

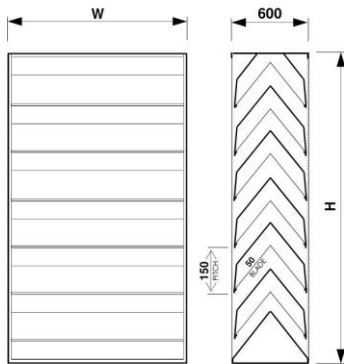
DATA SHEET **L120E**
 ACOUSTIC LOUVRE
 MODEL **AL3015D**



THIS IS NOT A STAND-ALONE DOCUMENT AND UNLESS REFERRED TO IN A DATED EQUIPMENT SCHEDULE IS SUBJECT TO REVISION WITHOUT NOTICE.

DIMENSIONS

SUFFIX



THE SUFFIX DEFINES ADDITIONAL FEATURES OR SPECIAL CONSTRUCTIONAL DETAILS.

- G** GALVANISED STEEL CONSTRUCTION.
- A** ALUMINIUM CONSTRUCTION.
- P** POLYESTER POWDER COAT.
- X** SPECIAL CONSTRUCTION - REFER TO EQUIPMENT SCHEDULE FOR DETAILS.

WEIGHT

LOUVRE WEIGHTS ARE GIVEN ON THE EQUIPMENT SCHEDULE. APPROXIMATELY:
104kg/M² GALVANISED CONSTRUCTION
74kg/M² ALUMINIUM CONSTRUCTION

ACOUSTIC PERFORMANCE

SOUND REDUCTION INDEX: BS EN ISO 10140 - 2

63	125	250	500	1000	2000	4000	8000	Hz
7	8	13	19	33	39	37	30	dB

SPECIFICATION

PRESSURE LOSS

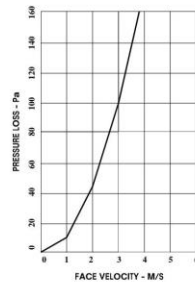
LOUVRES ARE CONSTRUCTED FROM FOLDED SHEET METAL AND HAVE A SERIES OF HORIZONTAL BLADES CONTAINED WITHIN A FOUR SIDED EXTERNAL FRAME.

THE MATERIAL OF CONSTRUCTION MAY BE PRE-GALVANISED STEEL (SUFFIX G) OR ALUMINIUM (SUFFIX A).

GALVANISED BIRD SCREENS ARE FITTED AS STANDARD.

CASING SIDES ARE PROVIDED WITH 10mm DIA HOLES FOR FIXING ADJACENT SECTIONS TOGETHER, OR FIXING THE LOUVRE INTO THE BUILDERSWORK OPENING.

LOUVRES ARE SUPPLIED SELF FINISH AS STANDARD OR WITH AN OPTIONAL POLYESTER POWDER FINISH (SUFFIX P).



NOTES

STANDARD SIZES

THIS DATA SHEET IS TO BE READ IN CONJUNCTION WITH THE EQUIPMENT SCHEDULE.

WIDTH (**W**) AND HEIGHT (**H**) DIMENSIONS GIVEN ON THE EQUIPMENT SCHEDULE ARE AS MANUFACTURED. ADEQUATE CLEARANCE MUST BE ALLOWED WHEN CONSTRUCTING THE BUILDERSWORK OPENING. A MINIMUM OF 10 mm IS RECOMMENDED.

LOUVRES WILL BE SUPPLIED WITHOUT SUPPORT STEELWORK, CLEATS, BRACKETS, FIXINGS, FLASHING, MASTIC, OR OTHER SUCH ITEMS, UNLESS OTHERWISE STATED.

EXCESSIVELY LARGE OR HEAVY LOUVRES MAY BE MANUFACTURED IN MATING SECTIONS FOR EASE OF HANDLING.

LOUVRES ARE MANUFACTURED TO STANDARD SHEET METAL TOLERANCES OF +/- 3 mm.

THERE ARE NO STANDARD SIZES. ALL LOUVRES ARE MADE TO ORDER.

ALLWAY ACOUSTICS LIMITED Old Police Station, 1 Queens Road, Hertford SG14 1EN
 T | 01992 550825 E | enquiries@allwayacoustics.co.uk W | allwayacoustics.co.uk

Sound Reduction Level of Acoustic Enclosure

LZ _{Feq} Frequency Spectral Data (dB) at 1m								
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Minimum Attenuation from Acoustic Enclosure	7	8	13	19	33	39	37	30