

New Residential Development

**53-55 The Broadway,
Joel Street, Northwood.**

Noise Impact Assessment

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Noise Impact Assessment Proposed Change of Use and New Residential Development	
Project Address:	53-55 The Broadway Joel Street Northwood
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1. INTRODUCTION

- 1.1 Acoustics Plus Ltd (APL) is an independent firm of multi-disciplinary acoustic engineers. 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 Westcombe Homes to assess the erection of a three storey building to provide 3 x 1 bedroom and 4 x 2 bedroom residential units with associated parking and bin and cycle storage, involving alterations to existing crossover.
- 1.3 It is understood that the Local Planning Authority (LPA) will require more information, specifically in regard of noise. It is further understood that the noise matters are in connection with the proposed new residential accommodations proximity to nearby highways and commercial activities.
- 1.4 The object of this report is to determine environmental noise levels at the site in accordance with Government planning policy guidance. Outline comments regarding any noise control measures will also be provided to demonstrate that the ingress of noise may be properly controlled.
- 1.5 The report will give due regard to the following documents:
 - (a) *National Planning Policy Framework February 2019 – Ministry of Housing Communities & Local Government;*
 - (b) *Noise Policy Statement for England (NPSE) March 2010 – Department for Environment, Food and Rural Affairs;*
 - (c) *ProPG: Planning and Noise May 2017 Professional Practice Guidance on Planning and Noise;*
 - (d) *BS8233:2014 “Sound insulation and noise reduction for buildings – Code of Practice”.*
 - (e) *Hillingdon Council planning permission reference 5564/APP/2020/847*
- 1.6 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.
- 1.7 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.
- 1.8 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 located at 53-55 The Broadway, Joel Street, Northwood. The site plan is shown in Diagram 1 (highlighted in red).

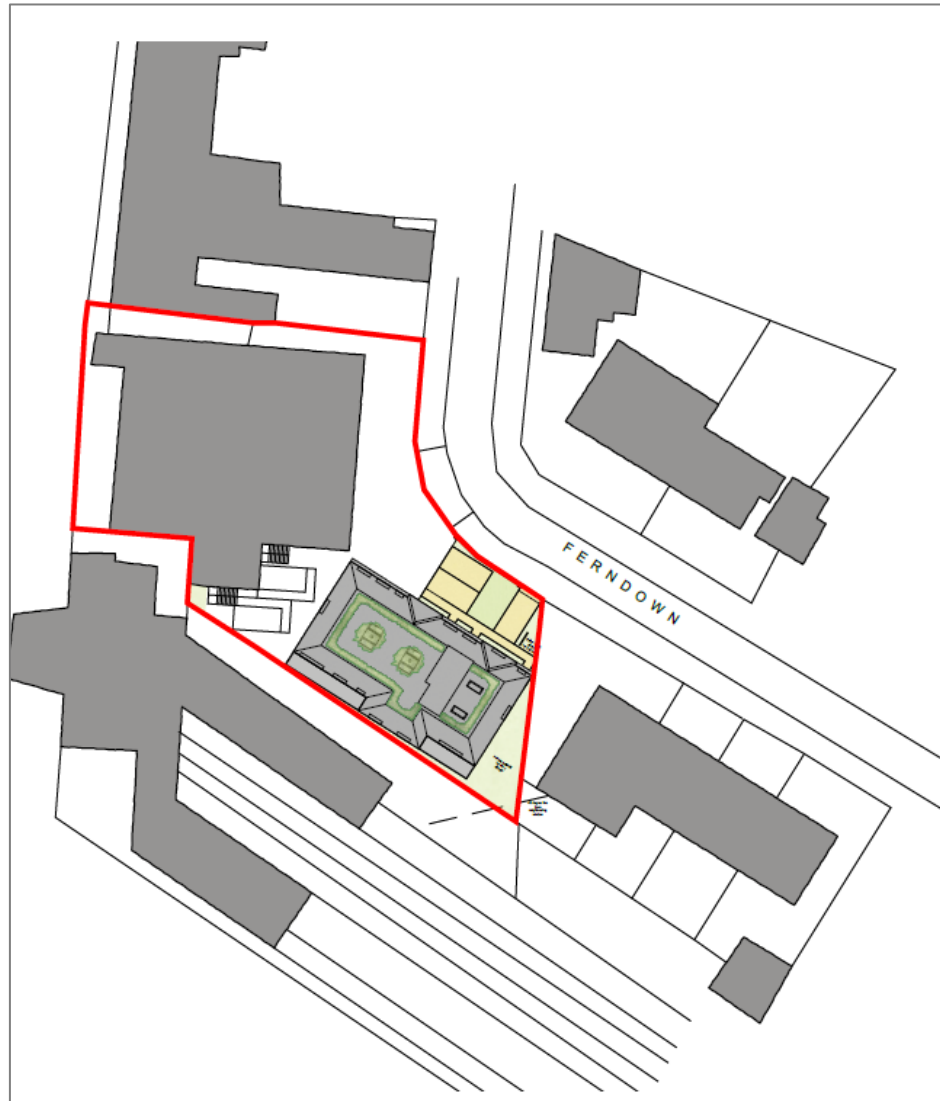


Diagram 1

- 2.2 It is understood that the proposals seek to erect a three storey building to provide 3 x 1 bedroom and 4 x 2 bedroom residential units with associated parking and bin and cycle storage, involving alterations to existing crossover.
- 2.3 Hillingdon Council has imposed 2 conditions relating to noise on the proposed development. The relevant conditions are reported verbatim overleaf.

Condition 15

“The noise level in rooms at the development hereby approved shall meet the internal noise levels specified in BS8233:2014 for internal rooms and external amenity areas.”

REASON

To safeguard the amenity of the occupants of surrounding properties in accordance with DMHB 11 of the Hillingdon Local Plan: Part 2 - Development Management Policies (January 2020) and Policy 7.15 of the London Plan (March 2016).

Condition 16

“No development shall commence until a scheme for protecting the proposed development from noise generation at nearby commercial uses has been submitted to and approved in writing by the Local Planning Authority. All works which form part of the scheme shall be fully implemented before the development is occupied and thereafter shall be retained and maintained in good working order for so long as the building remains in use.”

REASON

To ensure that the amenity of the occupiers of the proposed development is not adversely affected by noise in accordance with DMHB 11 of the Hillingdon Local Plan: Part 2 - Development Management Policies (January 2020) and Policy 7.15 of the London Plan (March 2016).

- 2.4 The proposal would result in the creation of new dwellings surrounded by mixed commercial and residential use.
- 2.5 The site and its surroundings can be seen in Figures 1 to 8.

3. NOISE CRITERIA

New residential accommodation – Condition 15

- 3.1 The National Planning Policy Framework (NPPF) released in February 2019 has replaced planning policy guidance which previously covered planning and pollution control and new development in England. The purpose of the planning system is to contribute to the achievement of sustainable development. There are three dimensions to sustainable development: economic, social and environmental. The environmental role is to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.
- 3.2 One of the core planning principles is to contribute to conserving and enhancing the natural environment and reducing pollution. Planning policies and decisions should contribute to and enhance the natural and local environment by:
- (a) *protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);*
 - (b) *recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland.*
 - (c) *maintaining the character of the undeveloped coast, while improving public access to it where appropriate.*
 - (d) *minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.*
 - (e) *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*
 - (f) *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*

3.3 Paragraph 180 of the NPPF states Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- (a) *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life (see Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010));*
- (b) *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 (see Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010));*
- (c) *limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

3.4 The Noise Policy Statement for England (NPSE) was developed by DEFRA and published in March 2010. The vision of the NPSE is to 'Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development.

3.5 The NPSE aims to 'Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- (a) *avoid significant adverse impacts on health and quality of life;*
- (b) *mitigate and minimise adverse impacts on health and quality of life; and*
- (c) *where possible, contribute to the improvement of health and quality of life'.*

- 3.6 The Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The recommended ProPG internal noise level guidelines are described in Table 1. These guidelines reflect and extend current practice contained in BS8233:2014 (Sound Insulation and Noise Reduction for Buildings – Code of Practice). For clarity, blue italic font is used to highlight additions to the guidance contained in Table 4 of BS8233:2014. The dB values provided in the table for different activities are target levels. The table plus supporting notes are referred to as ProPG internal noise level guidelines.

Activity	Location	07:00-23:00hrs	23:00-07:00hrs
Resting	Living room	35dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,8hr}$ 45dB $L_{Amax,F}$

Table 1

*NOTE 1 The Table provides recommended **internal L_{Aeq} target** levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.*

*NOTE 2 The **internal L_{Aeq} target** levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the **internal L_{Aeq} target** levels recommended in the Table.*

*NOTE 3 These **internal L_{Aeq} target** levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.*

*NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. **In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).***

*NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal **L_{Aeq} target** levels should not normally be exceeded, subject to the further advice in Note 7.*

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as “unreasonable”. Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as “unacceptable” by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing “unacceptable” noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (see Section 3.D).

BS4142:2014 – Condition 16

- 3.7 BS4142:2014 provides methods for rating and assessing sound of an industrial and/or commercial nature, which includes sound from industrial and manufacturing processes, fixed services plant, sound generated by the loading/unloading of goods and sound from mobile plant / vehicles associated with industrial/commercial premises (e.g. fork-lift trucks).
- 3.8 The magnitude of impact is assessed by subtracting the measured background sound level at a location representative of the nearest noise-sensitive receiver, from the ‘rating level’ (the specific sound source to be introduced into the locality, corrected for acoustically distinguishing characteristics which may make it more subjectively prominent)
- 3.9 Typically, the greater the difference between the background and rating level, the greater the magnitude of impact, although BS 4142 emphasises that this is highly context-specific. As a guideline, BS4142 states that:
- *A difference (between the background and rating level) of around +10 dB or more is likely to be indicative of significant adverse impact, depending on context.*
 - *A difference (between the background and rating level) of around +5 dB or more is likely to be indicative of adverse impact, depending on context.*
 - *The lower the rating level relative to the background level, the less likely it is that the specific sound will have an adverse impact.*
- 3.10 BS 4142 uses several specific terms to define the various levels used in assessments, as follows:
- *Specific sound – the commercial / industrial noise source under consideration.*
 - *Residual sound – the sound level at the noise-sensitive receivers in the absence of the specific sound.*
 - *Ambient sound – the sound level at the noise-sensitive receivers in the presence of the specific sound (i.e. ambient = residual + specific).*
 - *Background level - the sound pressure level which is exceeded by the residual sound for 90% of the measurement period.*
 - *Rating level the specific sound corrected for acoustically distinguishing characteristics.*
- 3.11 Where the rating level does not exceed the background level, this is an indication that the specific sound will have a low impact, depending on context.

4. ADJACENT COMMERCIAL USES

- 4.1 The proposal to erect a new building to provide 7 new apartments will need to consider commercial uses impacting the proposed residential accommodation. An image showing the location of the proposed new building to be erected (yellow) and notable adjacent commercial premises (red) are shown in Diagram 2.

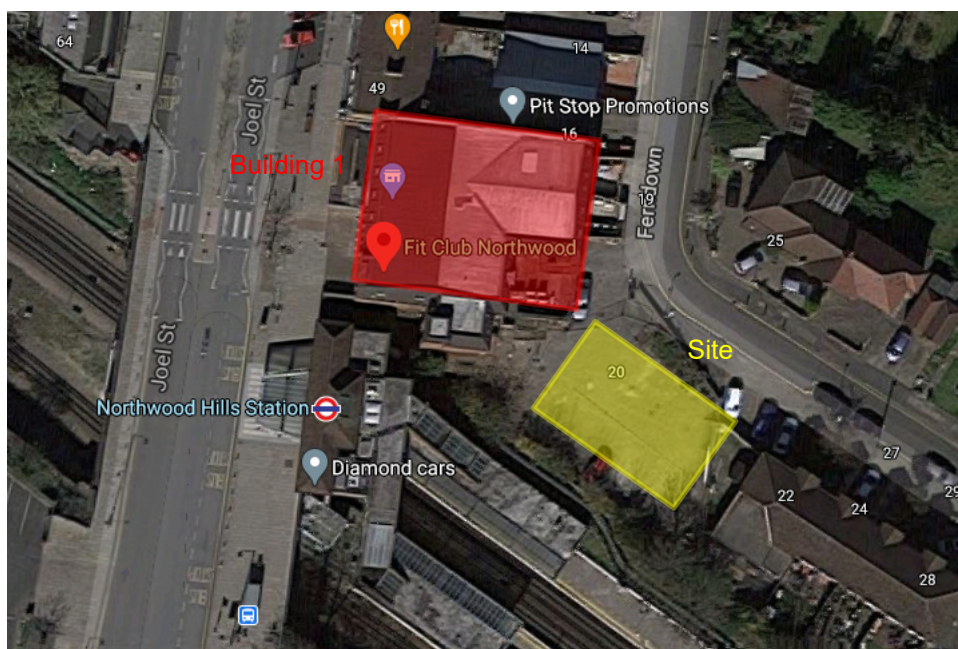


Diagram 2

- 4.2 The commercial premises highlighted above are described below in Table 2 below.

Building	Business	Noise sources
1	Fit Club Northwood	Gym operating 24 hours 7 days per week. audible fixed installation of mechanical plant.
Site	3 storey building	7 apartments with roof top amenity space

Table 2

- 4.3 The general noise climate was dominated by road traffic noise from Joel Street and the adjacent railway station (Northwood Hill station). There were low levels of condenser noise audible during the attended survey but given the gym is currently closed due to Covid-19 lockdown restrictions, the installation of mechanical plant was not in full operation.

5. NOISE OUTLINE

- 5.1 In order to determine the environmental noise level, consideration should be given to the noise levels on the site from the presence of commercial activities and urban traffic movements.
- 5.2 Given the location of the proposed development, unattended measurements were obtained externally at second floor roof level on the fire escape of the adjacent site. This location was considered to be indicative of the proposed residential accommodation that will be exposed to the noise sources affecting the site.
- 5.3 The particulars of the measurement exercise are recorded below:

Date: 8th to 10th February 2021
Start Time: 09:50hrs
Location: Rear fire escape, 51 The Broadway, Northwood

- 5.4 The full noise measurement data obtained during the measurement exercise is presented in Appendix A, with a level vs time summary of the noise data measurements obtained being presented in Diagram 3 below.

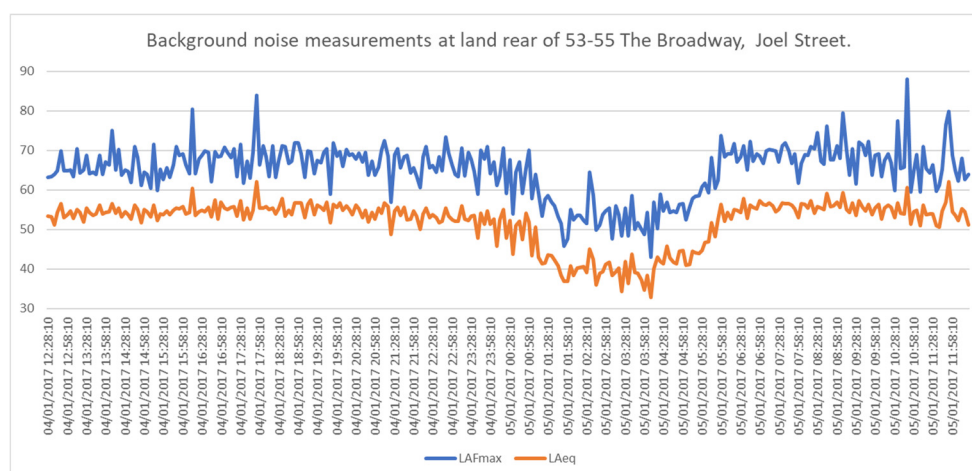


Diagram 3

- 5.5 The main noise source during the measurement exercise was from external traffic movements along Joel Street and train movements through adjacent railway station.

6. EQUIPMENT

6.1 All measurements were obtained using the following equipment:

- Svantek Svan 971 Serial No 51704
- Rion Calibrator Type NC-74 Class 1 Serial No. 00410215

6.2 The relevant equipment carries full and current traceable calibration. The equipment, where necessary, was calibrated prior to and after the measurements were carried out.

7. RESULTS

7.1 The measurements obtained during the internal noise measurement exercise have been averaged on an energy basis in accordance with the time periods outlined in BS8233:2014. The summary results are shown in Table 3 below, the worst case time periods with the highest measured average noise level obtained during the measurement exercise have been considered. The full data set (level vs time) is shown in Diagram 3.

Location	07:00 to 23:00 $L_{Aeq,16hour}$, dB	23:00 to 07:00 $L_{Aeq,8hour}$, dB	10 th highest L_{Amax} dB
2 nd floor fire escape, 51 The Broadway, Joel Street	55	50	69 ¹

Table 3

7.2 The measurements carried out during the exercise are recorded below.

$L_{Aeq, 5mins}$ (dB re 20 μ Pa) - average equivalent sound pressure level

$L_{Amax 5mins}$ (dB re 20 μ Pa) – maximum sound pressure level

7.3 These measurements have been obtained while Covid-19 tier restrictions were in place and while it may be plausible that a correction could be applied to the measurement data to account for possible lower amounts of commercial activity around the site, the commercial operations identified in Diagram 2 were closed due to Covid-19 lockdown restrictions.

¹ From the 24-hr data, the 10th highest $L_{Amax,F}$ measurement during the 8-hr night period at the façade has been considered, this is taken from WHO Guidelines for Community Noise – which states “For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times per night” (Vallet and Vernet 1991).

- 7.4 A previous assessment produced by APL to assess the noise impact of the proposed gym before it first opened and reported in APL assessment reference 103305.ph.Issue3 dated 6th June 2017 provided outline advice in order to contain the gym activity noise within the building envelope. It is understood that these works have been implemented and no complaints have been received from the adjacent neighbouring residential properties.
- 7.5 Based on measurements reported in APL assessment 103305.ph.Issue3, road and rail traffic levels indicate very little change in noise levels from those levels obtained in 2017 and during the most recent Covid-19 lockdown, so, no correction to the noise data reported within Table 3 is required.
- 7.6 APL report 103305.ph.Issue3 established a noise emission criteria for the proposed installation of mechanical plant (as the full scheme was yet to be finalised). The installation is now complete and operational but as the gym is currently closed no actual measurements of the installed plant could be obtained and full details of the installed plant was not available. APL have considered typical noise outputs from similar sized condensers provided by Mitsubishi and Fujitsu in order to assess the possible noise impact on the new residential dwellings.

Outside amenity spaces

- 7.7 When considering external noise levels and the noise levels experienced within the proposed amenity areas, BS8233:2014 "Guidance on sound insulation and noise reduction for buildings" states:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

- 7.8 Further, World Health Organisation (WHO) "Guidelines on Community Noise" suggests a maximum external noise level of 55 dB(A) LAeq between 7am and 11pm.
- 7.9 Onsite noise measurements show that the external amenity areas proposed at the rear experience average noise levels of 55dB during the daytime period. This level meets the upper limit recommended by WHO "Guidelines on Community Noise". It is noted that there are balconies proposed. When a terraced balcony is located where the noise source is at a low level compared with balcony height, the degree of noise attenuation is between 4dB and 7dB assuming the surrounding balustrade is continuous (but not enclosed). The roof top amenity space will also be screened by the portion of pitched roof that surrounds the space. This would help reduce the measured noise impact on the proposed balconies and amenity space to below the guidelines outlined in BS8233 / WHO.

8. BS4142 ASSESSMENT

- 8.1 The general noise climate was dominated by road traffic and railway noise around the site. There were no specific sound sources audible during the attended survey visits at the rear façade of the existing building.
- 8.2 A numerical BS4142 assessment is, therefore, not possible because no specific sound sources could be identified and measured. However, in order to account for the potential impact from the mechanical plant serving the gym, consideration has been given to the items of plant in photo 1 below.



Photo 1



Photo 2

8.3 The type and model number of the units installed are not known but from photo 1 the following units have been considered (a copy of the manufacturers data sheets is contained within Appendix B).

- *Small single fan Fujitsu AOYG12LALL (unit 1) at 50dBA @ 1m*
- *Small single fan Fujitsu AOYG12LALL (unit 2) at 50dBA @ 1m*
- *Double unit Mitsubishi PURY P350YNW-A (unit 3) at 63dBA @ 1m*
- *Twin fan 1 Fujitsu AOYG72LRLA (unit 4) at 53dBA @ 1m*
- *Twin fan 2 AOYG72LRLA (unit 5) at 53dBA @ 1m*
- *Big single fan Fujitsu AOYG24LALA (unit 6) at 54dBA @ 1m*
- *Big single fan Fujitsu AOYG24LALA (unit 7) at 54dBA @ 1m*

8.4 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.

8.5 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.

8.6 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.”

8.7 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.”

8.8 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.”

8.9 And goes on to note:

“In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.

Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes. Furthermore, in this general context it can also be necessary to separately assess weekends and weekday periods.”

8.10 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.”*

8.11 The standard also notes 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.”

8.12 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.”

- 8.13 The background noise levels were assessed using statistical analysis of the measured data, as directed in BS4142. The histograms can be seen in Diagrams 4 and 5.

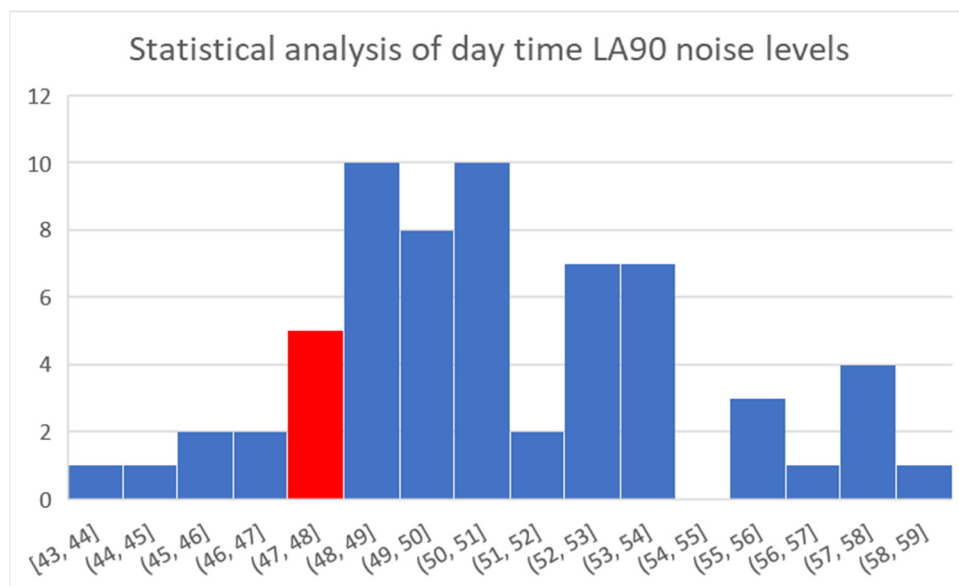


Diagram 4

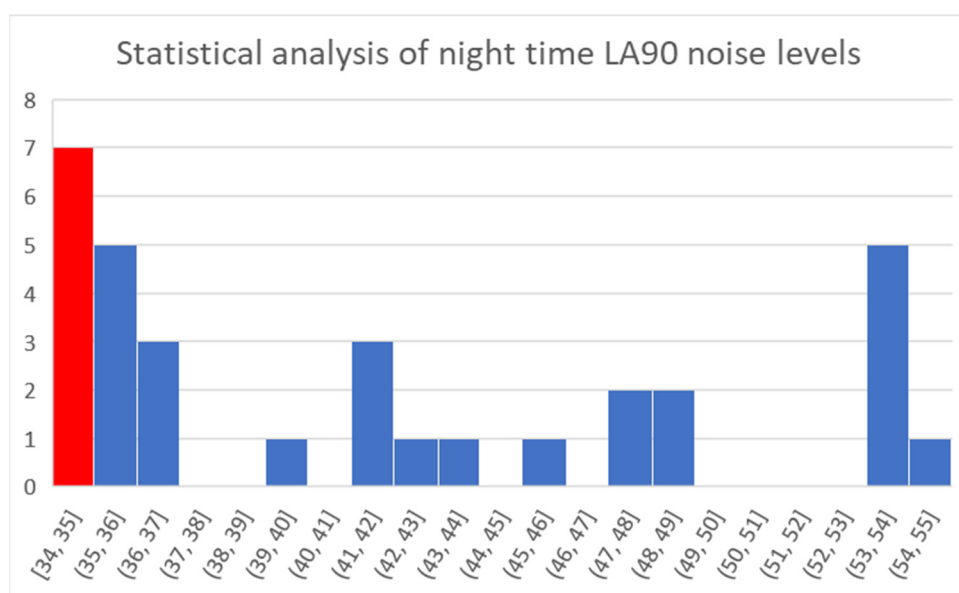


Diagram 5

- 8.14 The background noise levels vary during the day and night time periods. It is understood that the gym operates 24hrs a day. The most commonly occurring background noise level during the day time period was 48-50dB $L_{A90,15min}$. and during the night time period was 34dB $L_{A90,15min}$. Given the condenser units could operate at any time during the trading hours, it is considered that a representative background sound level of 47dB L_{A90} is deemed appropriate for the day time and 34dB L_{A90} for the night time periods.
- 8.15 The plant noise emission criteria that should not be exceeded is therefore based on Diagrams 4 and 5 and is shown in Table 4 below. This level should not be exceeded at the nearest noise sensitive façades and is indicative of being less or equal to the considered background noise. At such a level, there is an indication that the specific sound source will have a low impact.

Noise emission limit for mechanical plant	
Day time operation (07:00 to 23:00)	$L_{Aeq} \leq 48dB$
Night time operation (23:00 to 07:00)	$L_{Aeq} \leq 34dB$

Table 4

- 8.16 In considering the propagation of noise from the condensers, consideration was given to their location and number of reflecting planes and point source propagation to the nearest noise sensitive window (location of nearest noise sensitive window would be Bedroom 1 of Flat 7 on the second floor of the new residential block).
- 8.17 Noise leaving the condenser units was propagated over the relevant distance reported to the nearest noise sensitive façade (distance taken from scaled drawings and measurements obtained onsite).
- 8.18 To account for the location of the units being fixed to a wall or located on the hard surface of the roof top plant area, the noise output of the units was corrected to account for the reflecting plane behind and below the units.
- 8.19 The following corrections were accounted for to determine a rating level:

Results	Correction	Relevant clause	Commentary
On time correction	-3dB	7.3.14	The condensers are likely to switch on and off as required on a demand for heating/cooling basis. The condenser is assumed to be operating for half the assessment period during the day and night time periods
Acoustic feature corrections	+2dB	9.2	Just perceptible tonality
	+3dB	9.2	Readily distinctive intermittency

Table 5

8.20 The calculation exercise is highlighted in Tables 6-13 below.

Unit 1	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Fujitsu AOYG12LALL	53	49	46	49	46	42	34	25	50
Reflective plane correction (x2)	+6	+6	+6	+6	+6	+6	+6	+6	
Distance attenuation (9.5m)	-20	-20	-20	-20	-20	-20	-20	-20	
BS4142 feature correction	+2	+2	+2	+2	+2	+2	+2	+2	
Façade level	41	37	34	37	34	30	22	13	39

Table 6

Unit 2	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Fujitsu AOYG12LALL	53	49	46	49	46	42	34	25	50
Reflective plane correction (x2)	+9	+9	+9	+9	+9	+9	+9	+9	
Distance attenuation (9.5m)	-20	-20	-20	-20	-20	-20	-20	-20	
BS4142 feature correction	+2	+2	+2	+2	+2	+2	+2	+2	
Façade level	44	40	37	40	37	33	25	16	42

Table 7

Unit 3	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Mitsubishi PURY P350YNW-A	69	64	64	62	57	52	47	40	63
Reflective plane correction (x2)	+3	+3	+3	+3	+3	+3	+3	+3	
Distance attenuation (8.5m)	-19	-19	-19	-19	-19	-19	-19	-19	
BS4142 feature correction	+2	+2	+2	+2	+2	+2	+2	+2	
Façade level	55	50	50	48	43	38	33	26	49

Table 8

Unit 4	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Fujitsu AOYG72LRLA	61	63	52	49	46	44	42	38	53
Reflective plane correction (x2)	+3	+3	+3	+3	+3	+3	+3	+3	
Distance attenuation (5.5m)	-15	-15	-15	-15	-15	-15	-15	-15	
BS4142 feature correction	+2	+2	+2	+2	+2	+2	+2	+2	
Façade level	51	53	42	39	36	34	32	28	43

Table 9

Unit 5	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Fujitsu AOYG72LRLA	61	63	52	49	46	44	42	38	53
Reflective plane correction (x2)	+3	+3	+3	+3	+3	+3	+3	+3	
Distance attenuation (6.5m)	-16	-16	-16	-16	-16	-16	-16	-16	
BS4142 feature correction	+2	+2	+2	+2	+2	+2	+2	+2	
Façade level	50	52	41	38	35	33	31	27	42

Table 10

Unit 6	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Fujitsu AOYG24LALA	68	57	52	53	48	44	39	34	54
Reflective plane correction (x2)	+3	+3	+3	+3	+3	+3	+3	+3	
Distance attenuation (5.5m)	-15	-15	-15	-15	-15	-15	-15	-15	
BS4142 feature correction	+2	+2	+2	+2	+2	+2	+2	+2	
Façade level	58	47	42	43	38	34	29	24	44

Table 11

Unit 6	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Fujitsu AOYG24LALA	68	57	52	53	48	44	39	34	54
Reflective plane correction (x2)	+3	+3	+3	+3	+3	+3	+3	+3	
Distance attenuation (6.5m)	-16	-16	-16	-16	-16	-16	-16	-16	
BS4142 feature correction	+2	+2	+2	+2	+2	+2	+2	+2	
Façade level	57	46	41	42	37	33	28	23	43

Table 12

Total noise impact	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Unit 1	41	37	34	37	34	30	22	13	39
Unit 2	44	40	37	40	37	33	25	16	42
Unit 3	55	50	50	48	43	38	33	26	49
Unit 4	51	53	42	39	36	34	32	28	43
Unit 5	50	52	41	38	35	33	31	27	42
Unit 6	58	47	42	43	38	34	29	24	44
Unit 7	57	46	41	42	37	33	28	23	43
Impact at Flat 7 bedroom 1 window	62	58	52	51	47	43	38	33	53

Table 13

- 8.21 In order to demonstrate a low adverse noise impact, any noise from the installation of mechanical plant should not exceed a level of 34 dBA at 1m during the night time period at the nearest noise sensitive facade.
- 8.22 The calculated noise impact is 53dBA. The calculation exercise (Table 13) demonstrates that the proposed installation exceeds the criteria by 19dB. In this instance the rating level is 19dB above the statistically considered background noise level, providing an indication of a significant adverse impact.
- 8.23 APL would recommend that an acoustic fence is erected around the perimeter of the plant compound to screen the new residential development from the installation of mechanical plant and that mechanical ventilation is installed to service accommodation that has line of sight with the gym / plant compound so that windows do not have to be opened to provide ventilation.
- 8.24 The provision of an acoustic barrier should reduce the noise impact by a minimum of 10dB this assumption has been taken 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. “*

- 8.25 The use of an acoustic barrier will lower the indication from a significant adverse impact to one indicating an adverse impact, dependent on the context. In this instance the windows of rooms facing the installation of mechanical plant will not need to be opened for ventilation as mechanical ventilation is to be provided. The noise impact from the mechanical plant will result in internal noise levels significantly below the recommendations of BS8233.

9. BUILDING ENVELOPE RECOMMENDATIONS

- 9.1 With regard to site noise levels, the average daytime and night-time noise levels recorded are detailed in Table 3 above and the full measurement results are presented in Appendix A.
- 9.2 It is recommended that in order to meet the LPA requirements, acoustic fenestration and ventilation measures be considered in order to protect the daytime and night-time amenity of future occupiers. It is recommended that mechanical ventilation be provided to the dwellings with line of sight of the gym and its plant compound. As such, trickle ventilation elements will not need to be considered within the calculation exercises for these rooms but will need to be considered for the habitable rooms with no line of sight.
- 9.3 To reduce daytime and night-time noise exposure in the proposed dwelling, attention should be given to the sound insulation of the façade of the building. The windows and trickle vents will normally be the weakest elements of any façade.
- 9.4 Based on the drawings supplied, it is anticipated the proposed new brick / block cavity walls will have an insulation value of around R_w 57dB and the pitched roof will have an insulation value of around R_w 61dB. These performance values were obtained from proprietary prediction software 'Insul' written by Marshall Day, the values predicted have been corrected by -6 and -9dB respectively to account for workmanship and onsite installation. A copy of the prediction outputs for each construction considered is contained within Appendix C of this report. Given the external noise levels it is recommended that the glazing performances be considered. This will provide the necessary sound insulation values to reduce the internal noise levels to an acceptable level.
- 9.5 **If the considered constructions are to be amended or changed, the performance values should be checked prior to construction to ensure the internal noise level requirements of BS8233:2014 are still met.**
- 9.6 From the calculated levels it is possible to predict the internal noise levels within habitable rooms. In order to undertake this, consideration has been given to the following formula:

$$SPL_{in} = SPL_{out} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S}{A} \right) + 3$$

where:	SPL_{in} =	sound pressure level inside the room
	SPL_{out} =	highest sound pressure level outside the room
	A_0 =	reference absorption area of 10m ²
	S_{wi} =	area in m ² of the windows of the room
	S_{ew} =	area in m ² of the external wall of the room
	R_{wi} =	weighted sound reduction index of window ($R_w + C_{tr}$)
	R_{ew} =	weighted sound reduction index of external wall
	S =	area through which sound is transmitted (m ²)
	A =	amount of acoustic absorption in room (m ²)
	K =	a numerical factor associated with sound incidence

Equation 1

- 9.7 Room dimensions and the size of windows have been extracted from scaled drawings. For the purposes of the calculation exercise, a typical example of each room type (kitchen / lounge and bedroom) within the development has been considered.
- 9.8 Due to the varying methods of quantifying the sound insulation performance of building elements, the following parameter is utilised and has been calculated in accordance with the rigorous method as per section G.2.1 of BS8233:2014.
- *R_w Weighted Sound Reduction Index: Single figure sound insulation value derived from the measured sound reduction index R.*
- 9.9 To meet the criteria, Equation 1 was rearranged in terms of R_w (the sound reduction index of the window – glass and frame combined). This is considered to be the weakest façade element. In order to achieve the required internal level, the sound reduction index of the windows should exceed the values detailed in Table 14. The full calculations are shown in Appendix D.

Location	Sound Reduction Index (R _w)	D _{n,e,w} (dB)
Flat 1 (living)	34	Mechanical
Flat 1 (bedroom)	34	33
Flat 7 (living)	34	Mechanical
Flat 7 (bedroom)	34	Mechanical
Flat 6 (living)	34	33
Flat 6 (bedroom)	34	33

Table 14

- 9.10 To achieve the values of R_w as specified in Table 14, a number of glazing systems were considered.
- 9.11 The required window performance could be achieved using the following glazing configuration (taken from Guardian Glass):

Required window performance	Glazing configuration (example)
Acoustic performance	6mm float glass
Living rooms and bedrooms	10mm cavity
34dB R _w	4mm Float glass

Table 15

- 9.12 To achieve the D_{n,e,w}, as specified in Table 3, A Simon Acoustics FV ventilator (D_{n,e,w} 33dB) was considered. Other ventilators with equal or better performance are available. For the benefit of the calculation exercise, 2no. vents were considered for the lounge / kitchen diners and 1no vent was considered for the bedrooms.

- 9.13 A suggested window and ventilation specification is detailed in Appendix E. This glass has published performance data. The published performance figures for the 'glass only' were obtained from laboratory measurements. The best workmanship practices and installation guidelines should be followed to ensure that the stated performances can be obtained once installed within a frame.
- 9.14 **To be confident that the internal noise levels are achieved, it is recommended that the glazing is over specified (not required where the predicted internal noise level is already 5dB below the requirements) to allow a 5dB workmanship tolerance, this is especially important at frequencies 125Hz and 250Hz. Alternatively, a window system (glass and frame) matching or exceeding the octave band performances considered within the calculation exercises would be acceptable.**

Purge Ventilation

- 9.15 Ventilation requirements for dwellings (and other buildings) are covered under the Building Regulations 'Approved Document F – Means of Ventilation, 2010 Edition1 (ADF). Unfortunately, ADF contains very little information on the potential interactions between ventilation and the acoustic design of dwellings.
- 9.16 ADF requires that:
- *"There shall be adequate means of ventilation provided for people in the building"*
 - *"Ventilation is simply the removal of 'stale' indoor air from a building and its replacement with 'fresh' outside air".*
- 9.17 Ventilation is required for one or more of the following purposes:
- a) *Provision of outside air for breathing.*
 - b) *Dilution and removal of airborne pollutants, including odours;*
 - c) *Control of excess humidity (arising from water vapour in the indoor air).*
 - d) *Provision of air for fuel-burning appliances (which is covered under Part J of the Building Regulations).*
- 9.18 Ventilation may also provide a means to control thermal comfort but this is not controlled under the Building Regulations. Part L addresses minimising energy use due to the effects of solar gain in summer.'

- 9.19 ADF describes three types of ventilation provision and associated ventilation rates. The types of ventilation are summarised below:

Type of ventilation	Location / Reason for ventilation	When is this required
Whole Dwelling Ventilation	To provide fresh air to the building and to dilute and disperse residual water vapour not dealt with by extract ventilation as well as removing water vapour and other pollutants which are released throughout the building	Continuously
Extract Ventilation	From rooms where most water vapour and/or pollutants are released, e.g. due to activities such as cooking, bathing or photocopying. This is to minimise their spread to the rest of the building.	Continuous or Intermittent
Purge Ventilation	Throughout the building to aid removal of high concentrations of pollutants and water vapour released from occasional activities such as painting and decorating or accidental releases such as smoke from burnt food or spillage of water.	Occasionally

Table 16

- 9.20 It is recommended to install 'passive ventilation' to the residential units with no line of sight of the gym /plant compound and mechanical ventilation to those rooms with line of sight of the gym / plant compound.
- 9.21 In addition to the above ADF also states:
- *"Purge ventilation provisions may also be used to improve thermal comfort, although this is not controlled under the Building Regulations."*
- 9.22 With reference to the provision of purge ventilation within habitable rooms, the approved document provides the following note. 'There may be practical difficulties in achieving this (e.g. if unable to open a window due to excessive noise from outside).' However, no objective guidance is provided in the Approved Document as to what constitutes "excessive noise" or how to resolve the practical difficulties
- 9.23 Given the measured noise levels at the site and during occasions when purge ventilation is required with the windows open it should be noted that the acoustic performance of the building envelope will be reduced, typically reducing the insulation to no more than 10 to 15 dB(A). Most residents value the ability to open windows at will, for a variety of reasons but the internal target noise levels can only be practically achieved with windows closed. This is the case as this site is in an area adjacent to transportation and commercial noise sources.
- 9.24 It should also be noted that the internal noise level guidelines are generally not applicable under "purge ventilation" conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).

10. CONCLUSIONS

10.1 With regard to commercial noise impacting the proposed site and addressing planning condition No.16, it can be concluded that:

- a) *Specific consideration has been given to the installation of mechanical plant that services the gym use. A numerical BS4142 assessment was not possible because no specific sound sources could be identified and measured due to Covid lockdown.*
- b) *In predicting the noise impact from the installed mechanical plant, the rating level is 19dB above the considered background noise level, indicating a significant adverse impact.*
- c) *The suggested mitigation measures are to erect an acoustic barrier to screen the new development from the plant compound and to ensure mechanical ventilation is provided to all habitable rooms that overlook the plant compound. This ensures ventilation can be provided without the need to open windows and that the ingress of noise from the installation of plant is significantly below the requirements of BS8233. A copy of the calculation sheets is contained within Appendix D.*

10.2 With regard to transportation noise sources and to address Condition No.15, it can be concluded that:

- a) *Glazing with the appropriate acoustic performance would provide sufficient attenuation from noise levels generated from the adjacent highways and reduce internal noise levels to meet the levels stated within ProPG, BS 8233:2014 and WHO guidelines for Community.*
- b) *The required level of sound insulation needed to achieve this internal level is based on the proposed building envelope make up.*
- c) *Glazing systems with acoustic performances as detailed in Table 14 for living /kitchen/diners and bedrooms would provide sufficient attenuation to reduce internal noise levels to meet the minimum requirements recommended within ProPG, BS8233:2014 and World Health Organisation (WHO) guidelines.*
- d) *Passive ventilation is proposed for the residential habitable rooms with no line of sight of the gym/plant compound and all other habitable rooms with line of sight of the compound will have mechanical ventilation to provide adequate background ventilation and to avoid having to open windows. Ventilators with the relevant acoustic performance (Table 14) would provide sufficient attenuation to reduce internal noise levels to meet the minimum requirements recommended within ProPG, BS8233:2014 and World Health Organisation (WHO) guidelines.*
- e) *Outside amenity spaces and balconies / terraces will experience noise levels below the upper limit recommended by WHO "Guidelines on Community Noise."*

Figures

53-55 The Broadway, Joel Street, Northwood and surrounding area



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



Figure 7



Figure 8

Appendix A

No.	Date & time	LAeq [dB]	LA90
2	04/02/2021 10:48:16	55	50
3	04/02/2021 11:03:16	60	58
4	04/02/2021 11:18:16	59	57
5	04/02/2021 11:33:16	59	57
6	04/02/2021 11:48:16	63	58
7	04/02/2021 12:03:16	57	58
8	04/02/2021 12:18:16	55	46
9	04/02/2021 12:33:16	53	47
10	04/02/2021 12:48:16	54	48
11	04/02/2021 13:03:16	56	50
12	04/02/2021 13:18:16	56	53
13	04/02/2021 13:33:16	56	53
14	04/02/2021 13:48:16	55	50
15	04/02/2021 14:03:16	55	49
16	04/02/2021 14:18:16	54	49
17	04/02/2021 14:33:16	54	51
18	04/02/2021 14:48:16	55	50
19	04/02/2021 15:03:16	55	49
20	04/02/2021 15:18:16	55	49
21	04/02/2021 15:33:16	54	48
22	04/02/2021 15:48:16	54	50
23	04/02/2021 16:03:16	55	50
24	04/02/2021 16:18:16	54	50
25	04/02/2021 16:33:16	56	49
26	04/02/2021 16:48:16	58	54
27	04/02/2021 17:03:16	57	54
28	04/02/2021 17:18:16	57	54
29	04/02/2021 17:33:16	56	54
30	04/02/2021 17:48:16	56	53
31	04/02/2021 18:03:16	56	52
32	04/02/2021 18:18:16	57	52
33	04/02/2021 18:33:16	56	53
34	04/02/2021 18:48:16	56	53
35	04/02/2021 19:03:16	55	51
36	04/02/2021 19:18:16	56	51
37	04/02/2021 19:33:16	55	50
38	04/02/2021 19:48:16	55	51
39	04/02/2021 20:03:16	55	49
40	04/02/2021 20:18:16	56	51
41	04/02/2021 20:33:16	54	50
42	04/02/2021 20:48:16	54	50
43	04/02/2021 21:03:16	55	50
44	04/02/2021 21:18:16	56	53
45	04/02/2021 21:33:16	55	48
46	04/02/2021 21:48:16	55	45
47	04/02/2021 22:03:16	56	54
48	04/02/2021 22:18:16	56	54
49	04/02/2021 22:33:16	56	54
50	04/02/2021 22:48:16	56	53
51	04/02/2021 23:03:16	53	53
52	04/02/2021 23:18:16	54	47
53	04/02/2021 23:33:16	54	48
54	04/02/2021 23:48:16	53	46
55	05/02/2021 00:03:16	51	41
56	05/02/2021 00:18:16	53	39
57	05/02/2021 00:33:16	51	41
58	05/02/2021 00:48:16	51	41
59	05/02/2021 01:03:16	49	36
60	05/02/2021 01:18:16	44	35
61	05/02/2021 01:33:16	44	35
62	05/02/2021 01:48:16	45	35
63	05/02/2021 02:03:16	45	34
64	05/02/2021 02:18:16	44	36
65	05/02/2021 02:33:16	44	35
66	05/02/2021 02:48:16	44	34
67	05/02/2021 03:03:16	43	34
68	05/02/2021 03:18:16	47	34
69	05/02/2021 03:33:16	55	54
70	05/02/2021 03:48:16	54	53
71	05/02/2021 04:03:16	54	53
72	05/02/2021 04:18:16	54	53
73	05/02/2021 04:33:16	51	53
74	05/02/2021 04:48:16	45	34
75	05/02/2021 05:03:16	44	34
76	05/02/2021 05:18:16	43	34
77	05/02/2021 05:33:16	45	35
78	05/02/2021 05:48:16	48	36
79	05/02/2021 06:03:16	54	48
80	05/02/2021 06:18:16	52	42
81	05/02/2021 06:33:16	53	43
82	05/02/2021 06:48:16	53	47
83	05/02/2021 07:03:16	54	43
84	05/02/2021 07:18:16	56	48
85	05/02/2021 07:33:16	54	47
86	05/02/2021 07:48:16	54	47
87	05/02/2021 08:03:16	55	48
88	05/02/2021 08:18:16	55	49
89	05/02/2021 08:33:16	55	49
90	05/02/2021 08:48:16	56	51
91	05/02/2021 09:03:16	57	46
92	05/02/2021 09:18:16	59	56
93	05/02/2021 09:33:16	59	56
94	05/02/2021 09:48:16	61	56
95	05/02/2021 10:03:16	61	58
96	05/02/2021 10:18:16	56	49
97	05/02/2021 10:33:16	57	48
		Average	Minimum
Day		56	43
Night		51	34

No.	Date & time	LAFmax	LA90	LAeq	Leq 125 Hz	Leq 250 Hz	Leq 500 Hz	Leq 1000 Hz	Leq 2000 Hz	Leq 4000 Hz	Lmax 125 Hz	Lmax 250 Hz	Lmax 500 Hz	Lmax 1000 Hz	Lmax 2000 Hz	Lmax 4000 Hz
2	04/02/2021 10:28:16	64	51	55	55	54	52	51	46	45	63	62	62	60	54	63
3	04/02/2021 10:33:16	62	49	53	53	51	49	49	45	43	64	63	58	59	53	61
4	04/02/2021 10:38:16	70	50	55	54	53	51	51	48	42	66	65	63	60	63	69
5	04/02/2021 10:43:16	66	50	54	53	53	51	50	47	41	64	65	61	60	54	65
6	04/02/2021 10:48:16	62	50	54	52	51	50	50	46	41	69	66	62	60	55	52
7	04/02/2021 10:53:16	66	58	55	54	54	52	52	47	40	72	71	67	64	60	61
8	04/02/2021 10:58:16	67	58	54	55	54	51	50	46	43	69	68	66	64	57	57
9	04/02/2021 11:03:16	68	58	54	54	54	51	50	45	41	72	71	66	64	60	56
10	04/02/2021 11:08:16	65	57	59	54	56	58	54	49	41	71	65	64	62	59	54
11	04/02/2021 11:13:16	72	57	54	54	54	51	50	45	41	80	78	69	71	64	58
12	04/02/2021 11:18:16	70	58	59	56	59	59	54	49	43	70	73	71	68	63	61
13	04/02/2021 11:23:16	65	57	59	56	58	59	54	49	44	68	68	65	61	56	63
14	04/02/2021 11:28:16	64	57	59	54	57	58	54	49	42	65	65	63	61	57	56
15	04/02/2021 11:33:16	66	58	51	53	50	49	48	43	35	73	70	67	64	56	61
16	04/02/2021 11:38:16	75	58	53	53	53	49	50	46	39	78	75	75	72	69	72
17	04/02/2021 11:43:16	67	58	54	54	54	51	50	45	41	70	78	68	64	62	62
18	04/02/2021 11:48:16	75	58	59	55	57	59	54	49	45	71	73	74	74	69	68
19	04/02/2021 11:53:16	66	58	59	55	57	59	55	50	44	64	65	63	64	59	60
20	04/02/2021 11:58:16	67	47	56	55	55	55	52	47	41	68	65	66	65	60	60
21	04/02/2021 12:03:16	61	47	52	52	51	48	48	43	39	64	64	59	60	53	55
22	04/02/2021 12:08:16	63	46	52	52	49	48	48	44	40	65	62	61	60	55	52
23	04/02/2021 12:13:16	77	49	57	59	58	54	54	49	41	78	76	77	77	67	56
24	04/02/2021 12:18:16	63	50	54	54	54	51	50	45	41	64	65	61	61	56	56
25	04/02/2021 12:23:16	61	47	51	53	50	49	48	43	35	63	62	64	58	53	47
26	04/02/2021 12:28:16	64	47	55	55	54	53	51	46	39	69	66	63	62	62	60
27	04/02/2021 12:33:16	60	49	53	54	54	50	49	44	36	65	67	63	57	55	47
28	04/02/2021 12:38:16	63	48	53	53	52	50	49	45	37	63	66	61	60	56	50
29	04/02/2021 12:43:16	62	50	53	53	53	49	50	46	39	64	64	60	60	55	51
30	04/02/2021 12:48:16	63	49	54	53	53	51	50	46	40	64	65	67	61	56	53
31	04/02/2021 12:53:16	62	50	53	53	53	49	50	46	39	64	66	64	60	56	51
32	04/02/2021 12:58:16	69	52	57	56	55	54	53	48	42	72	68	70	67	60	52
33	04/02/2021 13:03:16	66	53	56	55	54	53	52	49	44	73	68	69	62	57	53
34	04/02/2021 13:08:16	63	53	56	54	53	52	51	49	43	69	63	64	61	56	51
35	04/02/2021 13:13:16	77	53	57	58	57	53	53	50	44	75	80	77	74	70	53
36	04/02/2021 13:18:16	66	53	56	53	53	51	51	49	43	68	66	66	63	60	59
37	04/02/2021 13:23:16	67	53	55	52	50	51	51	49	43	69	67	64	68	61	59
38	04/02/2021 13:28:16	72	55	58	56	56	53	53	51	45	71	69	72	69	64	59
39	04/02/2021 13:33:16	69	53	56	53	53	51	52	50	44	66	65	69	65	63	61
40	04/02/2021 13:38:16	70	50	56	53	52	48	52	52	42	71	66	59	70	70	62
41	04/02/2021 13:43:16	66	51	55	54	53	51	51	48	42	66	67	67	65	62	58
42	04/02/2021 13:48:16	72	51	54	53	53	51	50	47	41	71	74	74	68	64	55
43	04/02/2021 13:53:16	72	49	54	52	51	50	50	46	41	65	68	69	72	68	61
44	04/02/2021 13:58:16	73	50	55	54	54	52	52	47	40	69	66	70	71	70	52
45	04/02/2021 14:03:16	63	49	54	55	54	51	50	46	43	64	65	62	60	55	60
46	04/02/2021 14:08:16	59	49	52	52	49	48	49	45	38	65	63	58	57	53	50
47	04/02/2021 14:13:16	70	51	56	60	58	53	52	48	40	79	74	67	64	63	52
48	04/02/2021 14:18:16	61	50	53	53	53	49	50	46	39	66	65	61	58	55	53
49	04/02/2021 14:23:16	62	51	53	53	51	50	50	46	39	64	62	61	60	54	51
50	04/02/2021 14:28:16	63	50	54	55	53	51	51	46	40	63	66	61	60	54	55
51	04/02/2021 14:33:16	61	51	54	53	52	50	50	46	40	61	65	59	57	55	58
52	04/02/2021 14:38:16	71	50	55	54	53	51	51	47	40	63	64	61	69	67	57
53	04/02/2021 14:43:16	63	50	54	54	54	50	50	46	39	67	66	61	60	54	50
54	04/02/2021 14:48:16	62	50	55	54	54	52	51	46	41	65	65	61	61	59	59
55	04/02/2021 14:53:16	60	49	53	53	50	49	49	45	38	63	62	59	60	58	57
56	04/02/2021 14:58:16	69	51	56	56	55	53	53	47	42	70	67	67	67	59	62
57	04/02/2021 15:03:16	63	50	54	55	53	51	51	46	40	68	65	61	61	57	56
58	04/02/2021 15:08:16	61	49	53	53	52	49	50	45	39	63	65	61	59	54	55
59	04/02/2021 15:13:16	74	50	58	59	59	53	54	50	42	77	78	70	70	68	62
60	04/02/2021 15:18:16	63	50	54	54	53	51	51	46	40	63	65	61	60	55	57
61	04/02/2021 15:23:16	71	48	53	52	50	48	49	44	45	61	62	59	60	52	71
62	04/02/2021 15:28:16	67	51	55	55	55	53	52	47	39	69	68	66	65	58	55
63	04/02/2021 15:33:16	63	50	54	54	53	50	51	46	41	64	64	61	60	56	61
64	04/02/2021 15:38:16	61	50	53	56	53	50	50	45	38	66	65	58	61	55	50
65	04/02/2021 15:43:16	63	50	54	54	53	50	50	46	39	66	64	61	62	55	52
66	04/02/2021 15:48:16	63	49	54	54	53	50	51	46	39	65	66	62	60	56	50
67	04/02/2021 15:53:16	67	50	54	53	53	50	50	45	41	67	66	65	60	53	66
68	04/02/2021 15:58:16	68	49	56	57	54	53	52	47	43	76	68	67	66	59	62
69	04/02/2021 16:03:16	63	49	54	53	52	50	50	46	40	64	65	60	61	55	60
70	04/02/2021 16:08:16	59	50	52	51	50	48	48	44	39	60	58	58	60	53	47
71	04/02/2021 16:13:16	71	50	57	58	57	53	53	49	41	76	73	68	68	63	53
72	04/02/2021 16:18:16	61	50	53	53	52	49	50	45	40	67	65	59	59	55	55
73	04/02/2021 16:23:16	63	49	54	52	51	50	50	46	40	63	64	61	61	55	59
74	04/02/2021 16:28:16	64	51	56	54	55	54	51	46	41	65	65	61	62	55	59
75	04/02/2021 16:33:16	63	55	57	55	56	56	53	48	42	65	65	62	60	55	59
76	04/02/2021 16:38:16	68	54	57	56	56	56	53	48	40	73	70	66	66	60	52
77	04/02/2021 16:43:16	70	54	57	59	58	56	52	48	40	77	75	68	66	62	53
78	04/02/2021 16:48:16	69	55	54	53	52	50	50	46	40	74	71	66	65	61	57
79	04/02/2021 16:53:16	64	54	56	54	55	55	52	46	40	63	63	62	60	57	60
80	04/02/2021 16:58:16	67	54	57	56	57	56	54	47	40	72	67	66	65	58	50
81	04/02/2021 17:03:16	66	54	57	58	57	55	53	48	41	77	69	64	63	57	55
82	04/02/2021 17:08:16	71	54	57	59	58	56	52	47	39	78	75	69	65	59	51
83	04/02/2021 17:13:16	64	54	56	55	56	55	52	47	40	64	66	62	61	55	53
84	04/02/2021 17:18:16	68	54	57	57	56	53	48	39	73	72	67	66	61	53	53
85	04/02/2021 17:23:16	63	54	56	55	56	55	52	46	38	66	64	63	61	54	50
86	04/02/2021 17:28:16	63	54	56	56	56	55	52	47	40	65	66	62	61	57	57
87	04/02/2021 17:33:16	62	54	56	60	57	54	52	47	40	71	64	61	58	52	61

No.	Dates & time	LAFmax	LA90	LAeq	Leq 125 Hz	Leq 250 Hz	Leq 500 Hz	Leq 1000 Hz	Leq 2000 Hz	Leq 4000 Hz	Lmax 125 Hz	Lmax 250 Hz	Lmax 500 Hz	Lmax 1000 Hz	Lmax 2000 Hz	Lmax 4000 Hz
101	04/02/2021 18:43:16	68	52	56	56	56	53	52	48	41	73	70	65	64	60	58
102	04/02/2021 18:48:16	70	50	56	57	56	52	52	48	40	74	71	67	66	60	50
103	04/02/2021 18:53:16	64	51	54	54	54	50	51	46	40	63	66	63	62	55	52
104	04/02/2021 18:58:16	69	51	56	57	56	53	52	48	41	72	72	67	66	61	54
105	04/02/2021 19:03:16	67	49	55	55	54	53	52	47	41	71	67	66	65	56	59
106	04/02/2021 19:08:16	63	51	55	55	54	51	51	47	40	64	65	61	61	59	55
107	04/02/2021 19:13:16	69	51	56	57	56	53	52	48	41	73	71	66	65	60	53
108	04/02/2021 19:18:16	71	50	56	58	57	52	52	48	41	76	74	67	67	65	57
109	04/02/2021 19:23:16	66	50	54	55	53	50	50	45	39	71	64	61	63	61	56
110	04/02/2021 19:28:16	64	51	56	56	56	53	52	48	42	69	66	67	61	57	58
111	04/02/2021 19:33:16	67	52	56	58	57	53	52	48	41	71	70	65	63	58	56
112	04/02/2021 19:38:16	63	51	55	56	55	52	51	46	40	66	66	62	62	54	52
113	04/02/2021 19:43:16	62	49	54	54	54	50	50	45	39	63	66	61	61	54	49
114	04/02/2021 19:48:16	67	51	55	56	55	52	51	46	40	72	69	65	63	59	52
115	04/02/2021 19:53:16	63	49	54	54	53	50	50	45	42	64	65	61	60	54	61
116	04/02/2021 19:58:16	66	50	55	55	55	53	52	47	40	69	65	65	63	57	52
117	04/02/2021 20:03:16	69	50	56	57	56	53	53	48	43	73	72	67	66	61	60
118	04/02/2021 20:08:16	61	51	54	54	54	51	50	46	43	64	64	59	57	53	60
119	04/02/2021 20:13:16	72	49	52	51	52	48	49	45	38	76	73	66	72	64	52
120	04/02/2021 20:18:16	69	49	55	55	56	52	52	47	40	72	72	67	66	61	53
121	04/02/2021 20:23:16	61	50	52	52	52	48	49	45	38	62	58	59	58	57	52
122	04/02/2021 20:28:16	62	49	54	54	53	50	50	46	42	64	64	61	61	55	61
123	04/02/2021 20:33:16	68	48	56	56	56	52	52	48	41	73	70	66	64	60	52
124	04/02/2021 20:38:16	63	50	54	55	54	51	50	46	40	66	65	65	61	55	50
125	04/02/2021 20:43:16	62	48	53	53	52	49	49	45	38	65	65	61	59	54	49
126	04/02/2021 20:48:16	67	51	55	55	55	52	51	47	41	64	67	64	65	58	55
127	04/02/2021 20:53:16	66	50	52	52	52	48	48	45	40	66	67	64	61	62	59
128	04/02/2021 20:58:16	71	52	56	54	54	52	52	48	43	72	71	70	66	65	61
129	04/02/2021 21:03:16	66	51	56	55	55	53	52	48	42	69	66	64	63	58	52
130	04/02/2021 21:08:16	73	53	54	53	53	51	50	46	41	69	69	72	69	68	64
131	04/02/2021 21:13:16	71	50	55	55	55	52	51	47	41	77	75	67	68	63	54
132	04/02/2021 21:18:16	63	47	54	53	54	51	50	45	40	63	66	61	61	57	51
133	04/02/2021 21:23:16	70	48	55	54	53	52	52	46	39	70	67	69	67	60	52
134	04/02/2021 21:28:16	68	49	54	53	53	51	50	46	41	63	66	65	66	63	58
135	04/02/2021 21:33:16	68	49	55	55	55	52	51	47	41	72	70	66	65	63	58
136	04/02/2021 21:38:16	63	45	52	52	51	48	48	43	38	65	65	61	60	56	49
137	04/02/2021 21:43:16	67	48	54	52	52	50	50	46	40	63	63	64	66	63	56
138	04/02/2021 21:48:16	66	55	53	48	48	48	49	47	42	63	65	62	63	61	56
139	04/02/2021 21:53:16	61	54	56	54	56	55	51	45	40	63	62	62	59	52	58
140	04/02/2021 21:58:16	66	53	56	54	55	55	52	46	39	68	65	65	62	56	49
141	04/02/2021 22:03:16	63	54	56	53	56	55	52	47	40	63	66	62	61	55	58
142	04/02/2021 22:08:16	60	54	56	53	55	55	51	45	40	63	61	59	58	54	57
143	04/02/2021 22:13:16	64	54	56	53	55	55	52	46	40	63	66	62	61	55	56
144	04/02/2021 22:18:16	70	55	58	57	58	56	53	48	40	76	71	65	67	62	52
145	04/02/2021 22:23:16	60	54	55	51	54	54	50	45	39	61	61	60	58	53	57
146	04/02/2021 22:28:16	63	54	56	52	55	55	51	46	38	63	65	62	60	54	49
147	04/02/2021 22:33:16	63	54	56	54	56	55	52	46	41	64	64	62	60	54	59
148	04/02/2021 22:38:16	58	53	54	49	53	54	49	43	35	59	58	55	53	48	
149	04/02/2021 22:43:16	64	53	56	53	55	55	51	45	44	63	66	62	61	54	63
150	04/02/2021 22:48:16	64	54	56	54	56	56	52	46	43	64	65	63	61	55	63
151	04/02/2021 22:53:16	59	53	55	51	54	54	50	43	35	62	65	59	54	49	45
152	04/02/2021 22:58:16	65	41	52	51	51	49	48	43	43	65	64	61	61	55	64
153	04/02/2021 23:03:16	60	42	50	48	48	46	46	41	36	63	63	59	59	51	57
154	04/02/2021 23:08:16	63	47	53	53	54	50	49	44	39	64	64	61	60	56	52
155	04/02/2021 23:13:16	61	43	50	50	50	46	45	40	40	61	64	60	56	50	60
156	04/02/2021 23:18:16	72	46	53	48	48	48	49	47	42	79	78	74	68	63	57
157	04/02/2021 23:23:16	63	48	54	54	55	52	50	46	41	64	65	61	60	57	59
158	04/02/2021 23:28:16	69	43	48	49	49	47	43	37	34	70	66	68	67	63	57
159	04/02/2021 23:33:16	65	45	54	53	54	51	49	45	40	65	68	65	62	62	56
160	04/02/2021 23:38:16	70	46	53	48	48	48	49	47	42	65	66	65	66	65	59
161	04/02/2021 23:43:16	71	45	53	51	51	50	49	46	41	67	65	67	68	67	60
162	04/02/2021 23:48:16	63	44	51	51	52	49	47	42	37	64	65	59	61	52	51
163	04/02/2021 23:53:16	57	41	49	50	49	46	44	40	35	59	58	54	55	52	46
164	04/02/2021 23:58:16	66	40	52	51	51	49	47	43	44	63	65	61	60	54	65
165	05/02/2021 00:03:16	63	45	52	52	52	49	48	42	41	64	65	58	60	52	62
166	05/02/2021 00:08:16	63	39	50	49	49	47	46	41	35	64	63	62	60	56	48
167	05/02/2021 00:13:16	71	41	51	52	50	49	47	42	37	77	77	67	67	63	53
168	05/02/2021 00:18:16	62	40	51	51	51	48	47	42	37	63	63	61	59	55	51
169	05/02/2021 00:23:16	61	41	50	51	52	48	46	41	37	61	62	58	60	51	51
170	05/02/2021 00:28:16	68	38	53	56	55	51	48	43	36	75	73	67	64	58	49
171	05/02/2021 00:33:16	61	41	49	49	49	47	44	39	39	62	59	58	60	50	60
172	05/02/2021 00:38:16	63	41	52	52	53	50	48	43	40	64	64	61	60	54	61
173	05/02/2021 00:43:16	64	41	51	50	49	48	47	42	36	63	62	61	62	60	54
174	05/02/2021 00:48:16	59	43	50	51	51	48	45	40	36	65	62	58	57	50	58
175	05/02/2021 00:53:16	63	36	51	51	51	48	47	42	38	62	63	61	62	55	55
176	05/02/2021 00:58:16	62	46	48	49	49	47	43	37	34	58	54	53	61	51	50
177	05/02/2021 01:03:16	58	37	43	46	41	38	40	36	29	62	56	54	56	52	46
178	05/02/2021 01:08:16	52	35	40	42	36	34	36	33	25	61	45	47	49	47	42
179	05/02/2021 01:13:16	61	37	47	52	50	45	40	33	32	65	65	52	60	50	50
180	05/02/2021 01:18:16	56	35	43	46	43	42	39	33	29	55	53	49	53	50	45
181	05/02/2021 01:23:16	52	35	40	40	35	34	38	33	25	48	45	47	50	47	40
182	05/02/2021 01:28:16	61	35	41	40	37	36	37	33	28	55	52	52	60	51	50
183	05/02/2021 01:33:16	62	38	47	49	49	46	41	37	34	55	55	59	59	58	51
184	05/02/2021 01:38:16	57	35	42	39	36	36	38	35	28	51	47	52	54	53	48
185	05/02/2021 01:43:16	61	34	44	44	44	42	39	34	30	53	54	55	60	52	50
186	05/02/2021 01:48:16	55	40</													

No.	Dates & time	LAFmax	LA90	LAeq	Leq 125 Hz	Leq 250 Hz	Leq 500 Hz	Leq 1000 Hz	Leq 2000 Hz	Leq 4000 Hz	Lmax 125 Hz	Lmax 250 Hz	Lmax 500 Hz	Lmax 1000 Hz	Lmax 2000 Hz	Lmax 4000 Hz
201	05/02/2021 03:03:16	56	34	46	49	49	45	40	34	32	54	56	50	54	49	44
202	05/02/2021 03:08:16	67	34	45	39	36	38	41	39	34	53	53	59	64	64	58
203	05/02/2021 03:13:16	51	45	47	50	49	46	41	33	33	55	55	50	48	43	40
204	05/02/2021 03:18:16	57	33	50	46	49	50	43	38	30	54	56	58	53	48	44
205	05/02/2021 03:23:16	61	54	55	50	54	56	49	42	35	57	58	58	60	51	49
206	05/02/2021 03:28:16	56	54	55	52	55	55	49	42	35	58	57	58	51	48	45
207	05/02/2021 03:33:16	55	53	54	48	53	55	49	41	33	51	55	57	51	43	38
208	05/02/2021 03:38:16	61	53	54	49	54	55	49	42	35	55	58	57	60	51	51
209	05/02/2021 03:43:16	56	53	54	51	54	54	49	42	35	56	57	57	52	48	49
210	05/02/2021 03:48:16	56	53	54	48	53	54	48	41	33	51	55	56	53	48	41
211	05/02/2021 03:53:16	57	53	54	49	53	54	49	42	34	60	57	56	54	51	46
212	05/02/2021 03:58:16	62	53	54	50	54	54	49	41	35	58	57	57	61	51	50
213	05/02/2021 04:03:16	58	53	54	49	53	54	49	41	34	55	56	56	55	50	46
214	05/02/2021 04:08:16	61	53	54	49	53	54	49	41	34	54	56	56	60	51	50
215	05/02/2021 04:13:16	56	53	54	51	54	54	49	41	36	55	57	57	52	46	45
216	05/02/2021 04:18:16	56	53	54	48	53	54	49	41	34	52	55	56	53	47	47
217	05/02/2021 04:23:16	61	53	54	50	54	54	49	42	36	56	58	56	59	51	49
218	05/02/2021 04:28:16	56	35	51	50	51	51	45	38	33	55	57	57	52	46	43
219	05/02/2021 04:33:16	43	32	34	39	34	32	29	25	25	51	45	42	41	40	41
220	05/02/2021 04:38:16	60	34	47	49	48	46	42	35	33	55	54	51	60	50	50
221	05/02/2021 04:43:16	53	33	43	46	46	42	38	32	31	54	54	49	50	46	43
222	05/02/2021 04:48:16	61	33	43	41	41	41	39	34	33	53	52	51	60	51	52
223	05/02/2021 04:53:16	54	34	46	49	49	45	41	34	34	55	55	50	53	47	47
224	05/02/2021 04:58:16	56	33	41	38	35	34	37	34	30	56	53	47	54	50	45
225	05/02/2021 05:03:16	61	33	45	43	43	42	41	36	32	54	54	52	60	50	50
226	05/02/2021 05:08:16	56	34	45	48	48	44	40	33	33	55	55	49	53	48	47
227	05/02/2021 05:13:16	58	34	43	42	40	38	39	35	33	54	56	53	54	52	53
228	05/02/2021 05:18:16	52	34	40	39	36	35	37	33	30	50	45	44	50	46	46
229	05/02/2021 05:23:16	61	35	46	49	48	45	42	35	34	55	54	50	60	49	49
230	05/02/2021 05:28:16	57	36	45	41	40	39	42	38	33	55	59	50	56	50	49
231	05/02/2021 05:33:16	59	37	43	41	38	37	40	36	30	57	58	57	58	52	44
232	05/02/2021 05:38:16	60	36	46	45	46	43	43	38	34	55	54	52	59	51	50
233	05/02/2021 05:43:16	60	36	46	44	46	42	42	38	34	61	64	60	55	54	59
234	05/02/2021 05:48:16	55	37	46	44	41	40	42	38	39	58	53	55	53	49	55
235	05/02/2021 05:53:16	64	48	46	45	40	40	41	38	39	68	64	60	61	54	63
236	05/02/2021 05:58:16	67	42	55	54	53	52	52	46	45	68	65	65	65	56	64
237	05/02/2021 06:03:16	62	42	51	51	50	48	46	41	43	64	63	60	60	56	61
238	05/02/2021 06:08:16	65	42	52	52	51	48	48	43	44	63	61	60	60	54	65
239	05/02/2021 06:13:16	64	45	53	50	50	49	49	44	42	63	62	61	61	55	63
240	05/02/2021 06:18:16	62	47	52	52	51	48	48	43	44	63	62	59	56	53	61
241	05/02/2021 06:23:16	68	43	51	51	50	48	46	41	43	70	68	67	66	59	66
242	05/02/2021 06:28:16	60	43	52	51	51	48	48	43	41	62	64	60	58	51	59
243	05/02/2021 06:33:16	66	43	53	52	50	49	50	44	44	70	66	65	64	56	62
244	05/02/2021 06:38:16	63	47	53	52	52	49	49	44	39	63	64	60	61	54	53
245	05/02/2021 06:43:16	67	44	52	51	50	48	48	44	43	64	64	61	61	55	67
246	05/02/2021 06:48:16	69	46	54	55	52	51	51	46	40	74	70	66	65	64	58
247	05/02/2021 06:53:16	63	43	52	53	52	49	48	44	42	63	63	60	59	54	62
248	05/02/2021 06:58:16	68	44	55	53	53	52	52	47	44	68	66	66	66	61	63
249	05/02/2021 07:03:16	63	44	52	51	50	48	49	44	42	63	63	60	59	56	60
250	05/02/2021 07:08:16	64	48	53	53	52	50	50	45	42	63	64	61	61	62	59
251	05/02/2021 07:13:16	71	48	52	53	52	49	48	44	42	78	75	69	67	63	63
252	05/02/2021 07:18:16	70	49	55	55	53	51	51	46	47	66	67	65	64	56	68
253	05/02/2021 07:23:16	78	47	53	52	51	48	49	48	38	77	73	70	73	78	65
254	05/02/2021 07:28:16	58	45	51	51	49	47	48	44	38	64	63	57	56	57	53
255	05/02/2021 07:33:16	67	49	55	56	55	53	52	46	39	71	70	66	64	59	51
256	05/02/2021 07:38:16	63	47	56	55	54	52	52	47	45	65	65	62	62	55	61
257	05/02/2021 07:43:16	64	46	49	49	45	44	46	42	32	61	59	61	64	58	52
258	05/02/2021 07:48:16	69	49	55	55	54	53	52	46	42	69	67	67	67	59	61
259	05/02/2021 07:53:16	63	48	54	53	52	50	50	46	44	64	62	63	60	59	62
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263	05/02/2021 08:13:16	71	48	56	59	58	52	52	48	42	78	76	68	67	62	56
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265	05/02/2021 08:23:16	65	49	54	53	52	50	51	45	38	67	67	64	63	60	56
266	05/02/2021 08:28:16	69	48	53	52	51	49	49	45	42	71	73	68	63	59	62
267	05/02/2021 08:33:16	70	47	52	53	52	49	48	44	42	71	68	68	67	60	62
268	05/02/2021 08:38:16	70	51	52	53	52	49	48	44	42	64	67	68	68	65	63
269	05/02/2021 08:43:16	63	48	54	56	52	51	50	45	42	62	64	64	62	56	60
270	05/02/2021 08:48:16	68	50	56	55	55	53	52	46	42	68	67	68	65	57	58
271	05/02/2021 08:53:16	64	46	53	52	52	49	49	44	39	64	67	61	61	54	54
272	05/02/2021 08:58:16	74	48	56	54	53	52	52	49	45	71	66	66	64	72	65
273	05/02/2021 09:03:16	69	56	55	55	54	53	52	46	42	68	68	67	66	58	59
274	05/02/2021 09:08:16	65	56	54	53	52	50	50	46	44	63	70	66	61	58	54
275	05/02/2021 09:13:16	75	56	56	54	53	53	53	47	42	78	78	72	71	69	60
276	05/02/2021 09:18:16	68	56	54	53	52	51	51	45	41	73	70	66	63	60	61
277	05/02/2021 09:23:16	73	56	54	54	53	50	50	45	43	68	67	67	67	72	59
278	05/02/2021 09:28:16	71	56	56	59	58	52	52	48	42	78	73	69	67	68	61
279	05/02/2021 09:33:16	73	55	55	53	52	51	51	46	40	68	67	73	71	60	57
280	05/02/2021 09:38:16	67	56	54	53	52	50	51	45	38	69	72	67	66	63	65
281	05/02/2021 09:43:16	78	56	53	52	51	49	49	45	42	87	84	77	75	65	60
282	05/02/2021 09:48:16	82	57	63	60	60	62	59	52	46	88	81	84	81	75	71
283	05/02/2021 09:53:16	82	58	55	53	52	51	51	46	40	81	80	83	80	75	67
284	05/02/2021 09:58:16	80	57	54	53	52	50	51	45	38	77	75	78	80	69	64
285	05/02/2021 10:03:16	78	58	53	52	51	49	49	45	42	76	69	80	73	73	68
286	05/02/2021 10:08:16	69														

No.	Date & time	LAFmax	LAEq	Leq 125 Hz	Leq 250 Hz	Leq 500 Hz	Leq 1000 Hz	Leq 2000 Hz	Leq 4000 Hz	Lmax 125 Hz	Lmax 250 Hz	Lmax 500 Hz	Lmax 1000 Hz	Lmax 2000 Hz	Lmax 4000 Hz
2	04/01/2017 12:28:10	63	53	54	51	50	50	46	38	65	64	61	61	56	53
3	04/01/2017 12:33:10	63	53	53	50	50	50	45	38	64	63	61	62	55	53
4	04/01/2017 12:38:10	64	51	52	49	47	47	43	39	61	62	57	59	51	63
5	04/01/2017 12:43:10	65	54	55	52	50	51	47	39	66	64	61	61	60	52
6	04/01/2017 12:48:10	70	57	58	54	54	52	48	47	79	69	69	70	65	69
7	04/01/2017 12:53:10	65	53	54	50	50	49	45	38	67	67	69	65	61	57
8	04/01/2017 12:58:10	65	54	55	51	50	50	46	39	68	63	63	62	59	58
9	04/01/2017 13:03:10	65	55	54	52	51	51	47	39	64	63	62	62	58	57
10	04/01/2017 13:08:10	63	53	53	50	49	50	45	37	73	67	61	62	58	54
11	04/01/2017 13:13:10	70	55	56	54	51	51	48	40	76	73	70	64	67	59
12	04/01/2017 13:18:10	64	54	55	54	51	51	47	39	68	63	62	62	57	52
13	04/01/2017 13:23:10	65	52	53	50	47	49	44	38	68	69	58	57	53	65
14	04/01/2017 13:28:10	69	55	56	54	53	52	47	38	70	67	69	66	56	51
15	04/01/2017 13:33:10	64	54	56	53	51	50	46	41	73	68	62	62	56	58
16	04/01/2017 13:38:10	65	54	54	51	50	50	45	36	67	64	64	63	57	53
17	04/01/2017 13:43:10	64	54	54	51	51	50	45	41	64	62	66	64	56	61
18	04/01/2017 13:48:10	69	56	58	55	53	52	48	42	77	70	67	64	62	60
19	04/01/2017 13:53:10	64	54	56	54	49	50	46	42	72	68	62	64	60	62
20	04/01/2017 13:58:10	67	54	56	53	51	51	46	41	66	67	67	63	58	62
21	04/01/2017 14:03:10	66	55	56	53	51	51	46	40	70	70	61	67	56	60
22	04/01/2017 14:08:10	75	57	56	53	50	50	53	39	69	67	60	59	74	59
23	04/01/2017 14:13:10	65	54	56	52	52	50	45	38	67	62	66	62	59	57
24	04/01/2017 14:18:10	70	56	59	55	52	51	48	43	80	72	68	65	64	63
25	04/01/2017 14:23:10	64	53	54	50	50	50	45	36	67	63	62	62	59	50
26	04/01/2017 14:28:10	65	54	55	53	52	51	45	37	66	64	66	61	56	49
27	04/01/2017 14:33:10	65	54	54	53	52	50	44	36	62	67	63	66	52	52
28	04/01/2017 14:38:10	62	53	53	51	50	49	44	41	62	65	63	59	59	61
29	04/01/2017 14:43:10	71	56	59	57	54	51	47	41	79	76	69	66	64	62
30	04/01/2017 14:48:10	68	55	55	52	52	52	46	43	68	64	66	61	66	62
31	04/01/2017 14:53:10	61	52	54	50	49	48	43	33	65	62	64	61	54	45
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33	04/01/2017 15:03:10	64	55	55	53	51	51	47	40	65	65	64	62	58	54
34	04/01/2017 15:08:10	60	53	54	53	51	49	44	38	65	65	61	60	54	56
35	04/01/2017 15:13:10	71	56	59	56	54	52	48	39	80	77	69	65	64	53
36	04/01/2017 15:18:10	60	52	53	50	50	49	44	38	67	64	61	59	53	58
37	04/01/2017 15:23:10	65	54	56	53	52	50	45	42	67	65	66	64	56	61
38	04/01/2017 15:28:10	63	54	55	52	52	49	45	41	63	62	64	62	57	60
39	04/01/2017 15:33:10	66	55	55	53	53	50	46	41	66	66	67	63	60	61
40	04/01/2017 15:38:10	63	54	55	51	51	50	45	39	65	61	63	63	60	57
41	04/01/2017 15:43:10	66	55	59	54	52	51	46	39	72	65	64	64	58	55
42	04/01/2017 15:48:10	71	55	58	55	52	51	48	43	76	74	70	70	66	62
43	04/01/2017 15:53:10	69	55	56	55	52	51	48	37	68	67	64	68	63	51
44	04/01/2017 15:58:10	69	56	56	53	53	52	47	42	71	65	68	69	57	60
45	04/01/2017 16:03:10	66	54	55	53	52	49	44	42	66	66	68	61	58	63
46	04/01/2017 16:08:10	64	54	55	53	52	50	46	39	64	63	64	62	57	56
47	04/01/2017 16:13:10	80	61	62	59	57	57	53	44	78	74	72	82	71	63
48	04/01/2017 16:18:10	64	54	57	53	51	50	45	39	75	69	62	61	56	55
49	04/01/2017 16:23:10	68	55	53	49	48	51	48	36	70	63	65	68	66	58
50	04/01/2017 16:28:10	69	55	55	51	50	51	47	45	70	64	63	64	66	65
51	04/01/2017 16:33:10	70	54	57	53	51	51	47	40	78	72	67	65	64	61
52	04/01/2017 16:38:10	69	56	56	54	52	52	48	43	72	71	67	67	62	64
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54	04/01/2017 16:48:10	70	58	60	56	54	53	50	45	76	70	67	67	63	61
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56	04/01/2017 16:58:10	69	57	66	59	53	51	47	44	82	72	67	65	59	66
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59	04/01/2017 17:13:10	68	56	55	52	52	52	48	45	66	62	66	68	63	63
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62	04/01/2017 17:28:10	72	57	60	56	54	53	49	43	80	74	69	66	65	62
63	04/01/2017 17:33:10	62	52	53	51	49	49	44	38	61	60	60	61	55	56
64	04/01/2017 17:38:10	67	56	57	54	52	52	48	42	72	70	66	63	61	63
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78	04/01/2017 18:48:10	67	54	53	52	49	49	45	45	69	75	66	62	58	65
79	04/01/2017 18:53:10	72	57	59	56	53	52	49	47	79	76	70	67	64	64
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107	04/01/2017 21:13:10	73	57	59	55	52	51	49	49	81	77	70	66	66	69
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134	04/01/2017 23:28:10	68	53	54	51	50	49	45	45	74	68	66	65	58	63
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138	04/01/2017 23:48:10	68	51	50	47	46	47	43	45	63	60	57	59	56	67
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140	04/01/2017 23:58:10	64	51	49	47	47	47	43	43	63	63	64	61	55	63
141	05/01/2017 00:03:10	67	53	50	49	48	48	44	46	65	62	61	62	57	66
142	05/01/2017 00:08:10	61	46	45	42	41	43	38	28	61	60	58	59	54	48
143	05/01/2017 00:13:10	64	52	51	49	48	48	44	44	62	64	61	62	55	63
144	05/01/2017 00:18:10	71	55	58	54	51	50	48	46	78	73	69	65	64	63
145	05/01/2017 00:23:10	59	48	45	43	43	45	41	30	59	55	54	59	57	46
146	05/01/2017 00:28:10	68	52	50	49	48	46	44	46	64	61	62	60	60	66
147	05/01/2017 00:33:10	54	44	46	40	38	41	37	24	68	53	47	53	50	35
148	05/01/2017 00:38:10	65	51	50	48	48	47	43	39	63	62	62	62	56	61
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150	05/01/2017 00:48:10	59	47	47	45	44	43	40	36	64	60	57	58	52	58
151	05/01/2017 00:53:10	66	54	52	50	50	50	46	46	65	62	61	62	57	65
152	05/01/2017 00:58:10	70	52	49	48	46	44	43	48	63	61	61	60	60	69
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158	05/01/2017 01:28:10	59	44	44	40	40	41	36	22	56	51	52	57	53	38
159	05/01/2017 01:33:10	57	43	42	37	37	41	37	24	51	45	48	55	51	39
160	05/01/2017 01:38:10	56	42	41	38	37	40	36	22	52	47	49	54	50	37
161	05/01/2017 01:43:10	53	41	40	37	36	38	33	20	50	46	49	51	48	33
162	05/01/2017 01:48:10	52	38	39	36	34	35	31	19	49	42	44	48	49	34
163	05/01/2017 01:53:10	46	37	42	38	36	33	22	16	53	49	47	42	34	28
164	05/01/2017 01:58:10	48	37	42	35	33	34	28	18	57	43	42	47	41	31
165	05/01/2017 02:03:10	55	41	39	36	35	38	35	21	56	47	45	52	51	38
166	05/01/2017 02:08:10	52	38	38	36	34	35	31	20	48	50	45	51	48	33
167	05/01/2017 02:13:10	53	40	38	35	35	38	33	20	44	46	44	52	48	36
168	05/01/2017 02:18:10	54	40	42	36	35	37	34	21	52	46	47	52	50	37
169	05/01/2017 02:23:10	52	41	43	40	38	37	32	19	51	51	46	50	49	32
170	05/01/2017 02:28:10	52	39	42	37	35	36	32	20	56	44	44	50	48	33
171	05/01/2017 02:33:10	65	45	42	39	38	43	38	26	54	48	52	64	58	45
172	05/01/2017 02:38:10	59	42	41	37	36	40	36	22	50	46	48	58	55	41
173	05/01/2017 02:43:10	50	36	39	35	33	32	28	18	52	45	41	48	45	32
174	05/01/2017 02:48:10	51	39	45	38	35	35	30	19	59	49	47	50	45	30
175	05/01/2017 02:53:10	54	39	44	39	37	35	30	20	54	48	47	51	49	35
176	05/01/2017 02:58:10	55	41	40	37	36	38	35	22	51	44	47	53	50	34
177	05/01/2017 03:03:10	55	42	40	37	36	39	35	23	53	47	48	54	49	39
178	05/01/2017 03:08:10	48	38	40	36	35	35	30	19	53	44	48	46	41	31
179	05/01/2017 03:13:10	56	39	39	35	34	37	32	20	58	45	46	54	50	36
180	05/01/2017 03:18:10	54	40	40	36	35	37	33	22	63	50	47	52	50	37
181	05/01/2017 03:23:10	48	34	40	35	32	30	25	18	59	46	42	47	41	26
182	05/01/2017 03:28:10	55	42	44	39	39	38	34	21	64	60	48	53	50	38
183	05/01/2017 03:33:10	48	36	42	37	35	31	26	19	64	51	47	42	37	30
184	05/01/2017 03:38:10	59	44	45	40	40	41	36	22	55	48	51	57	53	36
185	05/01/2017 03:43:10	50	39	42	39	38	35	27	19	61	53	45	49	44	30
186	05/01/2017 03:48:10	52	39	40	37	36	35	30	20	58	46	45	50	45	35
187	05/01/2017 03:53:10	50	37	38	34	33	34	29	18	58	46	44	49	44	30
188	05/01/2017 03:58:10	49	35	37	34	30	31	27	17	44	39	39	45	45	31
189	05/01/2017 04:03:10	54	38	38	35	33	35	31	20	51	45	47	53	51	35
190	05/01/2017 04:08:10	43	33	38	34	30	29	22	16	42	38	42	42	36	30
191	05/01/2017 04:13:10	57	40	44	38	36	37	31	19	58	48	51	55	50	36
192	05/01/2017 0														

Background noise measurements at 53-55 The Broadway, Joel Street, Northwood.

201	05/01/2017 05:03:10	52	41	41	38	38	38	32	20	58	49	50	50	45	31
202	05/01/2017 05:08:10	56	41	41	37	36	38	34	23	61	50	50	55	51	45
203	05/01/2017 05:13:10	58	44	52	41	39	41	37	24	67	59	52	55	55	42
204	05/01/2017 05:18:10	58	44	44	39	38	41	38	25	65	55	48	56	54	40
205	05/01/2017 05:23:10	58	44	46	41	38	41	38	25	65	57	49	57	55	41
206	05/01/2017 05:28:10	61	45	43	39	38	42	38	26	63	51	50	58	58	43
207	05/01/2017 05:33:10	62	47	43	40	40	44	40	27	60	52	53	60	58	46
208	05/01/2017 05:38:10	59	47	47	42	42	44	40	27	62	56	54	55	56	41
209	05/01/2017 05:43:10	68	52	51	49	46	47	43	46	67	64	58	56	55	67
210	05/01/2017 05:48:10	61	48	45	42	42	46	42	28	60	54	50	60	55	41
211	05/01/2017 05:53:10	62	53	51	50	49	49	45	42	64	61	61	60	56	60
212	05/01/2017 05:58:10	74	56	57	53	51	51	48	50	77	69	64	64	67	72
213	05/01/2017 06:03:10	68	52	53	47	46	47	43	47	65	59	58	58	60	68
214	05/01/2017 06:08:10	69	54	61	51	48	49	47	46	78	66	62	62	63	68
215	05/01/2017 06:13:10	69	53	55	48	47	48	44	47	64	59	56	58	59	69
216	05/01/2017 06:18:10	72	55	56	50	49	49	46	51	66	61	63	64	57	71
217	05/01/2017 06:23:10	67	55	56	51	51	51	47	45	70	65	65	64	58	63
218	05/01/2017 06:28:10	68	54	54	50	50	50	46	47	63	62	68	60	60	68
219	05/01/2017 06:33:10	71	58	57	56	54	53	49	51	71	68	69	67	65	70
220	05/01/2017 06:38:10	65	53	54	48	48	49	46	43	64	62	62	61	60	64
221	05/01/2017 06:43:10	72	56	56	52	51	51	47	51	70	66	64	63	63	71
222	05/01/2017 06:48:10	67	56	55	52	51	52	47	46	71	65	65	64	59	66
223	05/01/2017 06:53:10	69	55	57	53	51	50	47	47	75	73	66	63	62	68
224	05/01/2017 06:58:10	69	57	57	53	52	53	49	50	69	66	65	64	59	67
225	05/01/2017 07:03:10	67	56	56	52	52	52	48	48	70	66	65	64	65	65
226	05/01/2017 07:08:10	70	56	56	53	51	50	47	51	65	63	58	59	61	68
227	05/01/2017 07:13:10	70	57	59	56	53	52	49	43	77	72	69	65	63	62
228	05/01/2017 07:18:10	70	56	56	53	51	52	47	48	71	66	67	67	60	69
229	05/01/2017 07:23:10	70	55	55	51	50	51	46	46	65	64	59	59	59	69
230	05/01/2017 07:28:10	67	55	55	51	51	51	47	46	64	61	62	60	55	66
231	05/01/2017 07:33:10	71	57	56	53	52	51	48	51	70	67	66	65	61	70
232	05/01/2017 07:38:10	72	56	56	53	52	52	47	50	69	70	69	71	61	66
233	05/01/2017 07:43:10	70	57	58	55	54	52	48	46	78	71	67	64	65	64
234	05/01/2017 07:48:10	67	56	56	53	52	52	48	47	69	65	64	64	62	64
235	05/01/2017 07:53:10	69	55	56	52	51	51	47	46	69	68	67	68	58	66
236	05/01/2017 07:58:10	62	53	55	51	49	50	45	39	64	61	61	58	54	55
237	05/01/2017 08:03:10	67	57	57	54	54	52	48	48	70	65	65	64	61	65
238	05/01/2017 08:08:10	69	56	57	54	54	51	47	48	70	65	66	64	58	67
239	05/01/2017 08:13:10	69	55	56	52	51	50	46	49	66	63	62	62	55	68
240	05/01/2017 08:18:10	71	57	61	57	54	53	49	46	79	74	68	66	64	63
241	05/01/2017 08:23:10	70	54	57	53	52	50	45	39	67	68	70	70	60	58
242	05/01/2017 08:28:10	74	56	56	53	51	51	46	50	69	65	61	62	60	74
243	05/01/2017 08:33:10	67	55	57	53	52	52	48	44	72	66	68	65	63	64
244	05/01/2017 08:38:10	66	55	55	52	51	50	46	48	69	63	61	61	57	66
245	05/01/2017 08:43:10	76	59	58	54	53	55	54	50	83	82	77	74	76	72
246	05/01/2017 08:48:10	68	56	57	54	53	52	47	46	73	69	67	63	58	65
247	05/01/2017 08:53:10	68	56	56	53	52	52	48	45	69	66	64	64	63	67
248	05/01/2017 08:58:10	71	57	58	53	52	53	49	48	72	68	65	65	63	67
249	05/01/2017 09:03:10	68	56	55	51	50	52	48	47	63	61	62	66	63	66
250	05/01/2017 09:08:10	80	59	56	53	53	53	53	53	70	66	66	69	79	72
251	05/01/2017 09:13:10	70	55	55	52	51	51	49	44	68	62	62	64	70	61
252	05/01/2017 09:18:10	64	54	54	52	51	51	46	42	65	62	63	61	57	60
253	05/01/2017 09:23:10	70	57	59	55	53	52	48	48	78	74	68	64	62	69
254	05/01/2017 09:28:10	62	54	54	51	50	50	46	40	66	61	60	62	57	58
255	05/01/2017 09:33:10	72	57	56	53	53	53	48	50	70	65	66	68	63	73
256	05/01/2017 09:38:10	71	56	55	52	52	52	48	44	69	66	65	65	70	62
257	05/01/2017 09:43:10	69	55	55	53	51	51	47	41	69	68	67	67	58	60
258	05/01/2017 09:48:10	72	56	60	56	53	52	47	42	81	75	71	68	64	61
259	05/01/2017 09:53:10	64	54	54	51	50	50	46	41	64	62	63	61	55	62
260	05/01/2017 09:58:10	69	55	55	53	52	51	47	46	65	67	62	60	56	68
261	05/01/2017 10:03:10	69	56	58	54	53	52	48	46	79	69	66	65	65	66
262	05/01/2017 10:08:10	63	53	53	50	49	49	44	42	66	61	60	58	52	62
263	05/01/2017 10:13:10	67	56	56	54	52	51	47	47	71	64	61	62	56	66
264	05/01/2017 10:18:10	69	56	58	55	53	52	48	43	78	72	68	69	64	62
265	05/01/2017 10:23:10	67	56	56	54	53	52	48	42	69	66	67	66	61	59
266	05/01/2017 10:28:10	60	53	53	51	49	50	45	39	67	60	57	58	57	58
267	05/01/2017 10:33:10	77	57	54	51	50	51	52	45	68	65	63	69	77	69
268	05/01/2017 10:38:10	65	54	53	50	50	50	46	46	63	60	62	62	55	64
269	05/01/2017 10:43:10	66	54	53	51	50	50	46	44	64	61	62	60	56	64
270	05/01/2017 10:48:10	88	61	59	57	59	56	51	44	79	83	89	83	79	63
271	05/01/2017 10:53:10	59	51	53	50	47	48	43	32	61	58	57	57	54	44
272	05/01/2017 10:58:10	65	54	56	53	51	51	46	42	68	67	64	62	56	60
273	05/01/2017 11:03:10	69	55	54	51	50	52	48	39	65	61	62	70	68	56
274	05/01/2017 11:08:10	59	51	50	47	46	48	44	32	58	59	53	57	54	45
275	05/01/2017 11:13:10	71	56	59	55	52	52	48	44	80	73	68	66	63	62
276	05/01/2017 11:18:10	65	54	54	52	50	50	45	44	65	67	62	64	54	64
277	05/01/2017 11:23:10	64	54	54	51	50	50	46	44	65	60	61	61	56	64
278	05/01/2017 11:28:10	66	54	54	51	50	50	46	42	67	63	64	64	57	62
279	05/01/2017 11:33:10	60	51	53	48	47	48	43	34	62	64	62	57	54	49
280	05/01/2017 11:38:10	61	51	52	48	47	47	44	37	65	62	59	60	59	58
281	05/01/2017 11:43:10	65	55	55	52	51	51	47	44	64	61	62	66	59	62
282	05/01/2017 11:48:10	77	57	57	54	51	54	47	44	77	73	67	76	64	63
283	05/01/2017 11:53:10	80	62	54	51	63	59	50	45	65	62	81	77	67	62
284	05/01/2017 11:58:10	69	55	55	52	51	51	47	40	67	62	68	69	60	59
285	05/01/2017 12:03:10	65	54	54	50	50	50	46	40	63	60	61	62	60	61
286	05/01/2017 12:08:10	62	52	54	50	50	48	44	40	65	63	61	62	57	59
287	05/01/2017 12:13:10	68	55	56	54	54	50	47	38	75	69	66	63	63	58
288	05/01/2017 12:18:10	63	54	54	54	53	50	45	39	63	64	62	59	54	59
289	05/01/2017 12:23:10	64	51	50	50	48	48	43	32	61	64	63	63	58	52

day
night

LAeq	Leq 125 Hz	Leq 250 Hz	Leq 500 Hz	Leq 1000 Hz	Leq 2000 Hz	Leq 4000 Hz
55	56	53	52	51	47	44
50	51	47	46	46	42	42
LAFmax	Lmax 125 Hz	Lmax 250 Hz	Lmax 500 Hz	Lmax 1000 Hz	Lmax 2000 Hz	Lmax 4000 Hz
69	62	59	58	59	55	68

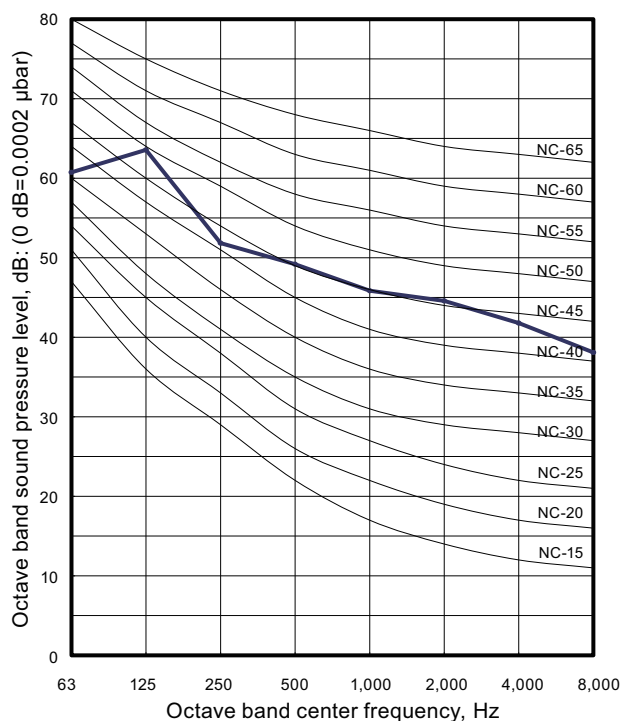
Appendix B

9. Operation noise (sound pressure)

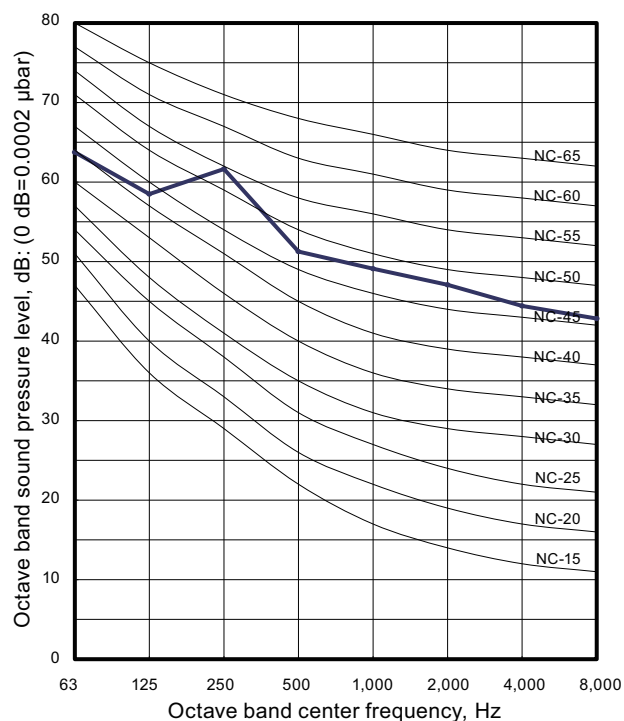
9-1. Noise level curve

■ Model: AOYG72LRLA

● Cooling

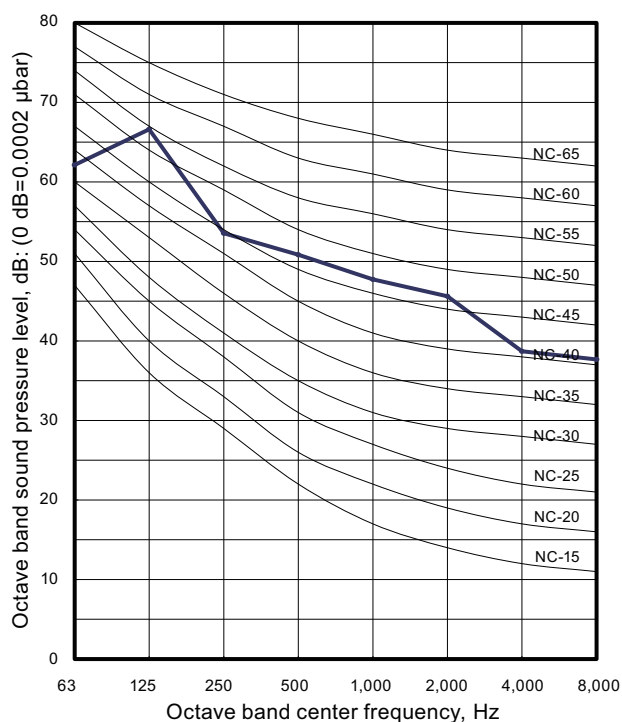


● Heating

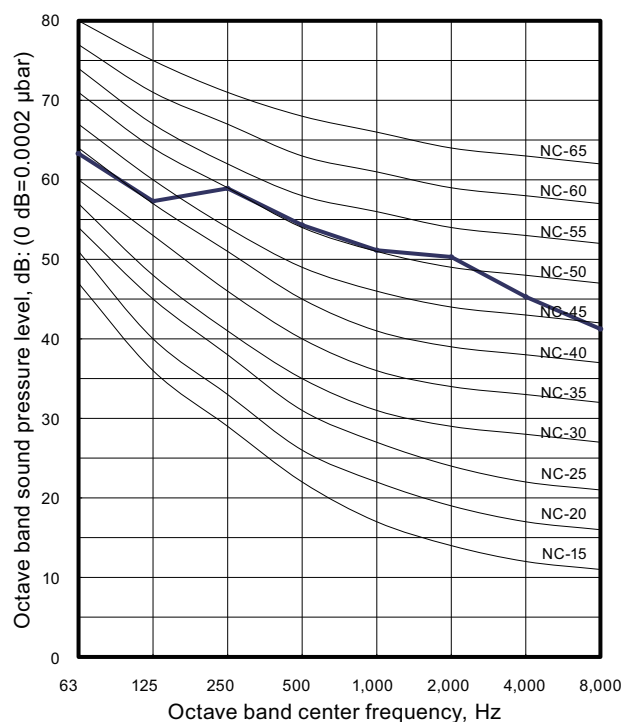


■ Model: AOYG90LRLA

● Cooling



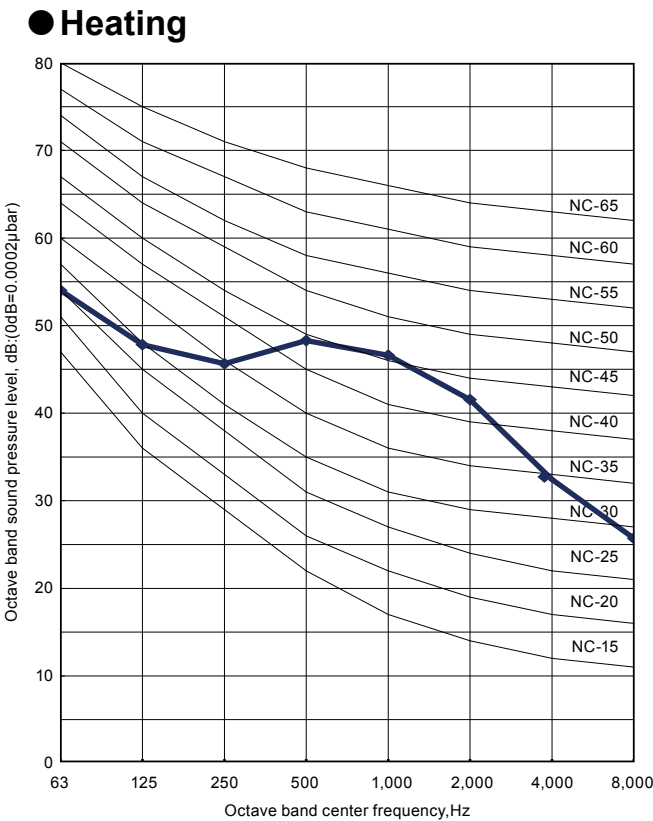
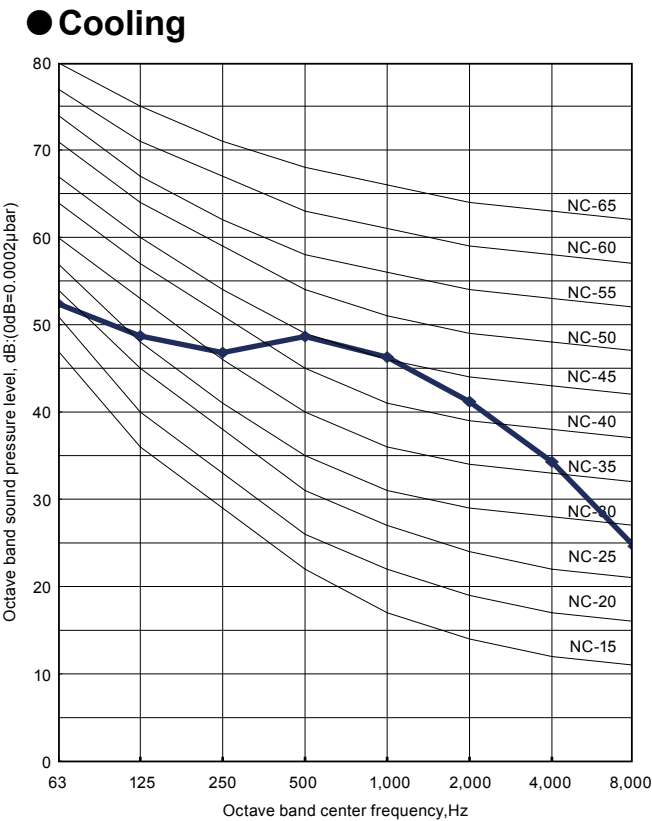
● Heating



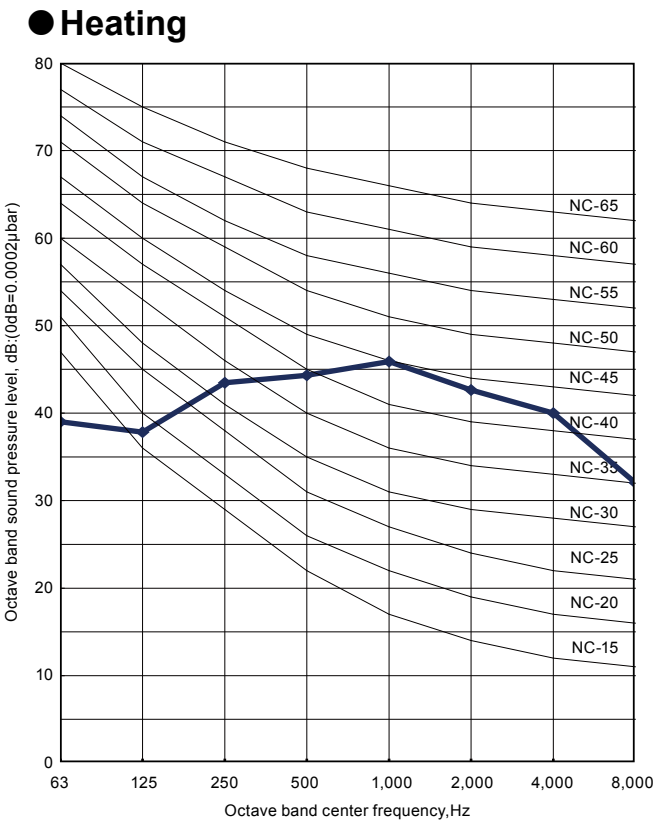
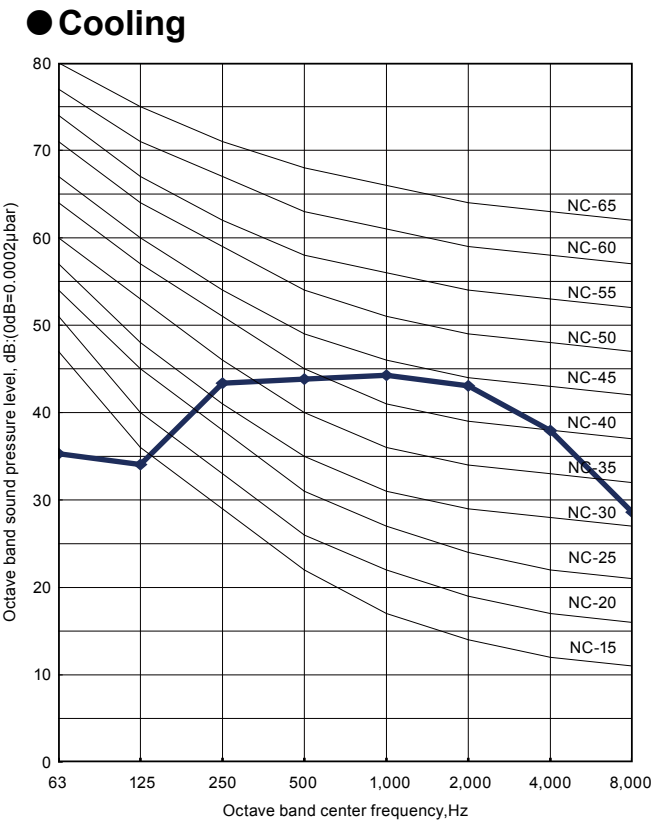
8. OPERATION NOISE (SOUND PRESSURE)

8-1. NOISE LEVEL CURVE

MODEL: AO*G12LALL

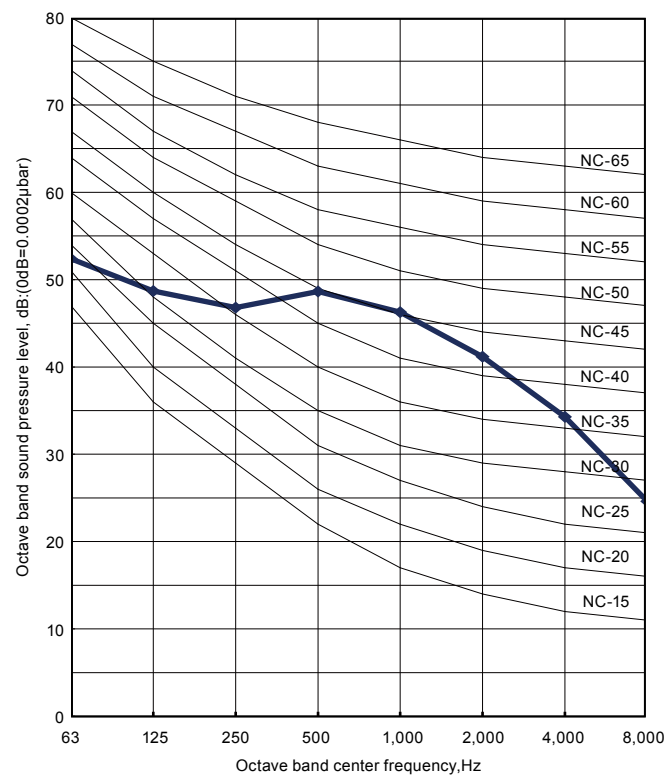


MODEL: AO*G14LALL

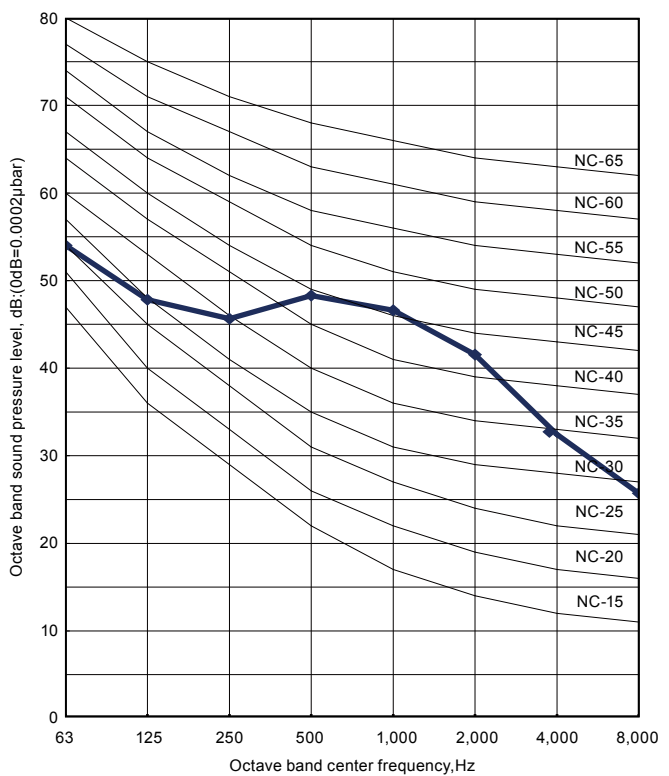


■ **MODEL: AO*G18LALL**

● **Cooling**

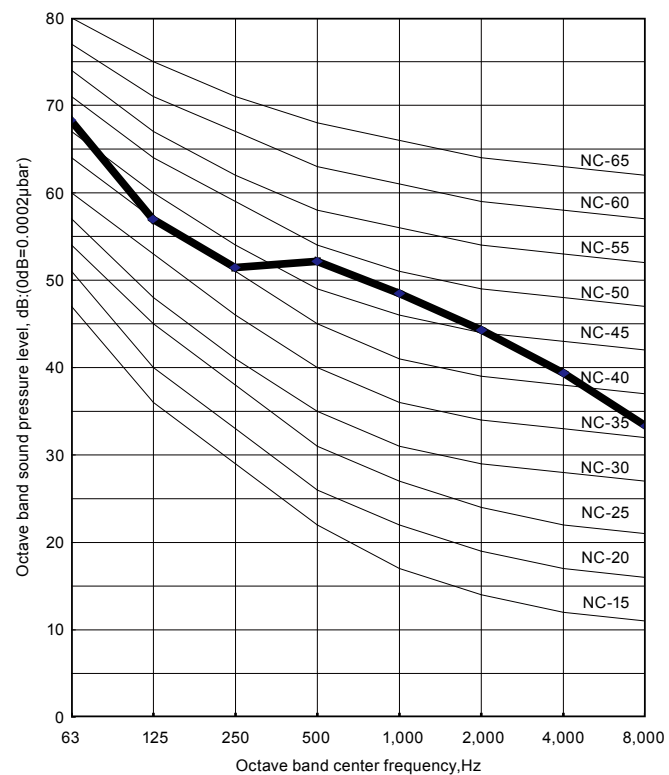


● **Heating**

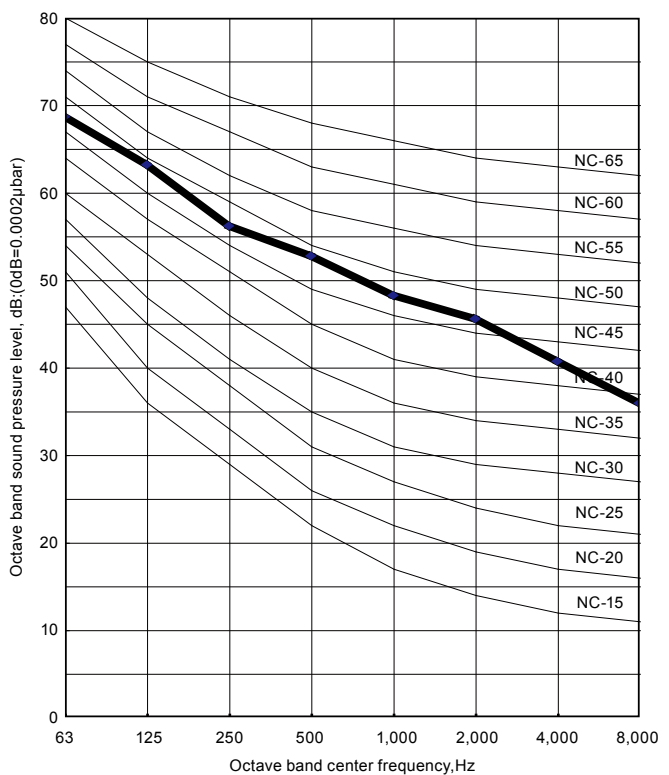


■ **MODEL: AO*G24LALA**

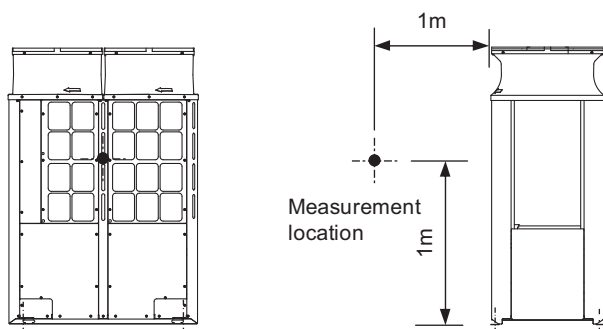
● **Cooling**



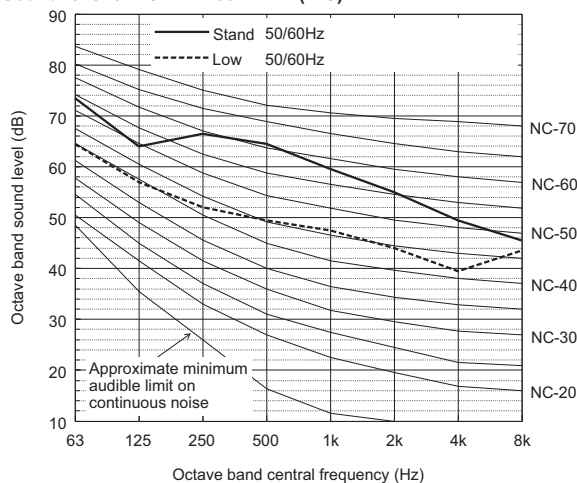
● **Heating**



Measurement condition PURY-P350, 400, 450YNW-A(-BS)



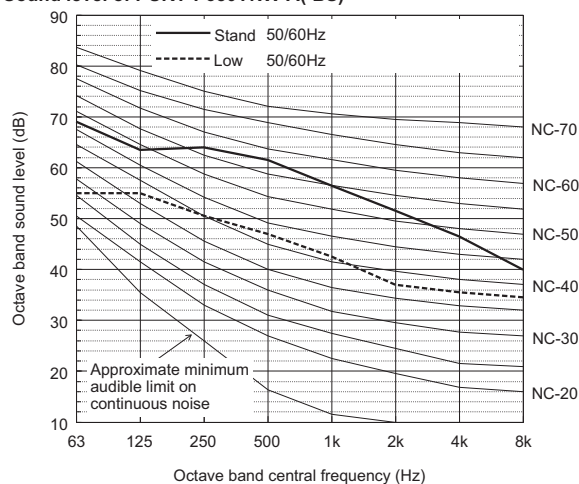
Sound level of PURY-P450YNW-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	73.5	64.0	66.5	64.5	59.5	55.0	49.5	45.5	65.5
Low noise mode	50/60Hz	64.5	57.0	52.0	49.5	47.5	44.0	39.5	43.5	53.0

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.

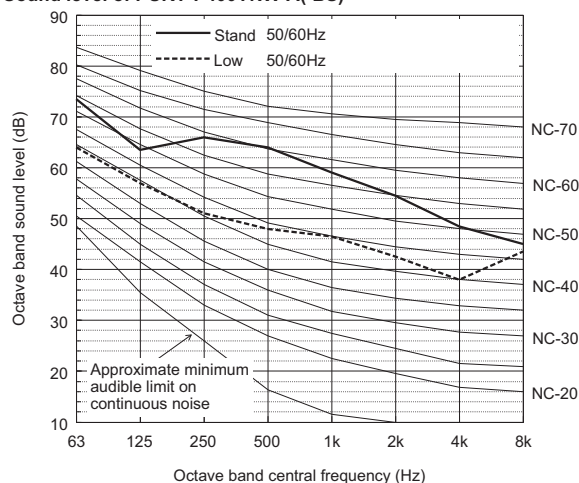
Sound level of PURY-P350YNW-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	69.0	63.5	64.0	61.5	56.5	51.5	46.5	40.0	62.5
Low noise mode	50/60Hz	55.0	55.0	50.5	47.0	42.5	37.0	35.5	34.5	49.0

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-P400YNW-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	73.5	63.5	66.0	64.0	59.0	54.5	48.5	45.0	65.0
Low noise mode	50/60Hz	64.0	57.0	51.0	48.0	46.5	42.5	38.0	43.5	52.0

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 BC controller, it is recommended to be installed in places such as ceilings of corridor, rest rooms and plant rooms.

Appendix C

Sound Insulation Prediction (v9.0.8)

Program copyright Marshall Day Acoustics 2017

margin of error is generally within $R_w \pm 3$ dB

- Key No. 2501

Job Name: Land rear of 53-55 Joel Street

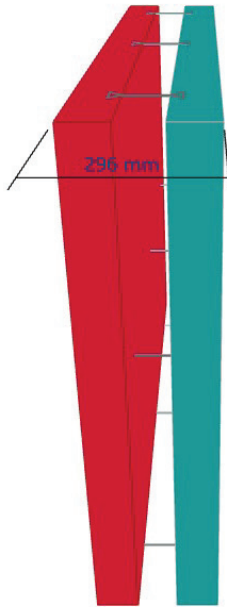
Job No.: 104106

Date: 22/02/2021

File Name: Insu

Initials: AD

Notes: External wall



R_w 57 dB

C -1 dB

Ctr -4 dB

Mass-air-mass resonant frequency = 21 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 321 kg/m²

System description

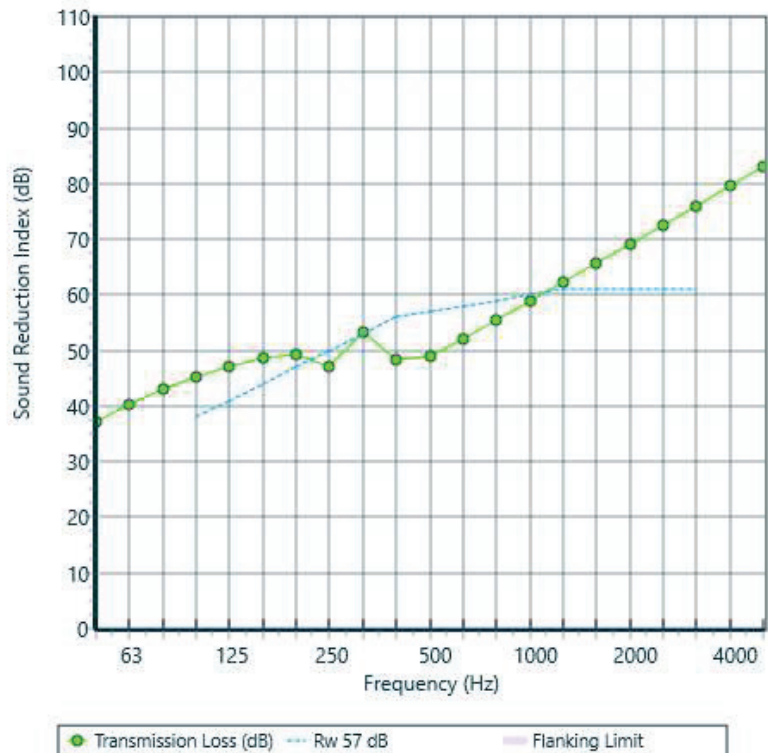
Panel 1 : 1 x 100 mm Brick

Frame: Butterfly Tie; Cavity Width 95.83 mm

Panel 2 : 1 x 100 mm Medium density block

Floor Cover: Thickness 0.02 mm

freq.(Hz)	TL(dB)	TL(dB)
50	37	
63	40	40
80	43	
100	45	
125	47	47
160	49	
200	49	
250	47	49
315	53	
400	48	
500	49	49
630	52	
800	55	
1000	59	58
1250	62	
1600	66	
2000	69	68
2500	73	
3150	76	
4000	79	79
5000	83	



Sound Insulation Prediction (v9.0.8)

Program copyright Marshall Day Acoustics 2017

margin of error is generally within $R_w \pm 3$ dB

- Key No. 2501

Job Name: Land rear of 53-55 Joel Street

Job No.: 104106

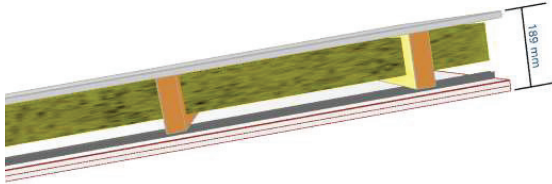
Initials: AD

Date: 24/02/2021

File Name: Insu



Notes: Pitched roof 2 - upgraded



R_w 61 dB

C -2 dB

Ctr -7 dB

Mass-air-mass resonant frequency = 41 Hz

Panel Size = 2.7 m x 4.0 m

Partition surface mass = 50.5 kg/m²

System description

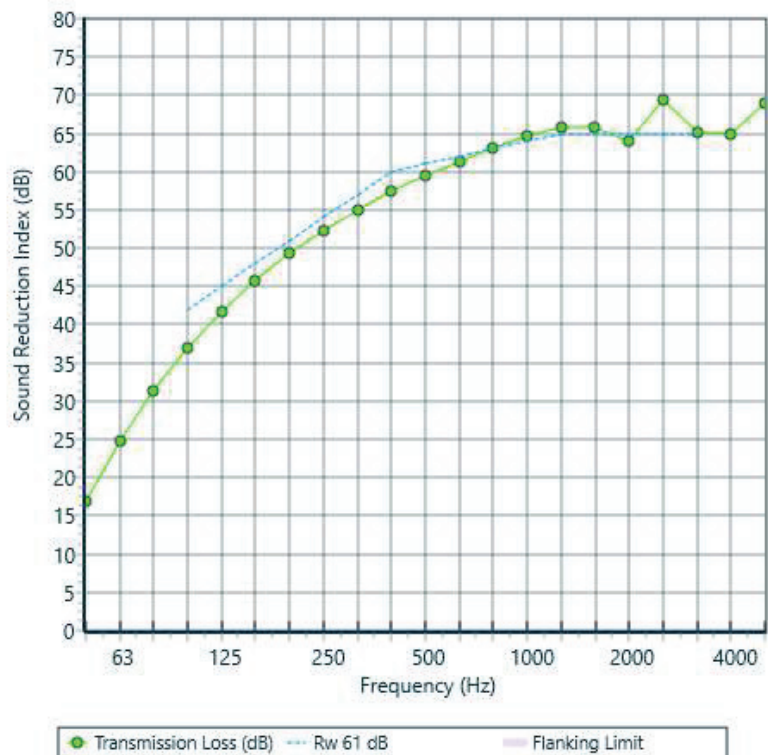
Panel 1 : 1 x 14 mm Roofing tiles

Frame: Solid Joist with resilient rail; Cavity Width 150 mm, Stud spacing 600 mm, 1 x Fibreglass (10kg/m³) Thickness 100 mm

Panel 2 : 2 x 12.5 mm Gyproc Wallboard 12.5mm

Floor Cover: Thickness 0.02 mm

freq.(Hz)	TL(dB)	TL(dB)
50	17	
63	25	21
80	31	
100	37	
125	42	40
160	46	
200	49	
250	52	52
315	55	
400	57	
500	59	59
630	61	
800	63	
1000	65	64
1250	66	
1600	66	
2000	64	66
2500	69	
3150	65	
4000	65	66
5000	69	



Appendix D

Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	56dBA	56	55	54	52	48	43
Mechanical ventilation	$D_{ne,w}$	$D_{ne,w}$ n/a dB	100	100	100	100	100	100
Glazing 6mm float / 10mm / 4mm float	R_w	R_w 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof - not applicable	R_{rr}	R_w N/a dB	100	100	100	100	100	100
Total room absorption (based on RT)	RT_{60}	0.75	4	6	8	8	7	7

Derivation	Term	Value
Façade area (including window)	S_f	15
Window area	S_{wi}	5
$S_f - S_{wi}$	S_{ew}	10
Area of ceiling	S_{rr}	16
$S_f + S_{rr}$	S	30
Reference absorption area	A_0	10
Room volume	V	39

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	56	55	54	52	48	43
Mechanical ventilation	$D_{n,e}$		100	100	100	100	100	100
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00035	0.00044	0.00028	0.00003	0.00004	0.00022
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00002	0.00002	0.00002	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		100	100	100	100	100	100
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-34	-33	-35	-44	-44	-37
Total Absorption Area of Receiver Room	A (furnished)		4	6	8	8	7	7
	$10\log(S/A)$	G	8.3	6.7	5.6	5.6	6.1	6.1
Total Internal Sound Pressure Level, Leq	$Leq,2$	A+F+G+3	32.8	31.7	27.3	16.3	13.2	15.6

RESULTANT INTERNAL NOISE LEVEL	28
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	56dBA	56	55	54	52	48	43
Simon acoustic frame vent	$D_{ne,w}$	Dne,w 33 dB	40	36	35	31	32	37
Glazing 6mm float / 10mm / 4mm float	R_w	Rw 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof - not applicable	R_{rr}	R_w N/a dB	100	100	100	100	100	100
Total room absorption (based on RT)	RT_{60}	0.5	3	5	7	7	6	6

Derivation	Term	Value
Façade area (including window)	S_f	16
Window area	S_{wi}	1.4
$S_f - S_{wi}$	S_{ew}	14
Area of ceiling	S_{rr}	9
$S_f + S_{rr}$	S	24
Reference absorption area	A_0	10
Room volume	V	21

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	56	55	54	52	48	43
Simon acoustic frame vent	$D_{n,e}$		39.5	35.9	35.1	30.7	32.1	36.9
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00005	0.00011	0.00013	0.00035	0.00026	0.00009
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00012	0.00015	0.00009	0.00001	0.00001	0.00007
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00005	0.00003	0.00003	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		100	100	100	100	100	100
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-37	-35	-36	-34	-36	-38
Total Absorption Area of Receiver Room	A (furnished)		3	5	7	7	6	6
	$10\log(S/A)$	G	9.1	6.9	5.4	5.4	6.1	6.1
Total Internal Sound Pressure Level, Leq	$Leq,2$	A+F+G+3	31.1	29.8	26.5	26.2	21.1	14.2

RESULTANT INTERNAL NOISE LEVEL	30
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	51dBA	50	51	49	46	41	38
Simon acoustic frame vent	$D_{ne,w}$	Dne,w 33 dB	40	36	35	31	32	37
Glazing 6mm float / 10mm / 4mm float	R_w	Rw 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof - not applicable	R_{rr}	R_w N/a dB	100	100	100	100	100	100
Total room absorption (based on RT)	RT_{60}	0.5	3	5	7	7	6	6

Derivation	Term	Value
Façade area (including window)	S_f	16
Window area	S_{wi}	1.4
$S_f - S_{wi}$	S_{ew}	14
Area of ceiling	S_{rr}	9
$S_f + S_{rr}$	S	24
Reference absorption area	A_0	10
Room volume	V	21

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	50	51	49	46	41	38
Simon acoustic frame vent	$D_{n,e}$		39.5	35.9	35.1	30.7	32.1	36.9
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00005	0.00011	0.00013	0.00035	0.00026	0.00009
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00012	0.00015	0.00009	0.00001	0.00001	0.00007
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00005	0.00003	0.00003	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		100	100	100	100	100	100
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-37	-35	-36	-34	-36	-38
Total Absorption Area of Receiver Room	A (furnished)		3	5	7	7	6	6
	$10\log(S/A)$	G	9.1	6.9	5.4	5.4	6.1	6.1
Total Internal Sound Pressure Level, Leq	$Leq,2$	A+F+G+3	25.6	25.0	21.6	20.5	14.5	9.3

RESULTANT INTERNAL NOISE LEVEL	24
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{max,ff}$	70dBA	68	65	65	65	56	64
Simon acoustic frame vent	$D_{ne,w}$	$D_{ne,w}$ 33 dB	40	36	35	31	32	37
Glazing 6mm float / 10mm / 4mm float	R_w	R_w 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof - not applicable	R_{rr}	R_w N/a dB	100	100	100	100	100	100
Total room absorption (based on RT)	RT_{60}	0.5	3	5	7	7	6	6

Derivation	Term	Value
Façade area (including window)	S_f	16
Window area	S_{wi}	1.4
$S_f - S_{wi}$	S_{ew}	14
Area of ceiling	S_{rr}	9
$S_f + S_{rr}$	S	24
Reference absorption area	A_0	10
Room volume	V	21

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	68	65	65	65	56	64
Simon acoustic frame vent	$D_{n,e}$		39.5	35.9	35.1	30.7	32.1	36.9
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00005	0.00011	0.00013	0.00035	0.00026	0.00009
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00012	0.00015	0.00009	0.00001	0.00001	0.00007
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00005	0.00003	0.00003	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		100	100	100	100	100	100
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-37	-35	-36	-34	-36	-38
Total Absorption Area of Receiver Room	A (furnished)		3	5	7	7	6	6
	$10\log(S/A)$	G	9.1	6.9	5.4	5.4	6.1	6.1
Total Internal Sound Pressure Level, Leq	$Leq,2$	A+F+G+3	43.3	39.1	37.8	39.5	29.8	34.9

RESULTANT INTERNAL NOISE LEVEL	43
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	56dBA	56	55	54	52	48	43
2No. Simon acoustics frame vents	$D_{ne,w}$	Dne,w 33 dB	36	33	32	28	29	34
Glazing 6mm float / 10mm / 4mm float	R_w	Rw 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof	R_{rr}	R_w 61 dB	31	43	50	55	57	57
Total room absorption (based on RT)	RT_{60}	0.75	3	5	7	7	6	6

Derivation	Term	Value
Façade area (including window)	S_f	15
Window area	S_{wi}	3
$S_f - S_{wi}$	S_{ew}	12
Area of ceiling	S_{rr}	13
$S_f + S_{rr}$	S	28
Reference absorption area	A_0	10
Room volume	V	32

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	56	55	54	52	48	43
2No. Simon acoustics frame vents	$D_{n,e}$		36.48970004	32.88970004	32.08970004	27.68970004	29.08970004	33.88970004
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00008	0.00018	0.00022	0.00061	0.00044	0.00015
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00022	0.00027	0.00017	0.00002	0.00003	0.00014
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00003	0.00002	0.00002	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		31	43	50	55	57	57
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00037	0.00002	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-32	-33	-34	-32	-33	-35
Total Absorption Area of Receiver Room	A (furnished)		3	5	7	7	6	6
	$10\log(S/A)$	G	9.7	7.5	6.0	6.0	6.7	6.7
Total Internal Sound Pressure Level, Leq	$Leq,2$	A+F+G+3	36.9	32.9	29.4	29.2	24.1	17.3

RESULTANT INTERNAL NOISE LEVEL	33
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	56dBA	56	55	54	52	48	43
Simon acoustic frame vent	$D_{ne,w}$	Dne,w 33 dB	40	36	35	31	32	37
Glazing 6mm float / 10mm / 4mm float	R_w	Rw 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof	R_{rr}	R_w 61 dB	31	43	50	55	57	57
Total room absorption (based on RT)	RT_{60}	0.5	2	4	6	6	5	5

Derivation	Term	Value
Façade area (including window)	S_f	14
Window area	S_{wi}	4.5
$S_f - S_{wi}$	S_{ew}	10
Area of ceiling	S_{rr}	7
$S_f + S_{rr}$	S	21
Reference absorption area	A_0	10
Room volume	V	18

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	56	55	54	52	48	43
Simon acoustic frame vent	$D_{n,e}$		39.5	35.9	35.1	30.7	32.1	36.9
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00005	0.00012	0.00015	0.00040	0.00029	0.00010
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00042	0.00053	0.00034	0.00004	0.00005	0.00027
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00004	0.00002	0.00002	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		31	43	50	55	57	57
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00026	0.00002	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-31	-32	-33	-33	-35	-34
Total Absorption Area of Receiver Room	A (furnished)		2	4	6	6	5	5
	$10\log(S/A)$	G	11.0	7.6	5.7	5.7	6.5	6.5
Total Internal Sound Pressure Level, Leq	$Leq,2$	A+F+G+3	38.6	34.4	29.9	27.4	22.6	18.2

RESULTANT INTERNAL NOISE LEVEL	33
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	51dBA	50	51	49	46	41	38
Simon acoustic frame vent	$D_{ne,w}$	Dne,w 33 dB	40	36	35	31	32	37
Glazing 6mm float / 10mm / 4mm float	R_w	Rw 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof	R_{rr}	R_w 61 dB	31	43	50	55	57	57
Total room absorption (based on RT)	RT_{60}	0.5	2	4	6	6	5	5

Derivation	Term	Value
Façade area (including window)	S_f	14
Window area	S_{wi}	4.5
$S_f - S_{wi}$	S_{ew}	10
Area of ceiling	S_{rr}	7
$S_f + S_{rr}$	S	21
Reference absorption area	A_0	10
Room volume	V	18

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	50	51	49	46	41	38
Simon acoustic frame vent	$D_{n,e}$		39.5	35.9	35.1	30.7	32.1	36.9
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00005	0.00012	0.00015	0.00040	0.00029	0.00010
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00042	0.00053	0.00034	0.00004	0.00005	0.00027
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00004	0.00002	0.00002	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		31	43	50	55	57	57
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00026	0.00002	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-31	-32	-33	-33	-35	-34
Total Absorption Area of Receiver Room	A (furnished)		2	4	6	6	5	5
	$10\log(S/A)$	G	11.0	7.6	5.7	5.7	6.5	6.5
Total Internal Sound Pressure Level, Leq	$Leq,2$	A+F+G+3	33.1	29.6	25.0	21.6	16.0	13.4

RESULTANT INTERNAL NOISE LEVEL	27
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{max,ff}$	70dBA	68	65	65	65	56	64
Simon acoustic frame vent	$D_{ne,w}$	$D_{ne,w}$ 33 dB	40	36	35	31	32	37
Glazing 6mm float / 10mm / 4mm float	R_w	R_w 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof	R_{rr}	R_w 61 dB	31	43	50	55	57	57
Total room absorption (based on RT)	RT_{60}	0.5	2	4	6	6	5	5

Derivation	Term	Value
Façade area (including window)	S_f	14
Window area	S_{wi}	4.5
$S_f - S_{wi}$	S_{ew}	10
Area of ceiling	S_{rr}	7
$S_f + S_{rr}$	S	21
Reference absorption area	A_0	10
Room volume	V	18

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	68	65	65	65	56	64
Simon acoustic frame vent	$D_{n,e}$		39.5	35.9	35.1	30.7	32.1	36.9
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00005	0.00012	0.00015	0.00040	0.00029	0.00010
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00042	0.00053	0.00034	0.00004	0.00005	0.00027
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00004	0.00002	0.00002	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		31	43	50	55	57	57
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00026	0.00002	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-31	-32	-33	-33	-35	-34
Total Absorption Area of Receiver Room	A (furnished)		2	4	6	6	5	5
	$10\log(S/A)$	G	11.0	7.6	5.7	5.7	6.5	6.5
Total Internal Sound Pressure Level, Leq	$Leq,2$	A+F+G+3	50.8	43.7	41.2	40.7	31.3	39.0

RESULTANT INTERNAL NOISE LEVEL	45
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	56dBA	56	55	54	52	48	43
Mechanical ventilation	$D_{ne,w}$	$D_{ne,w}$ n/a dB	100	100	100	100	100	100
Glazing 6mm float / 10mm / 4mm float	R_w	R_w 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof	R_{rr}	R_w 61 dB	31	43	50	55	57	57
Total room absorption (based on RT)	RT_{60}	0.75	4	6	8	8	7	7

Derivation	Term	Value
Façade area (including window)	S_f	14
Window area	S_{wi}	4
$S_f - S_{wi}$	S_{ew}	9
Area of ceiling	S_{rr}	14
$S_f + S_{rr}$	S	28
Reference absorption area	A_0	10
Room volume	V	35

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	56	55	54	52	48	43
Mechanical ventilation	$D_{n,e}$		100	100	100	100	100	100
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00031	0.00039	0.00024	0.00003	0.00004	0.00019
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00003	0.00002	0.00002	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		31	43	50	55	57	57
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00041	0.00003	0.00001	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-31	-34	-36	-45	-44	-37
Total Absorption Area of Receiver Room	A (furnished)		4	6	8	8	7	7
	$10\log(S/A)$	G	8.8	6.9	5.6	5.6	6.2	6.2
Total Internal Sound Pressure Level, L_{eq}	$L_{eq,2}$	A+F+G+3	36.2	31.6	26.9	16.1	12.8	15.2

RESULTANT INTERNAL NOISE LEVEL	28
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	56dBA	56	55	54	52	48	43
Mechanical ventilation	$D_{ne,w}$	Dne,w n/a dB	100	100	100	100	100	100
Glazing 6mm float / 10mm / 4mm float	R_w	Rw 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof	R_{rr}	R_w 61 dB	31	43	50	55	57	57
Total room absorption (based on RT)	RT_{60}	0.5	3	5	7	7	6	6

Derivation	Term	Value
Façade area (including window)	S_f	16
Window area	S_{wi}	1.4
$S_f - S_{wi}$	S_{ew}	14
Area of ceiling	S_{rr}	8
$S_f + S_{rr}$	S	24
Reference absorption area	A_0	10
Room volume	V	21

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	56	55	54	52	48	43
Mechanical ventilation	$D_{n,e}$		100	100	100	100	100	100
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00012	0.00015	0.00009	0.00001	0.00001	0.00007
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00005	0.00003	0.00003	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		31	43	50	55	57	57
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00028	0.00002	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-34	-37	-39	-48	-48	-41
Total Absorption Area of Receiver Room	A (furnished)		3	5	7	7	6	6
	$10\log(S/A)$	G	9.3	7.0	5.5	5.5	6.2	6.2
Total Internal Sound Pressure Level, Leq	$Leq,2$	A+F+G+3	34.5	28.2	23.6	12.8	8.7	10.9

RESULTANT INTERNAL NOISE LEVEL	25
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	51dBA	50	51	49	46	41	38
Mechanical ventilation	$D_{ne,w}$	$D_{ne,w}$ n/a dB	100	100	100	100	100	100
Glazing 6mm float / 10mm / 4mm float	R_w	R_w 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof	R_{rr}	R_w 61 dB	31	43	50	55	57	57
Total room absorption (based on RT)	RT_{60}	0.5	3	5	7	7	6	6

Derivation	Term	Value
Façade area (including window)	S_f	16
Window area	S_{wi}	1.4
$S_f - S_{wi}$	S_{ew}	14
Area of ceiling	S_{rr}	8
$S_f + S_{rr}$	S	24
Reference absorption area	A_0	10
Room volume	V	21

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	50	51	49	46	41	38
Mechanical ventilation	$D_{n,e}$		100	100	100	100	100	100
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00012	0.00015	0.00009	0.00001	0.00001	0.00007
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00005	0.00003	0.00003	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		31	43	50	55	57	57
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00028	0.00002	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-34	-37	-39	-48	-48	-41
Total Absorption Area of Receiver Room	A (furnished)		3	5	7	7	6	6
	$10\log(S/A)$	G	9.3	7.0	5.5	5.5	6.2	6.2
Total Internal Sound Pressure Level, L_{eq}	$L_{eq,2}$	A+F+G+3	29.0	23.5	18.7	7.1	2.2	6.0

RESULTANT INTERNAL NOISE LEVEL	20
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{max,ff}$	70dB(A)	68	65	65	65	56	64
Mechanical ventilation	$D_{ne,w}$	$D_{ne,w}$ n/a dB	100	100	100	100	100	100
Glazing 6mm float / 10mm / 4mm float	R_w	R_w 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof	R_{rr}	R_w 61 dB	31	43	50	55	57	57
Total room absorption (based on RT)	RT_{60}	0.5	3	5	7	7	6	6

Derivation	Term	Value
Façade area (including window)	S_f	16
Window area	S_{wi}	1.4
$S_f - S_{wi}$	S_{ew}	14
Area of ceiling	S_{rr}	8
$S_f + S_{rr}$	S	24
Reference absorption area	A_0	10
Room volume	V	21

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	68	65	65	65	56	64
Mechanical ventilation	$D_{n,e}$		100	100	100	100	100	100
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00012	0.00015	0.00009	0.00001	0.00001	0.00007
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00005	0.00003	0.00003	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		31	43	50	55	57	57
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00028	0.00002	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-34	-37	-39	-48	-48	-41
Total Absorption Area of Receiver Room	A (furnished)		3	5	7	7	6	6
	$10\log(S/A)$	G	9.3	7.0	5.5	5.5	6.2	6.2
Total Internal Sound Pressure Level, L_{eq}	$L_{eq,2}$	A+F+G+3	46.7	37.6	34.8	26.1	17.5	31.7

RESULTANT INTERNAL NOISE LEVEL	37
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
External Noise Level from mechanical plant	$L_{eq,ff}$	43dBA	48	42	41	37	33	28
Mechanical ventilation	$D_{ne,w}$	Dne,w n/a dB	100	100	100	100	100	100
Glazing 6mm float / 10mm / 4mm float	R_w	Rw 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	Rw 57dB	41	43	43	52	62	73
Roof	R_{rr}	Rw 61 dB	31	43	50	55	57	57
Total room absorption (based on RT)	RT_{60}	0.5	3	5	7	7	6	6

Derivation	Term	Value
Façade area (including window)	S_f	16
Window area	S_{wi}	1.4
$S_f - S_{wi}$	S_{ew}	14
Area of ceiling	S_{rr}	8
$S_f + S_{rr}$	S	24
Reference absorption area	A_0	10
Room volume	V	21

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	48	42	41	37	33	28
Mechanical ventilation	$D_{n,e}$		100	100	100	100	100	100
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00012	0.00015	0.00009	0.00001	0.00001	0.00007
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00005	0.00003	0.00003	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		31	43	50	55	57	57
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00028	0.00002	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-34	-37	-39	-48	-48	-41
Total Absorption Area of Receiver Room	A (furnished)		3	5	7	7	6	6
	$10\log(S/A)$	G	9.3	7.0	5.5	5.5	6.2	6.2
Total Internal Sound Pressure Level, Leq	$Leq,2$	A+F+G+3	26.2	15.3	10.5	-2.7	-6.2	-3.9

RESULTANT INTERNAL NOISE LEVEL	13
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Description	Term	Weighted rating	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
External Noise Level from mechanical plant	$L_{eq,ff}$	34dBA	38	34	32	28	24	19
Mechanical ventilation	$D_{ne,w}$	$D_{ne,w}$ n/a dB	100	100	100	100	100	100
Glazing 6mm float / 10mm / 4mm float	R_w	R_w 34dB	27	26	28	37	36	29
External wall - Brick/block cavity	R_{ew}	R_w 57dB	41	43	43	52	62	73
Roof	R_{rr}	R_w 61 dB	31	43	50	55	57	57
Total room absorption (based on RT)	RT_{60}	0.5	3	5	7	7	6	6

Derivation	Term	Value
Façade area (including window)	S_f	16
Window area	S_{wi}	1.4
$S_f - S_{wi}$	S_{ew}	14
Area of ceiling	S_{rr}	8
$S_f + S_{rr}$	S	24
Reference absorption area	A_0	10
Room volume	V	21

Description	Term from Equation	Reference letter	Octave Band Centre Frequency (Hz)					
			125	250	500	1000	2000	4000
Freefield External Noise Level	$L_{eq,ff}$	A	38	34	32	28	24	19
Mechanical ventilation	$D_{n,e}$		100	100	100	100	100	100
	$(A_0/S) * 10^{(-D_{ne,w}/10)}$	B	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Double Glazed Windows	R_{wi}		27	26	28	37	36	29
	$(S_{wi}/S) * 10^{(-R_{wi}/10)}$	C	0.00012	0.00015	0.00009	0.00001	0.00001	0.00007
External Wall Construction	R_{ew}		41	43	43	52	62	73
	$(S_{ew}/S) * 10^{(-R_{ew}/10)}$	D	0.00005	0.00003	0.00003	0.00000	0.00000	0.00000
Roof Construction	R_{rr}		31	43	50	55	57	57
	$(S_{rr}/S) * 10^{(-R_{rr}/10)}$	E	0.00028	0.00002	0.00000	0.00000	0.00000	0.00000
Total Sound Insulation Performance	$10\log(B+C+D+E)$	F	-34	-37	-39	-48	-48	-41
Total Absorption Area of Receiver Room	A (furnished)		3	5	7	7	6	6
	$10\log(S/A)$	G	9.3	7.0	5.5	5.5	6.2	6.2
Total Internal Sound Pressure Level, Leq	$Leq,2$	A+F+G+3	16.4	6.5	1.7	-11.6	-15.2	-13.3

RESULTANT INTERNAL NOISE LEVEL	4
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Appendix E



Acoustic Performance

Glazing Configuration

4mm Float Glass

10mm Cavity

6mm Float Glass

Sound Reduction Indices

Frequency, Hz / dB						Rw	C	Ctr	OITC	STC
125	250	500	1000	2000	4000	34	-1	-3	29	34
27	26	28	37	36	29					

Disclaimer: The acoustic performance data provided in the reports is based on a test protocol or an estimation and may be used if user actual glazing is identical to input data described herein. Acoustic performance data herein is only applicable for glazing dimensions 1,23 m x 1,48 m (as per testing standard). Estimation of acoustic performance is based on component-similarity assumptions which are derived from measured data and interpolation to expand the database of values from test protocols. Due to inherent variations in acoustic performance when testing in accordance with EN ISO 10140-3/EN ISO 10140-2, some variation in the calculated performance can also be expected. As such, the weighted performance, R_w , and adaptation terms, C and C_{tr} , should typically be considered to be accurate within ± 2 dB. However, wider deviations can occur. Actual performance may vary according to the glazing dimensions, frame system, noise sources and many other parameters. The acoustic performance data herein should not be used as a substitute for tests of actual glazing. For more information please consult Assumptions and Terminology section in Guardian Acoustic Assistant.

Simon

Acoustic Solutions - Simons have launched a range of acoustic ventilators to assist clients in creating a satisfactory solution for all their acoustic requirements. All ventilators in the range meet the requirements of Document F and Document E of the Building Regulations

Simon Acoustic Ventilators

Specification

- Sound reduction of up to 41dB
- All models have been independently tested in accordance with BS EN ISO 717-1:1997 (airborne sound insulation & BS EN 20140-10:1992)
- Acoustic canopy available in any standard RAL colour and silver anodised finish
- Available in 5 internal options
- All options can be supplied on carrier bar
- Some models available with humidity control
- All models have a minimum Equivalent Area of 2,500mm²
- Meets World Health Organisation recommended reduction of 33dB



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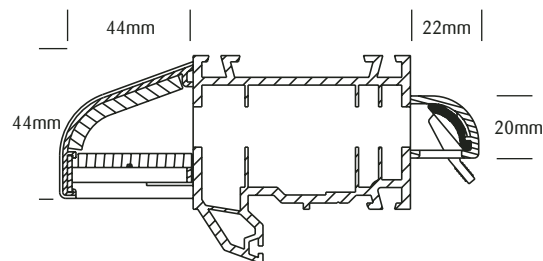
Web: www.rwsimon.co.uk



Simon
Air Management
Systems

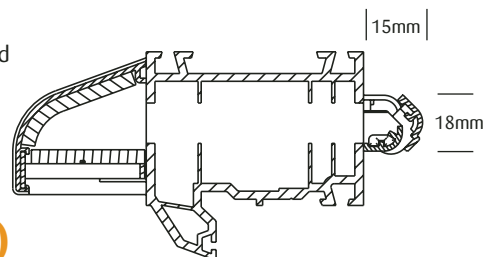
Simon Acoustic FV (Framevent)

- Supplied with a PVCu internal flap unit and aluminium external canopy
- 4080^{mm2} measured area 2500^{mm2} Equivalent Area
- Available with white, bright white, mahogany & tan internals and any standard RAL colour or anodised external aluminium canopy
- Achieves sound reduction of 40dB closed and 33dB open
- Rod options available



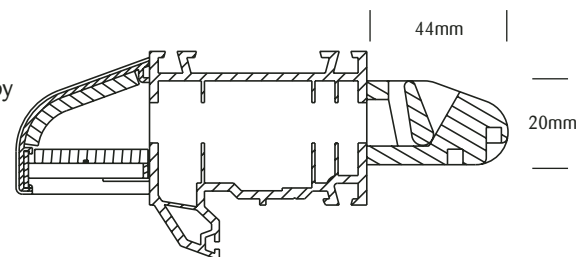
Simon Acoustic SL (Slimline)

- Manufactured fully from aluminium. Available in any standard RAL colour, or anodised internal and externals
- 4080^{mm2} measured area 2,500^{mm2} Equivalent Area
- Achieves sound reduction of 39dB closed and 33dB open
- Rod options available



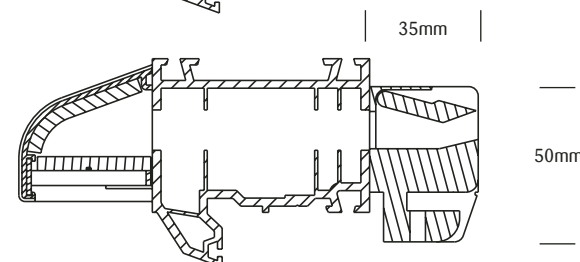
Simon Acoustic EMM (Humidity Controlled)

- Internal unit and an aluminium external canopy
- Achieves 2500^{mm2} Equivalent Area
- Available in white internally and any standard. RAL colour or anodised external canopy
- Uses a hygromatic sensor which opens and closes the flap dependent on the amount of moisture in the room
- Achieves sound reduction of 39dB closed and 33dB open



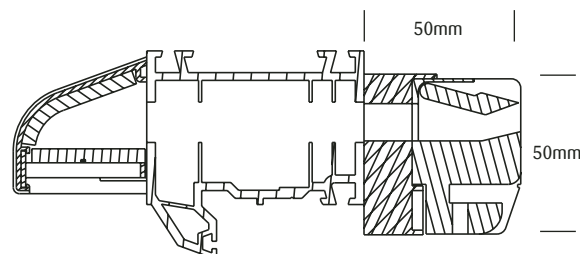
Simon Acoustic EHA

- Internal automatic opening unit and aluminium external canopy
- Achieves a minimum Equivalent Area of 2500^{mm2}
- Available in white internally and any standard RAL colour or anodised external
- Uses a hygromatic sensor which opens and closes the flap dependent on the amount of moisture in the room
- Achieves sound reduction of 38dB closed and 36dB open



Simon Acoustic EHAS

- Internal automatic opening unit and aluminium external canopy
- Has a minimum Equivalent Area of 2500^{mm2}
- Available in white internally and any standard RAL polyester powder coated finish or anodised external canopy
- Uses a hygromatic sensor which opens and closes the flap dependent on the amount of moisture in the room.
- Includes additional acoustic sleeve to increase the acoustic properties
- Achieves sound reduction of 41dB closed and 38dB open



Specifications

	dB Closed	dB open	EA to BS 13141-1	Measured Area ^{mm2}	Dimensions Int.	Dimensions Ext	Slot size
Simon Acoustic F V	40	33	2830	4080	400 x 20	431 x 45	340 x 12
Simon Acoustic SL	39	33	2967	4080	375 x 18	431 x 45	340 x 12
Simon Acoustic EMM	39	33	3199	4080	420 x 30	431 x 45	340 x 12
Simon Acoustic EHA	38	36	2799	4080	420 x 50	431 x 45	340 x 12
Simon Acoustic EHAS	41	38	2799	4080	420 x 50	431 x 45	340 x 12

Internal Colour Options

Simon Acoustic FV	White, Brown and Tan
Simon Acoustic SL	Any RAL colour and silver anodised
Simon Acoustic EMM	White only
Simon Acoustic EHA	White only
Simon Acoustic EHAS	White only

All the above acoustic vents can be supplied on glazed in carrier bar.

By adding additional units the acoustic performance may be reduced.

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Simon
Air Management
Systems



INVESTOR IN PEOPLE

Technical Report

Report Number C/06/5L/3690/1

Date 26 February 2007

Project

The laboratory Determination of the
Element Normalised level Difference
of the Simon Acoustic Framevent

Prepared for

**R W Simon
System Works
Hatchmoor Ind. Est
Torrington
Devon EX38 7HP**

By

Gareth Young

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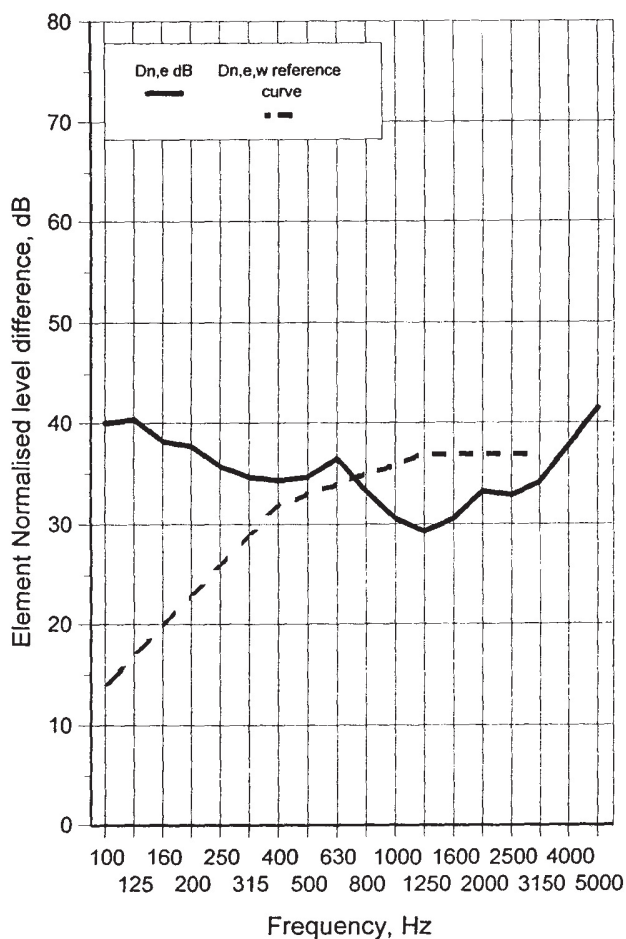
e-mail: srl@soundresearch.co.uk

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Data Sheet 9

Test Number: 11 Air temperature: 15.9 °C
 Test Date: 16/01/2007 Air humidity: 61 %
 Number of items tested at once: 1 Receiving room volume: 300 m³
 Nominal free area of single ventilator: 2500 mm² Source room volume: 115 m³
 Product identification: Simon Acoustic Frame Vent - Open (Mastic around canopy to wood - Receive side)

Freq f Hz	Element normalised level difference D _{n,e} dB	
	1/3 Oct	1/1 Oct
100	40.0 \$	39.5
125	40.4 \$	
160	38.3 %	
200	37.8 \$	35.9
250	35.7 \$	
315	34.7	
400	34.3	35.1
500	34.7	
630	36.4	
800	33.3	30.7
1000	30.5	
1250	29.3	
1600	30.6	32.1
2000	33.3	
2500	32.9	
3150	34.2	36.9
4000	37.7	
5000	41.5	
6300+	41.6	40.2
8000+	38.8	
10000+	40.5	
Average 100-3150	34.8	



Rating according to BS EN ISO 717-1:1997

D_{n,e,w}(C;Ctr)= 33 (-1;-1) dB

Notes : * designates measurement corrected for background
 # designates limit of measurement due to background
 % designates measurement corrected for flanking
 \$ designates limit of measurement due to flanking
 + designates frequency beyond standard

v1.2