

Land at and to the rear of 238 and 240 Nine Mile Ride, Finchampstead

Noise Impact Assessment Report Report 30965.NIA.01

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Contents

1.0	INTRODUCTION.....	1
2.0	SITE SURVEYS	1
2.1	Site Description	1
2.2	Environmental Noise Survey Procedure	1
2.3	Measurement Positions	2
2.4	Equipment.....	2
3.0	RESULTS.....	3
4.0	NOISE ASSESSMENT GUIDANCE.....	3
4.1	Noise Policy Statement for England 2010.....	3
4.2	Planning Practice Guidance – Noise (PPG-N).....	5
4.3	ProPG: Planning and Noise	5
4.4	BS8233:2014	6
4.5	WHO Guidelines for Community Noise (1999)	7
4.6	Approved Document O (ed. 2021).....	7
4.6.1	Application	8
4.6.2	Internal Noise Level Targets	8
4.6.3	Methods to Remove Excess Heat	9
5.0	EXTERNAL BUILDING FABRIC SPECIFICATION	9
5.1	Non-Glazed Elements.....	9
5.2	Glazed Elements.....	9
6.0	VENTILATION AND OVERHEATING.....	10
6.1	Ventilation Strategy	10
6.2	Openable Windows.....	11
6.3	Overheating Control Strategies	12
7.0	EXTERNAL AMENITY AREA ASSESSMENT.....	13
8.0	PLANT NOISE ASSESSMENT.....	13
8.1	Nearest noise sensitive receptors and Proposed plant installation location	13
9.0	RESULT	17
9.1	Plant Noise Survey Results.....	17
10.0	NOISE ASSESSMENT GUIDANCE.....	17
10.1	Local Authority Guidance.....	17

10.2	Noise Emissions Criterion	18
11.0	PLANT NOISE IMPACT ASSESSMENT	18
11.1	Proposed Plant Installations	18
11.2	Calculations	19
12.0	NOISE CONTROL MEASURES	20
12.1	Acoustic Enclosure	20
12.2	Anti-Vibration Mounting Strategy	21
13.0	CONCLUSION	21

List of Attachments

30695.TH1-2	Environmental Noise Time Histories
Appendix A	Glossary of Acoustics Terminology
Appendix B	Acoustic Calculations
Appendix C	Anti-Vibration Mounting Specification Reference Document

1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by Elivia Homes Limited, Unit 5-6, Woodlands Court, Burnham Road, Beaconsfield, Buckinghamshire, HP9 2SF, to undertake a noise impact assessment and planning compliance review at Land at and to the rear of 238 and 240 Nine Mile Ride, Finchampstead, RG40 3QD, in support of a proposed residential development comprising 26 dwellings.

A 24-hour environmental noise survey has been undertaken at the site. The measured background noise levels have been used to determine compliance with the internal noise level criteria set out in BS8233:2014. Additionally appropriate daytime and night-time noise emission limits have been derived for the proposed air source heat pump (ASHP) units.

This report presents the results of the environmental survey and outlines any necessary mitigation measures to demonstrate that the development is suitable for residential use and that the proposed plant installations will not adversely impact nearby noise-sensitive receivers.

2.0 SITE SURVEYS

2.1 Site Description

The site is bounded by existing residential properties fronting Nine Mile Ride (B3430) to the north, mature woodland to the west and south, and residential gardens and dwellings to the east. Access to the site is provided via a private driveway leading south from Nine Mile Ride, located between Nos. 238 and 240.

At the time of the survey, the background noise climate was predominantly influenced by road traffic movements along Nine Mile Ride, with occasional contributions from local residential activity and natural sounds from surrounding vegetation.

2.2 Environmental Noise Survey Procedure

A noise survey was undertaken on the proposed site as shown in Figure 2.1. The location was chosen in order to collect data representative of the worst-case levels expected on the site due to all nearby sources.

Two separate unattended environmental noise monitoring sessions were conducted as part of the survey. The first session took place between 14:00 on 02/07/2025 and 14:00 on 03/07/2025 for Position 1, and the second between 14:00 on 16/07/2025 and 14:00 on 17/07/2025 for Position 2.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2017 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*'.

2.3 Measurement Positions

Measurement positions are as described within Table 2.1 and shown within Figure 2.1.

Icon	Descriptor	Location Description
①	Noise Measurement Position 1	The microphone was installed on a tripod at the ground level in rear of the existing property, as shown in Figure 2.2. The microphone was positioned within free-field conditions at least approx. 1.5 metres from the nearest surface.
②	Noise Measurement Position 2	The microphone was installed on a tripod at the ground level in front of the existing property, as shown in Figure 2.2. The microphone was positioned within free-field conditions at least approx. 1.5 metres from the nearest surface.

Table 2.1 Measurement positions and descriptions



Figure 2.1 Site measurement positions (Image Source: Google Maps)

2.4 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.2.

Measurement instrumentation		Serial no.	Calibration Date	Cert no.
Noise Kit 30	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21149-E0	07/08/2024	TCRT24/1626
	Free-field microphone NTI Acoustics MC230A	A23572		
	Preamp NTI Acoustics MA220	10997		
	NTI Audio External Weatherproof Shroud	-	-	-
Noise Kit 31	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21119-E0	07/08/2024	TCRT24/1629
	Free-field microphone NTI Acoustics MC230A	A23402		
	Preamp NTI Acoustics MA220	10915		
	NTI Audio External Weatherproof Shroud	-	-	-
Larson Davis CAL200 Class 1 Calibrator		17148	17/12/2024	UCRT24/2677

Table 2.2 Measurement instrumentation

3.0 RESULTS

The L_{Aeq} : 5min, L_{Amax} : 5min, L_{A10} : 5min and L_{A90} : 5min acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as a time history in Figure 30695.TH1-2.

Measured noise levels are representative of noise exposure levels expected to be experienced by all facades of the proposed development, and are shown in Table 3.1.

Time Period	Noise Measurement Position 1 (Measured Noise level – dBA)	Noise Measurement Position 2 (Measured Noise level – dBA)
Daytime $L_{Aeq,16hour}$	44	47
Night-time $L_{Aeq,8hour}$	42	40

Table 3.1 Site average noise levels for daytime and night time

4.0 NOISE ASSESSMENT GUIDANCE

4.1 Noise Policy Statement for England 2010

The National Planning Policy Framework (NPPF) has superseded and replaces Planning Policy Guidance Note 24 (PPG24), which previously covered issues relating to noise and planning in

England. Paragraph 187 of NPPF 2024 states that planning policies and decisions should aim to:

- 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

In addition, Paragraph 198 of the NPPF states that *'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':*

- 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
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason

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

Noise Policy Statement England (NPSE) noise policy aims are as follows:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life*

The Noise Policy Statement England (NPSE) outlines observed effect levels relating to the above, as follows:

- NOEL – No Observed Effect Level

- This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed Adverse Effect Level
 - This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level
 - This is the level above which significant adverse effects on health and quality of life occur.

As stated in The Noise Policy Statement England (NPSE), it is not currently possible to have a single objective based measure that defines SOAEL that is applicable to all sources of noise in all situations. Specific noise levels are not stated within the guidance for this reason, and allow flexibility in the policy until further guidance is available.

4.2 Planning Practice Guidance – Noise (PPG-N)

Planning Practice Guidance – Noise (PPG) was introduced by the Ministry of Housing, Communities & Local Government in March 2014 and revised in July 2019. It is an online digital resource that “advises on how planning can manage potential noise impacts in new development”. It gives guidance on establishing whether noise will likely cause a concern, factors of influence on noise impact and methods by which planning can address adverse effects of noise sources.

A noise exposure hierarchy table is provided within the guidance that follows the same observed effect descriptors given within the NPSE guidance, i.e. NOEL, NOAEL and LOAEL and SOAEL.

For a NOAEL descriptor: “A noise has no adverse effect so long as the exposure does not cause any change in behaviour, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent there is a change in quality of life”

4.3 ProPG: Planning and Noise

As outlined above, the National Planning Policy Framework encourages improved standards of design, although it provides no specific noise levels which should be achieved on site for

varying standards of acoustic acceptability, or a prescriptive method for the assessment of noise.

ProPG: Planning and Noise was published in May 2017 in order to encourage better acoustic design for new residential schemes in order to protect future residents from the harmful effects of noise. This guidance can be seen as the missing link between the current NPPF and its predecessor, PPG24 (Planning Policy Guidance 24: Planning and Noise), which provided a prescriptive method for assessing sites for residential development, but without the nuance of ‘good acoustic design’ as outlined in ProPG.

ProPG allows the assessor to take a holistic approach to consider the site’s suitability, taking into consideration numerous design factors which previously may not have been considered alongside the noise level measured on site, for example the orientation of the building in relation to the main source of noise incident upon it.

It should be noted this document is not an official government code of practice, and neither replaces nor provides an authoritative interpretation of the law or government policy, and therefore should be seen as a good practice document only.

4.4 BS8233:2014

BS8233:2014 ‘*Sound insulation and noise reduction for buildings*’ describes recommended internal noise levels for residential spaces. These levels are shown in Table 4.1.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB(A)	-
Dining	Dining Room/area	40 dB(A)	-
Sleeping (daytime resting)	Bedrooms	35 dB(A)	30 dB(A)

Table 4.1 BS8233 recommended internal background noise levels

It should be noted that the recommended internal noise levels outlined above are not applicable under “purge ventilation” conditions as defined by Approved Document F of the Building Regulations, as this should only occur occasionally (e.g. to remove odour from painting or burnt food). However, the levels above should be achieved whilst providing sufficient background ventilation, either via passive or mechanical methods.

The external building fabric would need to be carefully designed to achieve these recommended internal levels.

In addition to guidance on internal levels, BS8233:2014 also states the following with regards to noise within external amenity spaces:

‘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 $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$, 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.’

As outlined above, the resulting noise levels in external amenity areas should not be a reason for refusal, providing that the noise levels are designed to be as low as practically possible within external amenity areas.

4.5 WHO Guidelines for Community Noise (1999)

WHO Guidelines for Community Noise (1999) recommends that internal noise levels for individual events should not exceed 45dB L_{Amax} more than 10-15 times per night.

It should be noted that this impact is increasingly being regarded as ‘LOAEL’ for this number of exceedances, as described in Section 4.1.

The external building fabric would need to be carefully designed to ensure that the above guidance is achieved.

4.6 Approved Document O (ed. 2021)

Approved Document O (ADO) supports Part O of Schedule 1 to the Building Regulations 2010. ADO introduces requirements for residential premises in order to prevent overheating from occurring. There are two specific requirements from ADO:

Requirement O1 (1):

To limit unwanted solar gains in summer and to provide adequate means to remove heat from the indoor environment.

Requirement O1 (2):

(a) Account must be taken of the safety of the occupant, and their reasonable enjoyment of the residence.

(b) Mechanical cooling may only be used where sufficient heat cannot be removed from the indoor environment without it.

The statutory guidance to support Requirement O1(2)(a) contains requirements relating to noise at night.

4.6.1 Application

The guidance within ADO applies to new residential buildings only and are defined within the following table:

Title	Purpose for which the building is intended to be used.
Residential (dwellings)	Dwellings, which includes both dwellinghouses and flats.
Residential (institutions)	Home, school or other similar establishment, where people sleep on the premises. The building may be living accommodation for the care or maintenance of any of the following. A. Older and disabled people, due to illness or other physical or mental condition. B. People under the age of 5 years.
Residential (other)	Residential college, hall of residence and other student accommodation, and living accommodation for children ages 5 years or older.

Table 4.2 Residential buildings within the scope of ADO (ref. Table 0.1 of Approved Document O)

Paragraphs 3.2 and 3.3 of ADO specifically refer to noise within bedrooms at night. Whilst any habitable room could be used as a bedroom, it is proposed that the scope is confined to those rooms specifically designated as bedrooms.

4.6.2 Internal Noise Level Targets

ADO sets internal noise level targets within Paragraph 3.3 of the document:

“Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

a. 40dB L_{Aeq,T_s} averaged over 8 hours (between 11pm and 7am)

b. 55dB L_{AFmax} more than 10 times a night (between 11pm and 7am).”

Where an openable window for the removal of excess heat is predicted to result in the above internal noise levels to be exceeded, then the overheating mitigation strategy must adopt one of the alternative means listed within Paragraph 2.10 of ADO (presented within Section 4.7.3 of this report). This constraint applies regardless of which method is used to demonstrate compliance with Requirement O1 (1).

4.6.3 Methods to Remove Excess Heat

Paragraph 2.10 of ADO lists the means for removing excess heat from dwellings according to the following:

- Openable windows
- Ventilation louvres in external walls
- A mechanical ventilation system
- A mechanical cooling system

5.0 EXTERNAL BUILDING FABRIC SPECIFICATION

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed and non-glazed elements in order to achieve the recommended internal noise levels shown in Table 4.1, taking into account average and maximum noise levels monitored during the environmental noise survey.

As a more robust assessment, L_{Amax} spectrum values of night-time peaks have also been considered and incorporated into the glazing calculation in order to cater for the interior limit of 45 dB L_{Amax} for individual events, as recommended in WHO Guidelines.

Please note that the glazed and non-glazed element calculations would need to be finalised once all design proposals are finalised.

5.1 Non-Glazed Elements

It is currently understood that the non-glazed building façade is comprised of the elements as shown within Table 5.1 based on the construction detail provided. The anticipated sound reduction index has been calculated, and would be expected to provide the minimum figures shown in the following table when tested in accordance with the BS EN ISO 10140 series of standards.

Element	Octave band centre frequency SRI, dB					
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Brickwork Cavity Wall	41	43	48	50	55	55

Table 5.1 Assumed sound reduction performance for non-glazed elements

5.2 Glazed Elements

Minimum octave band sound reduction index (SRI) values required for all glazed elements to be installed are shown in Table 5.2. The performance is specified for the whole window unit,

including the frame, seals, etc. as appropriate. Sole glass performance data would not demonstrate compliance with this specification.

Glazing performance calculations have been based both on average measured night-time noise levels as well as verified against the L_{Amax} spectrum of individual events in order to comply with a maximum internal noise level of 45dB(A) in bedrooms as recommended by World Health Organisation Guidelines. The combined most robust results of these calculations are shown in Table 5.2.

Elevation	Octave band centre frequency SRI, dB						$R_w (C;C_{tr})$, dB
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	
All	24	20	25	35	38	35	31 (-1;-4)

Table 5.2 Required glazing performance

The nominated glazing supplier should verify that their proposed window system meets the attenuation figures shown at each centre frequency band as shown in Table 5.2.

Example glazing types that would be expected achieve the above spectral values are shown in Table 5.3.

Elevation	Example glazing type
All	4/12/4

Table 5.3 Example glazing types

All major building elements should be tested in accordance with the BS EN ISO 10140 series of standards.

Independent testing at a UKAS accredited laboratory will be required in order to confirm the performance of the chosen system for an ‘actual’ configuration.

6.0 VENTILATION AND OVERHEATING

6.1 Ventilation Strategy

Based on the noise levels measured on site, appropriate ventilation systems are outlined in Table 6.1 below in order to ensure the internal noise environment is not compromised.

Ventilation System	Whole Dwelling Ventilation	Extract Ventilation
ADF System 1	Trickle vents providing a minimum performance of 23dB $D_{n,e,w}$	Intermittent extract fans
ADF System 3	Continuous mechanical extract (low rate) and trickle vents for supply providing a minimum performance of 23dB $D_{n,e,w}$	Continuous mechanical extract (high rate) with trickle vents providing inlet air
ADF System 4	Continuous mechanical supply and extract (low rate)	Continuous mechanical supply and extract (high rate)

Table 6.1 Ventilation systems

Where trickle vents are proposed, a typical number (2no.) has been assumed based on the room size and number of windows. As trickle vents introduce a weak point in the building façade, it should be noted that increasing the number of trickle vents will reduce the composite performance of the facade. If more trickle vents are required, the required insulation should be increased by '+10*LOG(N)' where N is the number of vents proposed. If trickle vents are proposed, the total number of trickle vents for each sensitive space should be confirmed so that calculations can be accurately revised.

In the case of mechanical ventilation, systems should be designed to meet the internal noise levels as defined in CIBSE Guide A (2015), as shown in Table 6.2.

Room Type	L_{Aeq} , dB	NR
Bedrooms	30	25
Living Rooms	35	30
Kitchen	45-50	40-45

Table 6.2 CIBSE Guide A 2015 guidance levels for mechanical building services

In all cases, purge ventilation would be provided by openable windows. As outlined in Section 4.5, the internal noise level requirement would not be applicable during purge conditions as this would only occur occasionally.

6.2 Openable Windows

Approved Document O (ADO) only applies to Bedrooms during night. The advice within this section would therefore only apply to Bedrooms during night-time hours (23:00-07:00) to ensure that the internal noise level targets of 40dB(A) $L_{eq,T}$ and 55dB(A) L_{max} are not exceeded.

Table 6.3 presents the open area of the window as a % of the floor area which would need to be achieved to ensure that sufficient attenuation is provided from outside to inside.

Elevation	Sound Reduction Required to Achieve ADO Target Internal L_{Aeq} Noise Levels	Sound Reduction Required to Achieve ADO Target Internal L_{Amax} Noise Levels	Maximum Open Area of the Window as a Percentage of the Floor Area to Achieve ADO Target Internal Noise Levels
North	0 dB	2 dB	27 %
South	2 dB	6 dB	11%

Table 6.3 Window open areas

The overheating model should inform the design team whether the % open areas above would be sufficient to remove excess heat. In the event they are insufficient, other options to limit solar gains into the building should be investigated (such as those outlined in Section 2.7 of Approved Document O), or other means of removing excess heat should be explored (as outlined in Section 2.10 of the Approved Document).

Note: Acoustic open area is the measurable, cross-sectional, geometric area of an opening. For a partially open window, this is considered to be the lesser of either the size of the hole in the window frame that is left by the opening light, or the combined cross-sectional area around the opening light through which air must pass to move from outside to inside. The area around a hinged opening light includes the triangular areas on the sides adjacent to the hinge, and the rectangular area on the side opposite the hinge. This should not be used for comparing the air-flow performance of elements because this will also be dependent on factors such as depth (length of air-path), surface roughness and tortuosity.

6.3 Overheating Control Strategies

Where the open areas specified above are not sufficient for controlling overheating, then one or more of the following strategies will need to be adhered to:

- Fixed shading devices comprising any of the following:
 - Shutters
 - External blinds
 - Overhangs
 - Awnings
- Glazing design, involving any of the following solutions
 - Size
 - Orientation
 - G-value

- Building design, e.g. the placement of balconies
- Shading provided by adjacent buildings structures or landscaping.
- Ventilation louvres in external walls
- A mechanical ventilation system
- A mechanical cooling system

KP Acoustics would be happy to review any proposals to ensure that they adhere to the internal noise levels targeted within ADO.

7.0 EXTERNAL AMENITY AREA ASSESSMENT

External amenity areas are proposed for all units on the ground floor.

The measured noise levels provided in Table 3.1 range from 44-47dB(A) during daytime hours. Similar levels are expected in gardens of the proposed houses.

This meets the BS8233:2014 upper guideline value of 55dB $L_{Aeq,T}$ and therefore the proposed location for external areas are considered suitable.

8.0 PLANT NOISE ASSESSMENT

KP Acoustics Ltd has been appointed to undertake a noise impact assessment for the proposed installation of 26 air source heat pump (ASHP) units serving the residential development at the above development.

An environmental noise survey has already been undertaken on site in order to support this assessment, which has been prepared in accordance with BS4142:2014 '*Method for rating and assessing industrial and commercial sound*' as required by the planning conditions set out by Wokingham Borough Council.

This report presents the methodology and results from the environmental survey, followed by calculations in accordance with BS4142 to provide an indication of the likelihood of noise emission from the proposed ASHP units having an adverse impact on the closest noise sensitive receiver. Mitigation measures will be outlined as appropriate.

8.1 Nearest noise sensitive receptors and Proposed plant installation location

Due to the proposed development and the multiple ASHP units to be installed, two representative situations have been identified to characterise the typical and worst-case conditions at the nearest noise sensitive receptors.

These situations have been selected to capture the range of potential impacts and ensure a robust assessment across the development site.

Situation 1:

This situation represents ASHP units that are at the rear of houses, with line of sight from the proposed plant to the nearest residential window, and neighbouring houses with plant at the rear.

Icon	Descriptor	Location Description
	Nearest noise sensitive receptor	Rear façade. 1st Floor window of a residential house
	Proposed plant installation location	Proposed plant installations are outlined in Section 11.1

Table 8.1 Nearest noise sensitive receptor and proposed plant installation location

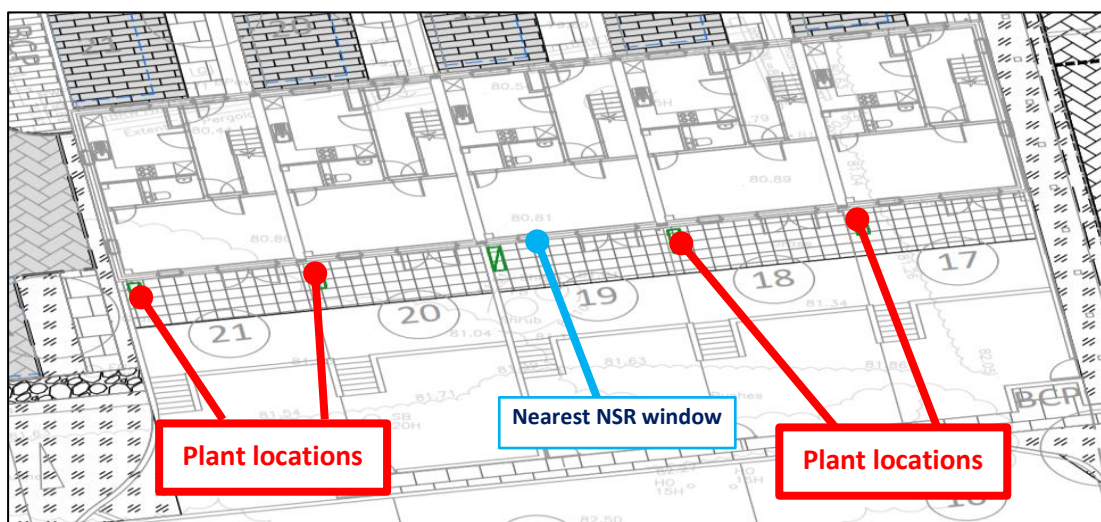


Figure 8.1 Proposed plant installation location & nearest noise sensitive receptor

Situation 2:

This situation represents ASHP units which are at a moderate distance from the nearest residential window, and which may have substantial barriers between the proposed plant items and the nearest residential windows, formed by the intervening buildings.

Icon	Descriptor	Location Description
	Nearest noise sensitive receptor	Rear façade. 1st Floor window of a residential house
	Proposed plant installation location	Proposed plant installations are outlined in Section 11.1

Table 8.2 Nearest noise sensitive receptor and proposed plant installation location

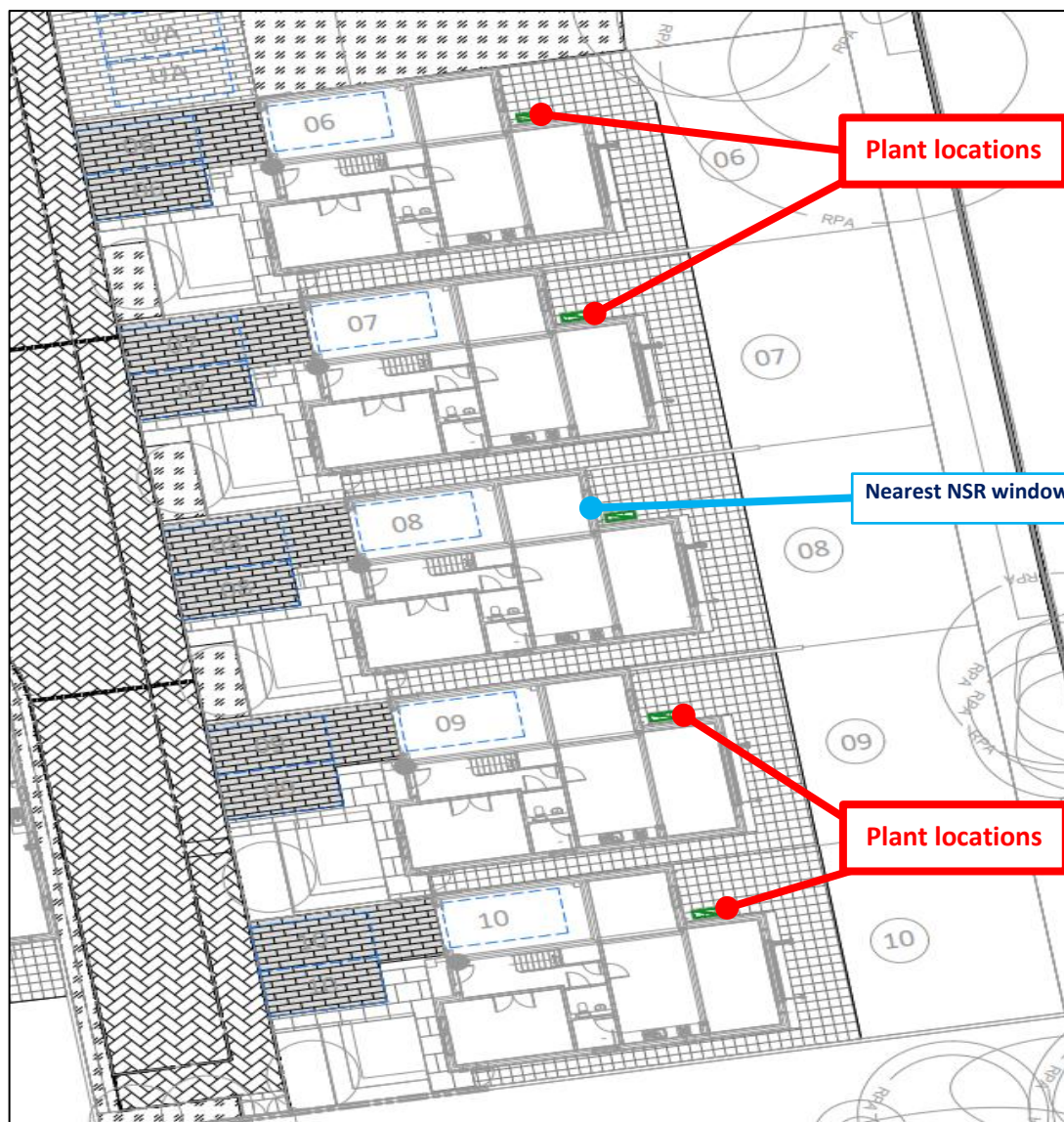


Figure 8.2 Proposed plant installation location & nearest noise sensitive receptor

Situation 3:

This situation represents ASHP units that are at the rear of houses, with a moderate distance to the nearest residential window and with solid barriers such as boundary walls or building façades that block direct line of sight to the receiver.

Icon	Descriptor	Location Description
	Nearest noise sensitive receptor	Rear façade. 1st Floor window of a residential house
	Proposed plant installation location	Proposed plant installations are outlined in Section 11.1

Table 8.3 Nearest noise sensitive receptor and proposed plant installation location

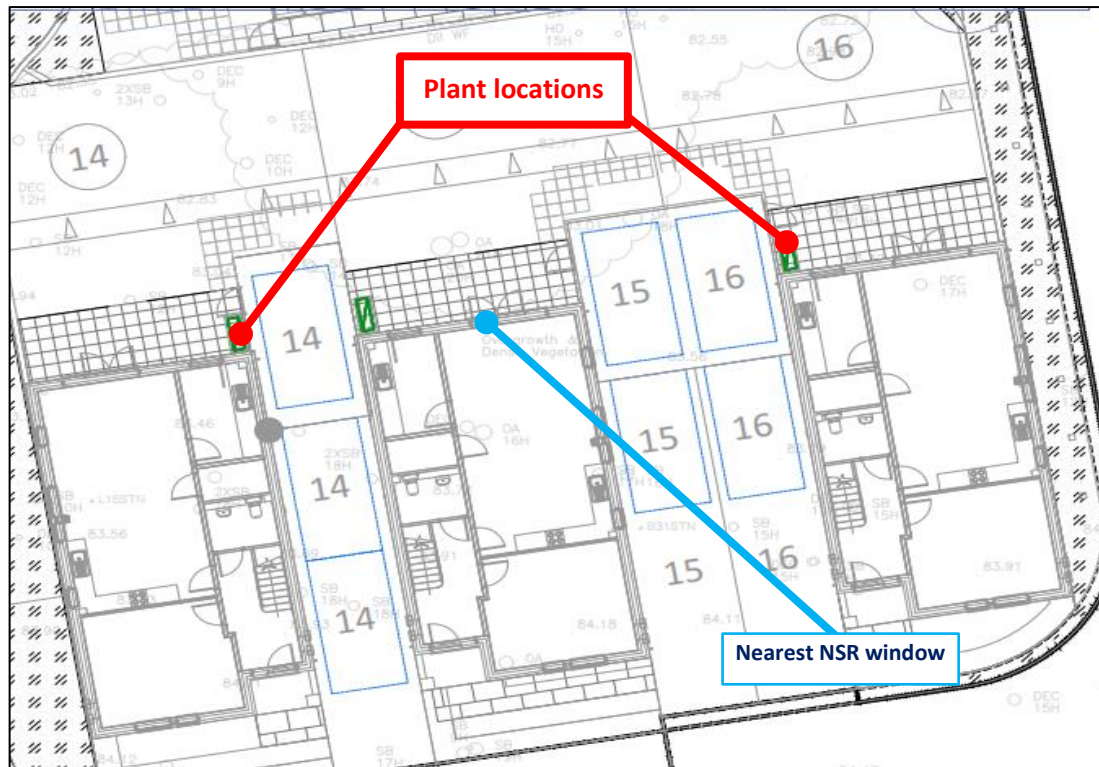


Figure 8.3 Proposed plant installation location & nearest noise sensitive receptor

Situation 4:

This situation represents ASHP units located at the rear of houses, with a distance greater than 20 metres to the nearest residential window and no direct line of sight.

Icon	Descriptor	Location Description
	Nearest noise sensitive receptor	Rear façade. 1st Floor window of a residential house
	Proposed plant installation location	Proposed plant installations are outlined in Section 11.1

Table 8.4 Nearest noise sensitive receptor and proposed plant installation location

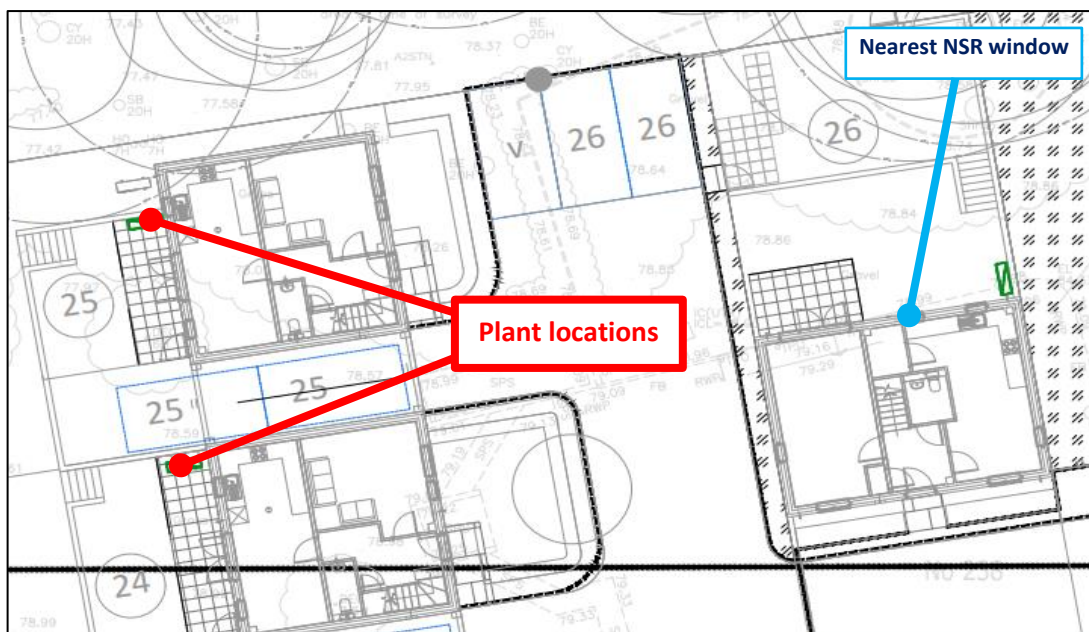


Figure 8.4 Proposed plant installation location & nearest noise sensitive receptor

9.0 RESULT

9.1 Plant Noise Survey Results

Noise Measurement Positions 1 and 2 are considered representative of the noise climate at the receptors located near the proposed ASHP units.

Representative background noise levels are shown in Table 9.1 for daytime and night-time, in accordance with the assessment criteria set out by Wokingham Borough Council.

Time Period	Position 1 Representative background noise level L_{A90} dB(A)	Position 2 Representative background noise level L_{A90} dB(A)
Daytime (07:00-23:00)	37	40
Night-time (23:00-07:00)	23	26

Table 9.1 Representative background noise levels

10.0 NOISE ASSESSMENT GUIDANCE

10.1 Local Authority Guidance

The criterion of The Wokingham Borough Council in this instance states that noise emission levels from plant units should be 5dB below representative background noise level, L_{A90} , or 10dB below if tonal components are present in the noise emission spectrum.

10.2 Noise Emissions Criterion

As the proposed units could be used at any time of the day or night, and no tonal components are evident in the noise data the criterion has been set as shown in Table 4.1 in order to comply with the above requirements.

The proposed criterion is very low, and in our view unnecessarily restrictive, falling below what is required to ensure noise levels which meet guidance targets in internal, residential spaces. This criterion may result in an onerous mitigation recommendation for the proposed plant, which may not be appropriate for the small, individual units that are proposed.

Time Period	Maximum Plant Noise Emissions Criterion at Nearest Residential Receiver
Night-time (23:00 to 07:00)	18 dB(A)

Table 10.1 Proposed noise emissions criterion

11.0 PLANT NOISE IMPACT ASSESSMENT

11.1 Proposed Plant Installations

It is understood that the proposed plant installation is comprised of the following units:

- 26 No. Vaillant aroTHERM plus (5/7 kW) Air Source Heat Pump Unit

The proposed installation locations for the ASHP units will be distributed across the development site, with one unit per house, as shown in Figures 8.1, 8.2, and 8.3 above.

The noise emission levels as provided by the manufacturer for the units are shown in Table 11.1.

Unit	Descriptor	Octave Frequency Band (Hz)								Overall (dBA)
		63	125	250	500	1k	2k	4k	8k	
Vaillant aroTHERM plus (7 kW)	SWL@1m (dBA)	46	46	48	50	48	46	47	41	54

Table 11.1 Plant Units Noise Emission Levels as provided by the manufacturer

Situation 1:

The closest noise sensitive receiver to the proposed installation location has been identified as a rear façade first-floor window of a residential unit, located approximately 5 metres from the nearest ASHP unit. There are no significant noise barriers between the unit and the window, representing a worst-case scenario in terms of potential impact, as shown in Figure 8.1.

Situation 2:

The closest noise sensitive receiver to the proposed installation location has been identified as a rear façade first-floor window of a residential unit, located approximately 11 metres from the nearest ASHP unit. No notable screening is present, although the increased distance between windows and proposed plant items reduces the potential impact compared to Situation 1, as shown in Figure 8.2.

Situation 3:

The closest noise sensitive receiver to the proposed installation location has been identified as a rear façade first-floor window of a residential unit, located approximately 11 metres from the nearest ASHP unit. Solid barriers, such as boundary walls or building façades, block direct line of sight and provide significant noise reduction, meaning no additional acoustic enclosures are required, as shown in Figure 8.3.

Situation 4:

The closest noise sensitive receiver to the proposed installation location has been identified as a rear façade first-floor window of a residential unit, located more than 20 metres from the nearest ASHP unit. The large separation distance provides substantial attenuation of noise levels, resulting in minimal potential impact, as shown in Figure 8.4.

11.2 Calculations

Taking all acoustic corrections into consideration, the noise level contribution expected at the closest residential window from the proposed plant has been calculated using a few sample areas across the site. These locations were chosen to represent the worst-case scenarios. The predicted noise levels would be as shown in Table 11.2. Detailed calculations are shown in Appendix B.

Receiver	Criterion	Noise Level at 1m From the Closest Noise Sensitive Window
1st Floor Residential Window (Situation 1)	18dB(A)	18dB(A)
1st Floor Residential Window (Situation 2)	18dB(A)	18dB(A)
1st Floor Residential Window (Situation 3)	18dB(A)	14dB(A)

Receiver	Criterion	Noise Level at 1m From the Closest Noise Sensitive Window
1st Floor Residential Window (Situation 4)	18dB(A)	1dB(A)

Table 11.2 Predicted noise level and criterion at nearest noise sensitive location

As shown in Appendix B and Table 11.2, transmission of noise to the nearest sensitive windows due to the effects of the proposed plant unit installation satisfies the emissions criterion of the Local Authority, providing that the mitigation measures outlined in Section 12 are implemented.

12.0 NOISE CONTROL MEASURES

In order to achieve the specific sound level and subsequent rating level shown in the assessment above, the following noise control strategy should be adopted.

12.1 Acoustic Enclosure

To control the noise emissions from the plant installation, we would recommend that individual acoustic enclosures are installed for the unit in situations 1 and 2, according to the insertion loss specification below.

Unit Ref.	Insertion Loss Levels (dB) in each octave frequency band (Hz)							
	63	125	250	500	1k	2k	4k	8k
Vaillant aroTHERM plus (7 kW) (Situation 1) Houses 1 – 3 Houses 17 - 21	7	9	12	17	19	20	25	25
Vaillant aroTHERM plus (7 kW) (Situation 2) Houses 4 – 10 Houses 22 – 25	7	9	12	14	16	14	15	10
Vaillant aroTHERM plus (7 kW) (Situation 3 -4) Houses 11 – 16 House 26	No Enclosure							

Table 6.2 Insertion loss figures to be provided by acoustic enclosure

The relevant plant units must be completely enclosed for optimal noise reduction (including a top panel/weather hood). Ventilation openings for cooling must not compromise sound

insulation. Doors, access panels, windows, ducts, and cable penetrations shall be treated so as to maintain the proposed acoustic specification when fully assembled.

The manufacturer/supplier will need to ensure that the enclosures can achieve the above specifications in-situ.

In instances where a manufacturer/supplier proposes an enclosure that deviates from this specification, KPA should be informed so that we may comment upon the acceptability.

12.2 Anti-Vibration Mounting Strategy

In the case of all plant units, appropriate anti-vibration mounts should be installed in order to ensure that vibrations do not give rise to structure-borne noise. Appendix C outlines detailed advice in order to ensure that the system installer selects the appropriate anti-vibration mount for the installation.

It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail.

13.0 CONCLUSION

An environmental noise survey has been undertaken at 238–240 Nine Mile Ride, Finchampstead, RG40 3QD, by KP Acoustics Ltd. The results of the survey have enabled criteria to be set for noise emissions and allowed the assessment of daytime and night-time levels likely to be experienced by the proposed development.

Measured noise levels allowed a robust glazing specification to be proposed which would provide internal noise levels for all residential environments of the development commensurate to the design range of BS8233:2014.

No further mitigation measures should be required in order to protect the proposed habitable spaces from external noise intrusion.

Using manufacturer noise data, noise levels are predicted at the nearby noise sensitive receivers for compliance with current requirements.

Calculations show that noise emissions from the proposed plant installation would meet the requirements of Wokingham Borough Council, providing that the mitigation measures outlined in Section 12 are implemented. The proposed plant installation would result in a low magnitude of impact and an indication of low adverse impact on the closest residential receiver, in accordance with BS4142:2014.

The resulting criterion is low compared with the requirements of BS4142 and BS8233, and it may be reasonable to relax the criterion.

238 - 240 NINE MILE RIDE,
RG40 3QD - Position 1
Environmental Time History
02/07/2025 to 03/07/2025

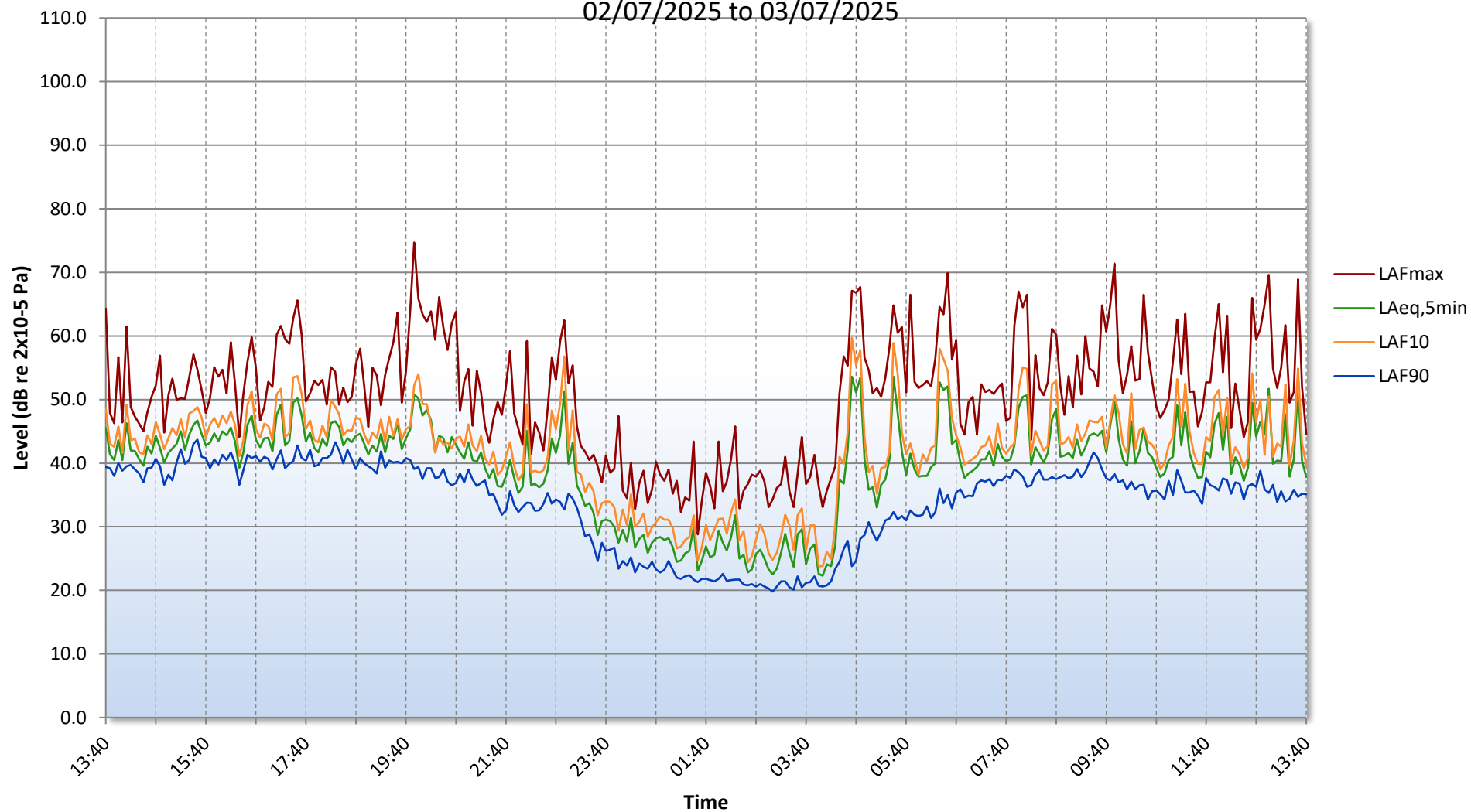


Figure 30695.TH1

238 - 240 NINE MILE RIDE,
RG40 3QD - Position 2
Environmental Time History
16/07/2025 to 17/07/2025

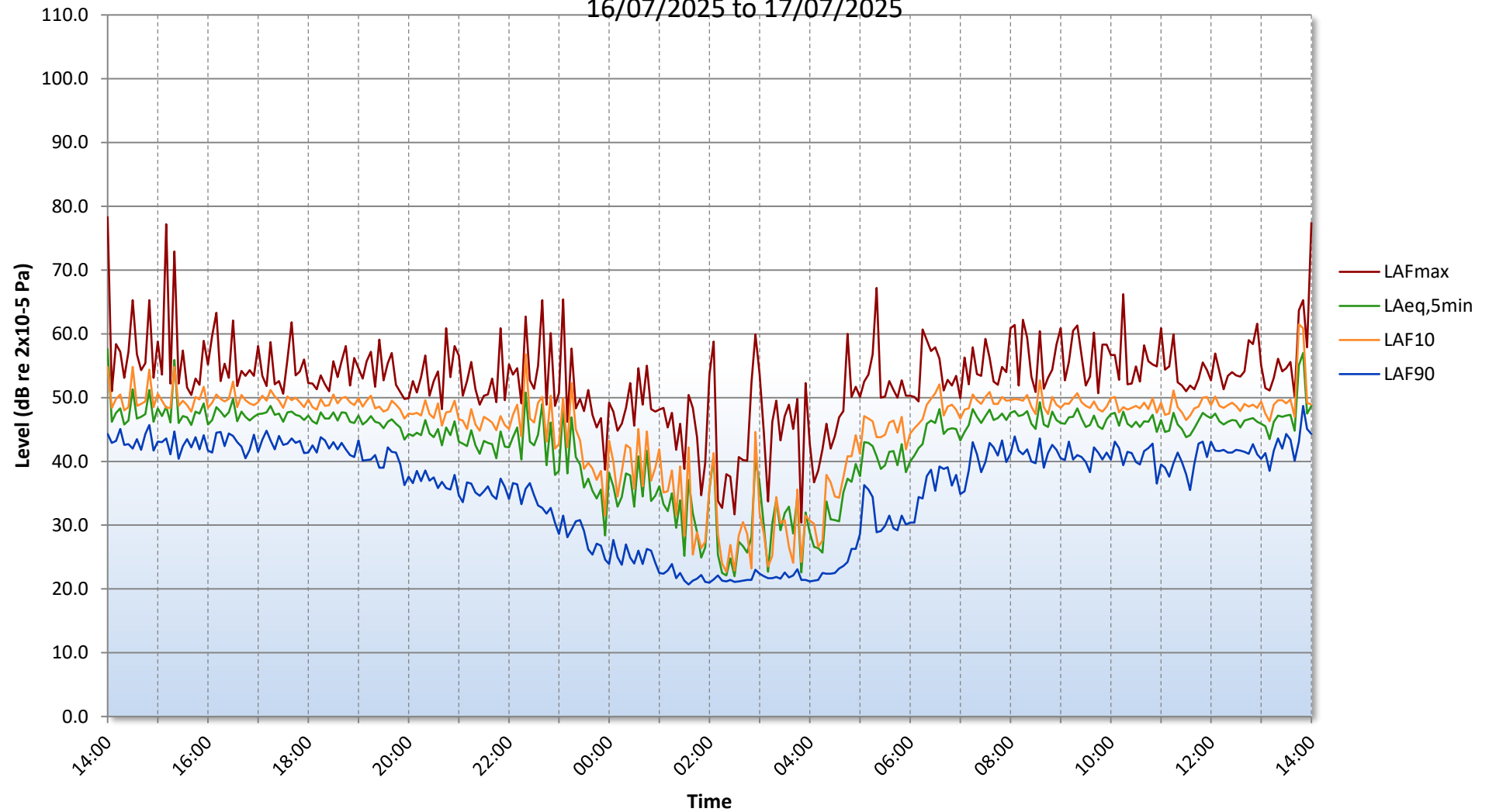


Figure 30695.TH2

GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq} . The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.

APPENDIX B

238 and 240 Nine Mile Ride, Finchampsstead, RG40 3QD

PLANT NOISE EMISSIONS CALCULATIONS

Situation 1 Receiver: 1st Floor Residential Window	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Vaillant aroTHERM plus 7kW(Sound Power Level @1m)	46	46	48	50	48	46	47	41	54
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (3), dB	9	9	9	9	9	9	9	9	
Minimum attenuation due to building envelope, dB	-6	-7	-8	-10	-12	-14	-17	-20	
Minimum attenuation provided by distance (5m), dB	-14	-14	-14	-14	-14	-14	-14	-14	
Minimum attenuation required by proposed acoustic enclosure, dB	-7	-9	-12	-17	-19	-20	-25	-25	
Total at NSR from this unit dB(A)	17	14	12	7	1	-4	-11	-20	9
Vaillant aroTHERM plus 7kW(Sound Power Level @1m)	46	46	48	50	48	46	47	41	54
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (3), dB	9	9	9	9	9	9	9	9	
Minimum attenuation due to building envelope, dB	-8	-9	-11	-14	-17	-20	-20	-20	
Minimum attenuation provided by distance (11m), dB	-21	-21	-21	-21	-21	-21	-21	-21	
Minimum attenuation required by proposed acoustic enclosure, dB	-7	-9	-12	-17	-19	-20	-25	-25	
Total at NSR from this unit dB(A)	8	5	1	-4	-10	-17	-21	-27	-2
Vaillant aroTHERM plus 7kW(Sound Power Level @1m)	46	46	48	50	48	46	47	41	54
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (3), dB	9	9	9	9	9	9	9	9	
Minimum attenuation due to building envelope, dB	0	0	0	0	0	0	0	0	
Minimum attenuation provided by distance (7m), dB	-17	-17	-17	-17	-17	-17	-17	-17	
Minimum attenuation required by proposed acoustic enclosure, dB	-4	-9	-12	-17	-19	-20	-25	-25	
Total at NSR from this unit dB(A)	23	18	17	14	10	7	3	-3	16
Vaillant aroTHERM plus 7kW(Sound Power Level @1m)	46	46	48	50	48	46	47	41	54
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (3), dB	9	9	9	9	9	9	9	9	
Minimum attenuation due to building envelope, dB	0	0	0	0	0	0	0	0	
Minimum attenuation provided by distance (12m), dB	-22	-22	-22	-22	-22	-22	-22	-22	
Minimum attenuation required by proposed acoustic enclosure, dB	-7	-9	-12	-17	-19	-20	-25	-25	
Total at NSR from this unit dB(A)	15	13	12	9	6	2	-2	-8	11
Total Rating Noise Level of all Plant Unit Installations at Receiver	25	21	19	16	12	9	4	-2	18

Design Criterion	18
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APPENDIX B

238 and 240 Nine Mile Ride, Finchampsstead, RG40 3QD

PLANT NOISE EMISSIONS CALCULATIONS

Situation 2 Receiver: 1st Floor Residential Window	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Vaillant aroTHERM plus 7kW(Sound Power Level @1m)	46	46	48	50	48	46	47	41	54
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (3), dB	9	9	9	9	9	9	9	9	
Minimum attenuation due to building envelope, dB	-6	-7	-8	-10	-12	-14	-17	-20	
Minimum attenuation provided by distance (11m), dB	-21	-21	-21	-21	-21	-21	-21	-21	
Minimum attenuation required by proposed acoustic enclosure, dB	-7	-9	-12	-14	-16	-14	-15	-10	
Total at NSR from this unit dB(A)	10	8	5	3	-3	-5	-14	-12	4
Vaillant aroTHERM plus 7kW(Sound Power Level @1m)	46	46	48	50	48	46	47	41	54
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (3), dB	9	9	9	9	9	9	9	9	
Minimum attenuation due to building envelope, dB	-8	-9	-11	-14	-17	-20	-20	-20	
Minimum attenuation provided by distance (22m), dB	-27	-27	-27	-27	-27	-27	-27	-27	
Minimum attenuation required by proposed acoustic enclosure, dB	-7	-9	-12	-14	-16	-14	-15	-10	
Total at NSR from this unit dB(A)	2	-1	-5	-7	-14	-17	-17	-18	-6
Vaillant aroTHERM plus 7kW(Sound Power Level @1m)	46	46	48	50	48	46	47	41	54
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (3), dB	9	9	9	9	9	9	9	9	
Minimum attenuation due to building envelope, dB	0	0	0	0	0	0	0	0	
Minimum attenuation provided by distance (11m), dB	-21	-21	-21	-21	-21	-21	-21	-21	
Minimum attenuation required by proposed acoustic enclosure, dB	-4	-9	-12	-14	-16	-14	-15	-10	
Total at NSR from this unit dB(A)	19	14	13	13	9	9	9	8	17
Vaillant aroTHERM plus 7kW(Sound Power Level @1m)	46	46	48	50	48	46	47	41	54
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (3), dB	9	9	9	9	9	9	9	9	
Minimum attenuation due to building envelope, dB	0	0	0	0	0	0	0	0	
Minimum attenuation provided by distance (21m), dB	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation required by proposed acoustic enclosure, dB	-7	-9	-12	-14	-16	-14	-15	-10	
Total at NSR from this unit dB(A)	10	8	7	7	4	3	3	2	11
Total Rating Noise Level of all Plant Unit Installations at Receiver	20	16	14	14	11	10	10	9	18

Design Criterion

18

APPENDIX B

238 and 240 Nine Mile Ride, Finchampsstead, RG40 3QD

PLANT NOISE EMISSIONS CALCULATIONS

Situation 3 Receiver: 1st Floor Residential Window	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Vaillant aroTHERM plus 7kW(Sound Power Level @1m)	46	46	48	50	48	46	47	41	54
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (3), dB	9	9	9	9	9	9	9	9	
Minimum attenuation due to building envelope, dB	-11	-14	-17	-21	-25	-25	-25	-25	
Minimum attenuation provided by distance (5m), dB	-14	-14	-14	-14	-14	-14	-14	-14	
Total at NSR from this unit dB(A)	19	16	14	12	7	5	-14	0	14
Vaillant aroTHERM plus 7kW(Sound Power Level @1m)	46	46	48	50	48	46	47	41	54
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (3), dB	9	9	9	9	9	9	9	9	
Minimum attenuation due to building envelope, dB	-12	-15	-19	-23	-25	-25	-25	-25	
Minimum attenuation provided by distance (12m), dB	-22	-27	-27	-27	-27	-27	-27	-27	
Total at NSR from this unit dB(A)	10	2	0	-3	-6	-8	-7	-13	1
Total Rating Noise Level of all Plant Unit Installations at Receiver	19	16	15	13	7	5	-6	0	14

Design Criterion	18
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APPENDIX B

238 and 240 Nine Mile Ride, Finchampsstead, RG40 3QD

PLANT NOISE EMISSIONS CALCULATIONS

Situation 4 Receiver: 1st Floor Residential Window	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Vaillant aroTHERM plus 7kW(Sound Power Level @1m)	46	46	48	50	48	46	47	41	54
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (3), dB	9	9	9	9	9	9	9	9	
Minimum attenuation due to building envelope, dB	-12	-15	-19	-24	-25	-25	-25	-25	
Minimum attenuation provided by distance (22m), dB	-27	-27	-27	-27	-27	-27	-27	-27	
Total Rating Noise Level of all Plant Unit Installations at Receiver	5	2	0	-3	-6	-8	-7	-13	1

Design Criterion	18
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ANTI-VIBRATION MOUNTING REFERENCE DOCUMENT

1.0 GENERAL

- 1.1.1 All mountings must provide suitable static deflection when under the equipment weight. Mounting selection should allow for any eccentric load distribution or torque reaction so that the design deflection is achieved on all mountings under operating conditions.
- 1.1.2 A positioning or restraining device should be provided where required, to prevent the equipment position changing if its load changes (e.g. during maintenance). The device shall consist of a stud passing through an oversize hole with a nut and locknut providing restraint, with a fibre or neoprene washer fitted between nut and restraining member leaving a clearance of at least 3mm.
- 1.1.3 It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail. Particular attention should be paid to mountings which will be exposed to atmospheric conditions to prevent corrosion.
- 1.1.4 All mountings shall be colour coded, or otherwise marked, to indicate their load capacity, to facilitate identification during installation.
- 1.1.5 Where use of resilient supports allows omission of pipe flexible connections for vibration/noise isolation, it shall be the Mechanical Services Consultant's or Contractor's responsibility to decide whether such devices are required to compensate for misalignment or thermal strain.

2.0 MOUNTINGS

2.1 Caged Spring Type

- 2.1.1 Each mounting shall consist of cast or fabricated telescopic top and bottom housings enclosing one or more helical steel springs as the principal isolation elements and shall incorporate a built-in levelling device. The housing should be designed to permit visual inspection of the springs after installation, i.e. the spring must not be totally enclosed.
- 2.1.2 The springs shall have an outside diameter of not less than 75% of the operating height and be selected to have at least 50% overload capacity before becoming coil-bound.
- 2.1.3 The bottom plate of each mounting shall have bonded to it a rubber/neoprene pad designed to attenuate any high frequency energy transmitted by the springs.
- 2.1.4 Mountings incorporating snubbers or restraining devices shall be designed so that the snubbing, damping, or restraining mechanism is capable of being adjusted to have no significant effect during the normal running of the isolated machine.
- 2.1.5 All nuts, bolts or other elements used for adjustment of a mounting shall incorporate locking mechanisms to prevent the isolator going out of adjustment due to vibration or accidental or unauthorised tampering.

2.2 Open Spring Type

- 2.2.1 Each mounting shall consist of one or more helical steel springs as the principal isolation elements and shall incorporate a built-in levelling device.
- 2.2.2 The springs shall be fixed or otherwise securely located to cast or fabricated top and bottom plates, shall have an outside diameter of not less than 75% of the operating height, and shall be selected to have at least 50% overload capacity before becoming coil-bound.
- 2.2.3 The bottom plate shall have bonded to it a rubber/ neoprene pad designed to attenuate any high frequency energy transmitted by the springs.

2.3 Rubber/Neoprene Type

- 2.3.1 Each mounting shall consist of a steel top plate and base plate completely embedded in oil resistant rubber/neoprene. Each mounting shall be capable of being fitted with a levelling device and should have bolt holes in the base plate and a threaded metal insert in the top plate so that they can be bolted to the floor and equipment where required.

2.4 Hangers

- 2.4.1 Hangers shall incorporate a helical steel spring or neoprene in shear element, as required, located securely in a steel cage. The clearance hold at the bottom of the cage should allow lateral movement of the lower anger rod of at least 15 degrees included angle.
- 2.4.2 If hangers incorporate a positions device, this should include a locking mechanism to prevent the hanger going out of adjustment either due to vibration or tampering.

3.0 PLANT BASES

3.1 A.V. Rails

- 3.1.1 An A.V. Rail shall comprise a steel beam with two or more height-saving brackets. The steel sections must be sufficiently rigid to prevent undue strain in the equipment and if necessary, should be checked by the Structural Engineer.

3.2 Steel Plant Bases

- 3.2.1 Steel plant bases shall comprise an all-welded steel framework of sufficient rigidity to provide adequate support for the equipment and be fitted with isolator height saving brackets. The frame depth shall be approximately $1/10^{\text{th}}$ of the longest dimension of the equipment with a minimum of 150 mm. This form of base may be used as a composite A.V. rail system.

3.3 Concrete Inertia Base (for use with steel springs)

- 3.3.1 These shall consist of an all-welded steel pouring framework with height saving brackets, and a frame depth of approximately $1/12^{\text{th}}$ of the longest dimension of the equipment, with a minimum of 100 mm. The bottom of the pouring frame should be blanked off, and concrete (2300 kg/m^3) poured in over steel reinforcing rods positioned 35 mm above the bottom. The inertia base should be sufficiently large to provide support for all parts of the equipment, including any components which over-hang the equipment base, such as suction and discharge elbows on centrifugal pumps.
- 3.3.2 A typical rule of thumb is that the ratio of mass of the base to mass of the supported equipment should be 1.5 : 1.0 for most conventional equipment, including pumps. However, this could rise to 5.0 : 1.0 for equipment with large lateral out-of-balance forces.

3.4 Concrete Split Plinth Bases

- 3.4.1 These should comprise a concrete inertia base of sufficient size to permit support for all parts of the equipment, including any components which overhang the equipment base, such as suction and discharge elbows on centrifugal pumps. The inertia base should be cast onto a permanent bottom shuttering and supported on the specified neoprene mounts or pads, the whole resting on a plinth as required. It should be noted that the construction of concrete bases on cork, expanded polystyrene or mineral wool slabs is not normally permitted. Where neoprene pads are used, small areas of pad must be equally spaced to provide the correct deflection. The supplier should advise the correct number, dimensions and locations of such pads.