

INFINITY ACOUSTICS

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Noise Assessment

87 Southampton Street,
Reading,
RG1 2QU

Project Description:

Noise Assessment of a Proposed Residential Development

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1. Introduction

1.1 Infinity Acoustics Ltd has been appointed to undertake a noise assessment for a residential development located on the 2nd floor of 87 Southampton Street, Reading, RG1 2QU. The assessment will be undertaken to analyse the potential impact of both road noise and nearby commercial plant noise on the future residents of the proposed development.

1.2 As part of the development process, the client will be submitting a Class MA Prior Approval application to the local planning authority Reading Borough Council. For the change of use of 2nd floor office space to residential dwellings.

1.3 A previous prior approval application of the site was refused, one of the reasons for refusal was related to noise from the surrounding commercial mechanical plant units. The details of this are outlined below:

'Having consulted the Council's Environmental Protection team it has been identified that plant equipment associated with the adjacent ground floor offices at 'City Gate' no. 95-107 Southampton Street is a potential commercial noise concern. The plant equipment is located at ground floor level on the north flank wall of City Gate close to the windows to the southern flank wall of no. 87. A noise assessment has not been provided with the application and therefore the Local Planning Authority has no contrary to information to suggest the proposal is acceptable in terms of commercial noise. The proposal therefore fails to accord with condition (d).'

1.4 The aim of the noise survey and assessment below is to provide the relative information to assist the client and the local planning authority in approving the new prior approval application. The noise levels at the site will be measured and

assessed according to the relative standards and local planning policy, a sound insulation scheme will be provided where necessary to ensure the amenity of any future residents can be protected from surrounding transport and commercial plant noise and that relative criteria can be achieved.

The following noise assessment will be undertaken with reference to the National Planning Policy Framework 2023 and the Noise Policy Statement for England 2010 as well as the following standards.

- BS8233:2014 – Guidance on Sound Insulation and Noise Reduction In Buildings
- BS4142:2014+A1:2019 - Methods for Rating and Assessing Industrial and Commercial Sound.

1.5 BS8233:2014

The general noise criteria used in the assessment will be obtained from BS8233: 2014 'Guidance on sound insulation and noise reduction for buildings' The criteria in BS8233 are largely based on the World Health Organisation Guidelines on Community Noise. The BS8233 criteria are outlined below:

- Living Room/Bedroom - 35 dB $L_{Aeq,16hour}$ (Day)
- Dining Room – 40 dB $L_{Aeq,16hour}$ (Day)
- Bedroom – 30 dB $L_{Aeq,8hour}$ (Night)

L_{Amax} levels during the night will also be assessed based on the criteria defined by the World Health Organisation. The WHO state within the 'Guidelines on Community Noise' that in order to avoid sleep disturbance within bedrooms during the night, the internal sound pressure level should not exceed 45 dB

$L_{A_{fmax}}$. The frequency of $L_{A_{fmax}}$ events should also be considered it is understood that for an $L_{A_{fmax}}$ noise event to adversely impact sleep the criteria would need to be exceeded more than ten times during a night time period.

The above criteria are desirable however BS8233 states the following: '*where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.*' It is assumed the development is desirable. Therefore, it is assumed that when considering an open window condition reasonable internal conditions can be achieved with a 5 dB relaxation in criteria.

1.6 BS4142:2014+A1:2019

BS4142 is a British Standard that provides guidance and a standardised methodology for assessing industrial and commercial noise sources. BS4142 outlines methods for defining specific sound levels from a given development and/or noise source. Rating penalties are then applied to account for the acoustic characteristics of the noise source. Rating penalties can be applied for the following:

- Tonality
- Impulsivity
- Intermittency

Using the subjective method, the penalties vary in magnitude depending on how perceptible the acoustic characteristic is to the human ear. The rating noise level is then compared to the underlying L_{A90} background sound level of the area without the source under assessment operating to assess the likely noise impact. The level by which the rating noise level exceeds the background L_{A90} defines the potential for noise impact. The table below outlines the relevant criteria bandings described in BS4142.

Description	Impact Rating
Rating noise levels +10 dB above the background	Significant adverse impact, depending on the context.
Rating noise levels +5 dB above the background	Adverse impact, depending on the context.
Where the rating level does not exceed the background	Low impact dependent on Context

Table 1.0 – BS4142 Criteria

2. Site & Surroundings

- 2.1 The development site is located in central Reading and the area surrounding the site could be considered urban with a mixture of transport links, commercial and office units and residential dwellings.
- 2.2 To the west of the site is Southampton Street which facilitates high levels of road traffic throughout the day time. The site itself is shielded from this road traffic by intervening residential buildings. However, upon site inspection, it was found that the upper floors of the northern façade of the development received the most exposure to road noise.
- 2.3 To the south of the site approximately 2.5m away is the City Gate Business Centre. This location is assumed to operate during typical business hours from 07:00 – 19:00.
- 2.4 Located on the northern facade of the City Gate Business Centre there are no. 5 mechanical plant units assumed to be associated with the Air Conditioning in the nearby offices. The make and models of the plant units identified on site are outlined below:

- No.1 Daikin RXP35L5V1B
- No. 1 Daikin R25DBV11B
- No. 3 Marstair – MHPUE130

It should be noted that the current units in place were deemed to be old and thus may not operate fully the client indicated that only the smaller Daikin units operate at this moment in time. However, it is assumed that the older larger Marstair units could be replaced or refurbished at any time were they to be replaced it is likely they would be replaced with newer lower noise units.

- 2.5 During the site visit it was noted that the units were old however the client indicated that they do still operate intermittently and therefore the noise from these units will be assessed in the subsequent sections of this report.
- 2.6 To the east of the site was a car park however noise from this location was not audible during the visit and is assumed to be intermittent low-level vehicle noise.
- 2.7 In general, the acoustic environment surrounding the site was dominated by distant road noise from Southampton Street. The noise from the nearby plant units was not audible however the units were not operating during the visit. It is assumed however that when all 5 units operate mechanical plant noise would become the dominant noise source in the area of the southern and western facades of the development. The location of the plant units can be found in the site plan in Appendix B.

3. Survey

3.1 A noise survey of the site was undertaken between January 30th 2024 to February 1st 2024 in order to establish the noise levels incident on the site.

3.2 The following equipment was used to undertake the noise survey. All equipment used was field calibrated at 1kHz to 114 dB with a tolerance of less than 0.5 dB drift before and after the measurement. Calibration certificates for the equipment can be provided upon request.

- SVAN 971A Class 1 Sound Level Meter – SN – 113352
- SVAN 971A Class 1 Sound Level Meter – SN – 139441
- SVAN SV33B Class 1 Calibrator – SN – 122241

3.3 The long-term noise meter and associated microphone at Measurement Location 1 (ML1) were located on the southern façade of the development at the first-floor level. The noise meter was positioned approximately 1m from the façade of the building and 1.5m from the nearest AC unit associated with the adjacent business centre.

The long-term noise meter and associated microphone at Measurement Location 1 (ML2) were located on the northern façade of the development at 2nd floor level the noise meter was positioned approximately 1m from the façade of the building that was most exposed to road noise.

Due to the proximity of both microphones to the facades of the development appropriate faced corrections will be applied to account for free field noise levels. All measurement locations can be found in Appendix B.

3.4 Generally, the weather across the majority of the survey complied with the requirements of BS 7445-2. The weather during the setup of the equipment is outlined below. The temperature was 7.7 degrees Celsius with wind speeds of less than 1 m/s and no precipitation. During the collection of the equipment, the temperature was 5.7 degrees Celsius and wind speeds of less than 1m/s. and no percipitation. A full weather summary for the duration of the survey is outlined in the table below.

Weather Data - Earley Reading – 30/01/24 – 01/02/24					
Date	Temp (C)	Rain Fall (mm)	Wind Speed (m/s)	Prevailing Wind	Mean Relative Humidity (%)
30/01/2024 – 01/02/2024	1.2 – 11.7	0.0	0.0 – 3.1	SW	54.0 – 97.0

Table 2.0 – Weather Data

3.5 The results of the ambient noise survey are presented in the tables below and will be used in the subsequent noise assessment. A full noise survey time history can be found in Appendix C.

16 & 8 Hour Results ML1 – Southern Facade		
Time Period	L _{Aeq} (dB)	L _{Afmax} (dB)
Day – 30/01/2024 – 11:30 – 23:00	53.0	95.0
Night – 30/01/2024 – 23:00 – 07:00	42.0	66.0
Day – 31/01/2024 – 07:00 – 23:00	51.0	87.0
Night – 31/01/2024 – 23:00 – 07:00	43.0	65.0
Day – 01/02/2024 – 07:00 – 10:15	51.0	76.0
ML1 L _{Afmax} Analysis		
Time Period	L _{Afmax,t}	10 th Highest L _{Afmax,1min}
Night 1	66.0	61.0
Night 2	65.0	61.0

Table 3.0 – Noise Survey Data ML1

- 3.6 As can be seen in the table of results above the noise levels incident on the southern façade of the development are low. Generally appropriate internal noise levels could be achieved when considering an open window at the site. This is a good indication that in general, the site is suitable for residential development.
- 3.7 A review of the time history in Appendix C indicates there are no clearly identifiable periods in which it could be defined that the nearby mechanical plant units turned on or off or operated. Further calculations in the sections below will be presented to ensure AC unit noise is fully accounted for.

16 & 8 Hour Results ML2 - Northern Facade		
Time Period	L _{Aeq} (dB)	L _{Afmax} (dB)
Day – 30/01/2024 – 12:00 – 23:00	56.0	89.0
Night – 30/01/2024 – 23:00 – 07:00	47.0	73.0
Day – 31/01/2024 – 07:00 – 23:00	56.0	87.0
Night – 31/01/2024 – 23:00 – 07:00	48.0	74.0
Day – 01/02/2024 – 07:00 – 09:45	56.0	87.0
ML2 L _{Afmax} Analysis		
Time Period	L _{Afmax,t}	10 th Highest L _{Afmax,1min}
Night 1	73.0	63.0
Night 2	74.0	62.0

Table 4.0 – Noise Survey Data ML2

- 3.8 As can be seen in the table above the noise levels incident on the northern façade of the development are slightly higher than that at other facades. This is due to the upper floors being more exposed to road noise. However, it is noted that in general the noise levels are still low and would be considered reasonable for a residential environment.

4. BS4142 Screening Assessment

4.1 The following section of the report outlines a BS4142 Screening Assessment in order to establish the rating noise level associated with the nearby Air Condensing Units.

4.2 In relation to scenarios where new residential dwellings are introduced into an area with commercial or industrial noise BS4142 states the following:

'Where a new noise-sensitive receptor is introduced and there is extant industrial and/or commercial sound, it should be recognized that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances, other guidance and criteria in addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation.'

BS4142 also states:

Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following...

The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

- i) facade insulation treatment;*
- ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
- iii) acoustic screening.*

4.3 As the applicant has no control over the operation of the nearby units and the proposed development is for residential flats with no external amenity spaces

the level by which the AC unit noise exceeds the background sound level is less relevant.

Given the above commentary and guidance from BS4142, it is also apparent that alternative criteria and standards can be used to assess the impact of commercial noise on new residential dwellings and the likely noise impact should be assessed with the inclusion of noise mitigation measures and thus residents would be fully protected from surrounding noise sources provided the sound insulation scheme and recommendations are sufficient. Therefore, ensuring they are defined using the BS4142 rating noise level or the highest measured one-hour period whichever is higher will ensure protection of future residents from commercial plant noise.

4.4 Given the above a commercial rating noise level will be established and either the higher of the BS4142 rating noise level or the highest ambient 1-hour period will be utilised to establish the sound insulation scheme.

4.5 The table below outlines the defined BS4142 rating noise level at the most exposed façade of the development based on manufacturers' noise data of the nearby AC units. This will then be compared to the loudest measured 1 hour at ML1 to establish a worst-case scenario. Full AC unit noise calculations can be found in Appendix D.

BS4142 Rating Noise Level	
Description	L _{Aeq} (dB)
Day Time Specific AC Unit Noise at Façade of Development	61.0
Rating Noise Level (+2 dB Tonality, + 3 dB Intermittency)	66.0
Highest Measured L _{Aeq,1hour} , ML1 (dB)	
Highest L _{Aeq,1hour} ML1	59.0

Table 5.0 – Rating Noise Level Analysis

4.6 As can be seen, the calculated BS4142 Rating noise level of the nearby AC units falls significantly above the loudest measured 1-hour period at ML1. Given this, the rating noise levels will be utilised for the daytime noise break-in assessment associated with the southern and western facades of the site which are exposed to commercial plant noise. Thus, ensuring the amenity of future residents and ensuring full protection from commercial mechanical plant noise.

4.7 It should be noted that the calculated noise levels above represent a true worst-case scenario with all 5 units in operation. The client has noted that currently only the small Daikin units operate and the larger units have not operated for a long time. Given this, the assessment below is considered to be robust and conservative.

5. BS8233 Assessment Results and Requirements

5.1 As can be seen in the section above the noise levels incident on site vary depending on location. The table below indicates the required sound reduction in each façade zone to ensure the BS8233 Internal noise criteria can be achieved. Full noise break-in calculations can be found in Appendix D.1. The BS4142 Rating Noise Level has been utilised for the break-in calculations along the southern and western facades To ensure protection against mechanical plant noise.

Required Sound Reduction	
Façade Zone	Required Sound Reduction
Southern and Western Facades	31.0 dB R _{w+ctr}
Northern and Eastern Facades	21.0 dB R _{w+ctr}

Table 6.0 – Required Sound Reduction

5.2 In order to assess the need for an alternative ventilation strategy an open window assessment has been undertaken and is presented in Appendix D.2. The assessment indicates that with an open window, the noise levels within the proposed dwellings would exceed the criteria within the daytime period. This indicates an alternative ventilation strategy should be employed. However, it should be noted that the internal noise criteria could be achieved during the nighttime period when considering an open window.

6. Sound Insulation Scheme and Recommendations

6.1 The following section of the report details the sound insulation scheme required to ensure internal noise criteria can be achieved and that future residents are protected from noise ingress from the external environment. Prior approval of the sound insulation scheme should be sought from the local authority before any of the works outlined below are implemented. A summary of the sound insulation scheme for each façade can be found in the table below:

Sound Insulation Scheme Summary			
Façade Location	Glazing	Ventilation System	Trickle Vents
Southern & Western Facades	Existing 4mm Glass / 6-16mm Air Cavity / 4mm Glass / 75mm Cavity 6mm / Secondary (32 dB R_{w+ctr}).	System 3 Approved Document F	Greenwoods AWW39 Acoustic Wall Vent (37 $D_{n,e,w+ctr}$)
Northern & Eastern Facades	Existing 4mm Glass / 6-16mm Air Cavity / 4mm Glass (25 dB R_{w+ctr}).	System 3 Approved Document F	Titon Trickle Vent SF Xtra – Standard Vent + Standard Canopy (32 dB $D_{n,e,w+ctr}$)

Table 7.0 – Sound Insulation Scheme Summary

6.2 Facades and Roof

The façade build-up was yet to be defined however it is assumed to be 100mm masonry Brick, 100mm cavity and 100mm inner leaf of concrete block. This is a heavyweight construction and as such is deemed to provide sufficient sound reduction. When modelled in INSUL 9.0 typical cavity wall constructions such as this are found to provide a minimum of 50 dB R_w .

The flat roof is assumed to be constructed as follows:

- 4mm waterproof membrane
- 22mm OSB or marine ply roof deck
- Minimum 100mm Timber roof trusses
- 100mm insulation (Min Density 10kg/m³)
- No.1 Layer of 12.5mm standard plasterboard
- Expected performance 42 dB R_w

As can be seen, the expected performance of 42 dB R_w is sufficient to ensure the internal criteria within the rooms on the 2nd floor are achieved.

6.3 Glazing

To ensure the amenity of the future residents can be protected the minimum sound reduction defined in the BS8233 Assessment above should be achieved by all glazing. The following glazing units are sufficient to achieve said performance and could be installed along each facade zone for both bedrooms and living rooms.

It should be noted that the existing glazing assumed to be 4mm / 6-16mm 4mm along the northern and eastern facade of the building is deemed sufficient and can be retained. The glazing along the southern and eastern facades of the development would require upgrading with secondary glazing as outlined below:

- Southern and Western Facades – Existing 4mm Glass / 6-16mm Air Cavity / 4mm Glass / 75mm Cavity / 6mm Secondary (32 dB R_{w+ctr}).
- Northern and Eastern Facades – Existing 4mm Glass / 6-16mm Air Cavity / 4mm Glass (25 dB R_{w+ctr} / 29 dB R_w).

The glazing above has been taken from the Pilkington database however any other glazing capable of achieving the minimum required sound reduction is outlined in the BS8233 Break-in Assessment in Appendix D.1 could be installed.

To allow ease of assessment the designated façade Zones are highlighted below:

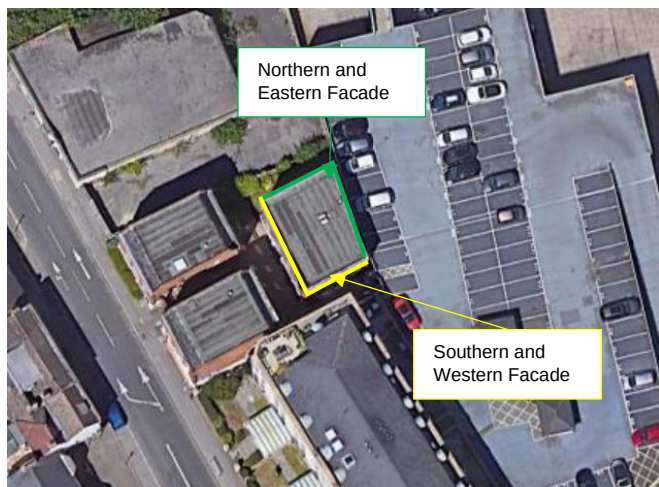


Figure 1.0 – Proposed Façade Designations

6.4 Ventilation

An alternative ventilation system should be employed across the site the ventilation system will be specified to ensure noise ingress can be reduced whilst vents are open and operating and the internal noise criteria achieved.

Based on the noise levels incident on each façade zone and Table B-3 of the AVO Guide, System 3 outlined in the Building Regulations Approved Document F should be sufficient for the development. System 3 outlines the use of trickle ventilation or through-wall ventilation and continuous mechanical extract, as indicated in the figure below. It should be noted that an overheating assessment may be required to establish the potential for overheating with windows closed using the system below for ventilation due to the presence of mechanical plant noise. It is assumed however that the

residents can still use open windows for purge ventilation and rapid dispersion of moisture and odour at their discretion.



Figure 2.0 – Proposed Ventilation System

Internal mechanical ventilation such as extract systems produce self-generated noise. The following criteria should be achieved by any mechanical ventilation systems employed at the site. The criteria below have been defined by the ANC in consultation on the Future Home Standards 2019 and the AVO Guide 2020.

Extract ventilation system noise should not exceed:

- 26 dB $L_{Aeq,t}$ in Bedrooms
- 35 dB $L_{Aeq,t}$ in Living rooms
- 45 dB $L_{Aeq,t}$ in Kitchens and Bathrooms

The section below outlines a trickle ventilation model for the existing glazing that is suitable for ventilation on northern and eastern facades and locations in both bedrooms and living rooms. A further through-wall option is outlined for the southern and western façades where secondary glazing is advised and as such trickle ventilation cannot be implemented.

- Southern and Western Facades – Greenwoods AWW39 Acoustic Wall Vent (37 dB $D_{n,e,w+ctr}$)
- Northern and Eastern Facades – Titon Trickle Vent SF Xtra – Standard Vent + Standard Canopy (32 dB $D_{n,e,w+ctr}$)

7. Conclusion

- 7.1 In conclusion, a noise survey has been undertaken at 87 Southampton Street, Reading, RG1 2QU. The noise levels obtained during the survey have allowed a noise assessment to be undertaken in order to calculate the requirements for a sound insulation scheme to ensure the amenity of future residents can be protected from all surrounding noise sources including road traffic and commercial noise including that of commercial plant noise.
- 7.2 Noise measurements were undertaken along the southern façade of the development site in close proximity to the nearby Air Conditioning Units. A review of the survey results could not fully identify specific operational periods of the AC units and thus it was assumed that they may not have operated during the survey. Therefore, manufacturers' noise data for the units was obtained and a BS4142 Rating noise level assuming all units were operating simultaneously was calculated at the development's façade. The BS4142 Rating Noise Level was utilised to define the requirement of a sound insulation scheme for facades exposed to AC unit noise. It should be noted that the current units in place were deemed to be old and thus may not operate fully, were they to be replaced it is likely they would be replaced with newer lower noise units.
- 7.3 As a result of the noise assessment, a sound insulation scheme and further mitigation measures have been defined in Section 6.0 to ensure all the criteria outlined in BS8233:2014 can be achieved. Provided the sound insulation scheme and recommendations are installed and retained thereafter the amenity of future residents can be fully protected from surrounding commercial plant noise and all internal criteria should be achieved. Prior to the commencement of any works or implementation of the sound insulation works the above assessment should be fully approved by the local authority.

APPENDIX A – List of Terms and Glossary

The following section of the report outlines a glossary of terms used in the assessment to assist the reader in understanding the assessment above which is by necessity technical in nature.

Decibel DB - The decibel often denoted as dB is the logarithmic unit used to describe the magnitude of sound or noise levels. The typical range of sound pressure levels is from 0 dB, defined as the threshold of hearing to 120dB defined as the threshold of pain.

Frequency Hz – As well as the decibel sound and noise is also measured and defined in frequency. Frequency or Hertz (Hz) is an expression of the number of cycles a sound wave will complete per second. Larger frequencies may be expressed in Kilo Hertz (kHz). The typical range of human hearing is from 20 Hz to 20,000Hz however with age the audible frequency range decreases in most humans.

A - Weighting – The A-weighting is the most commonly used weighting curve taken IEC 61672:2003 and is applied to sound pressure level measurements. The A-weighting is applied to measured sound levels to account for the loudness perceived by the human ear, as the ear is less sensitive to low audio frequencies.

L_{Aeq} - The A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over any given time period. L_{Aeq} is the level of a continuous noise that has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. The A-weighting represents a curve that is applied to the measured noise levels to represent the way the human auditory system perceives sound.

L_{Afmax} - The maximum A-weighted noise level that was recorded during the monitoring period using a fast time weighting. This acoustic parameter represents more transient sound levels within the acoustic environment which may only occur for a few seconds or minutes.

L_{A10} - This is the A-weighted noise level exceeded for 10% of a given time period. This parameter is typically used to measure and predict road traffic noise.

L_{A90} - This is the A-weighted noise level exceeded for 90% of any given time period. Generally, this acoustic parameter represents the underlying background sound level in a given area and doesn't generally include transient or short-term noise events that may occur within the surroundings.

Sound Pressure – Sound pressure is the difference between the instantaneous pressure at a point in the presence of a sound wave and the static pressure of the medium. Sound pressure fluctuates due to refractions and compressions of air molecules.

Sound Reduction Index – The sound reduction index denoted by the parameter 'R' is the laboratory-measured sound reduction given material or construction. R is measured in 1/3 octave band frequencies. The R_w sound insulation parameter stands for the weighted standardised sound reduction index and is a single-figure global rating of the sound insulation of a given material or construction.

APPENDIX B – Surroundings and Location



Figure 3.0 – Site and Measurement Location

APPENDIX C – Noise Survey Time History

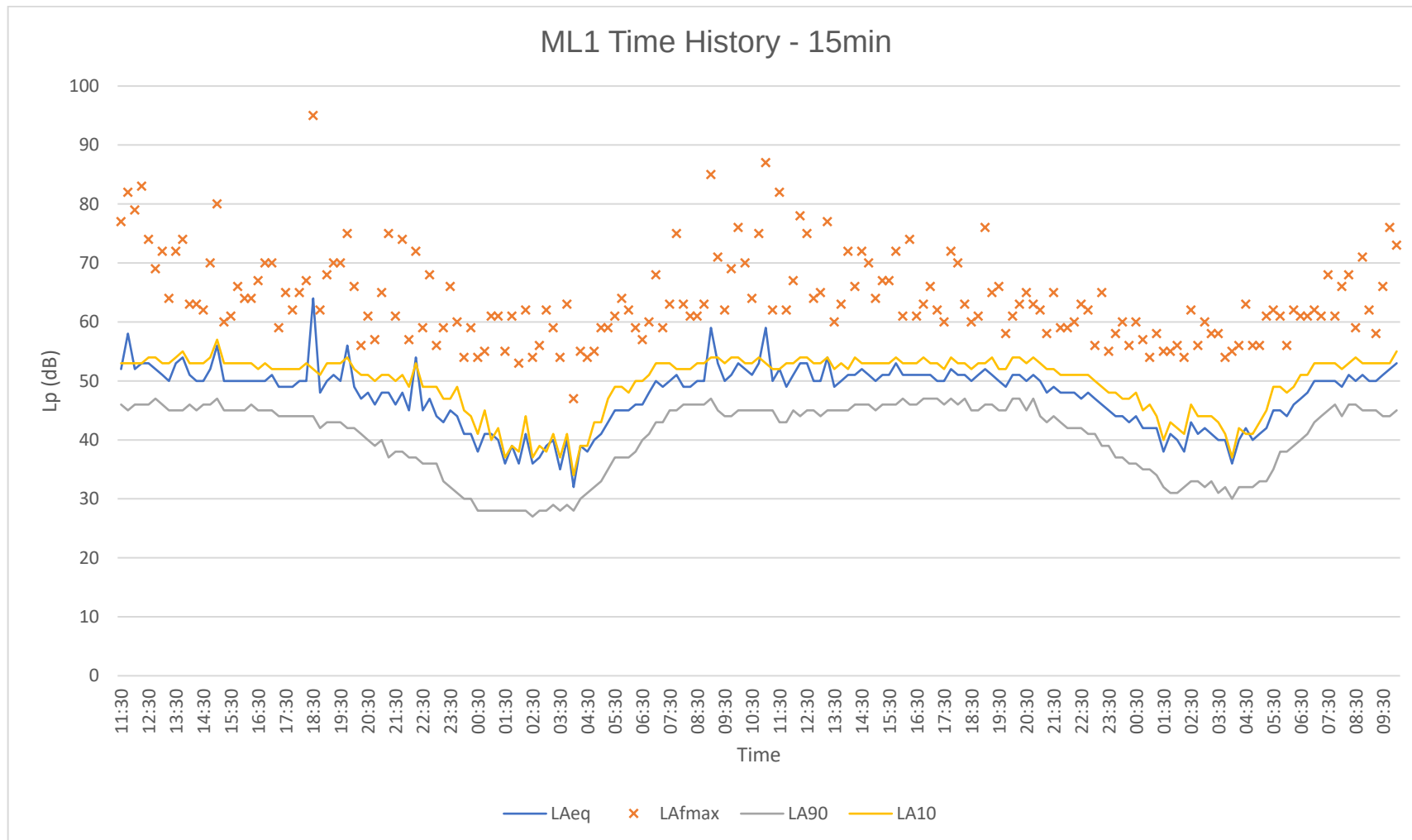


Figure 4.0 – Noise Survey Time History – ML1

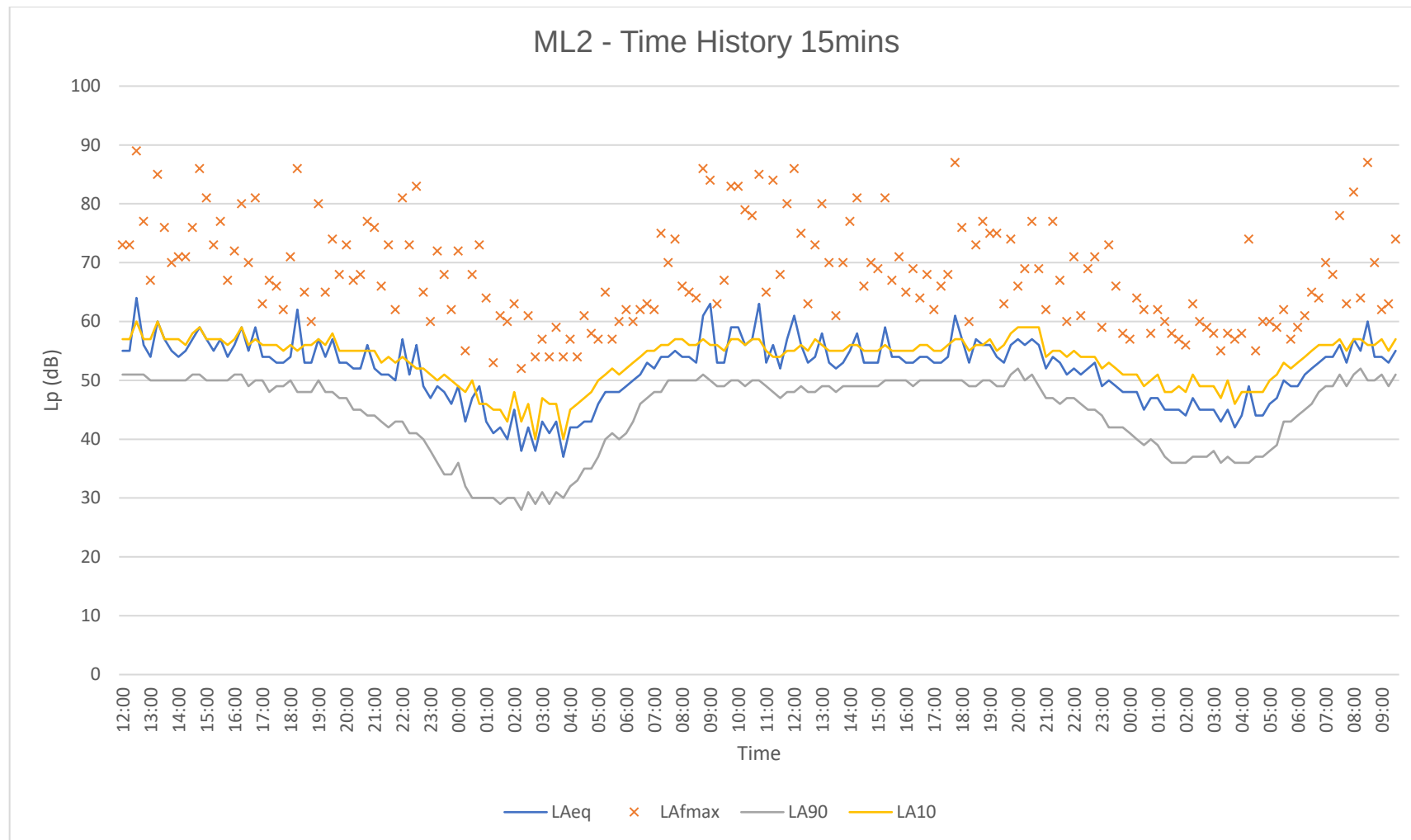


Figure 5.0 – Noise Survey Time History – ML2

APPENDIX D – Noise Calculations and Assessments

D.1 – BS8233 Noise Break-In Assessment

The tables below compare the noise levels expected at each of the defined facade zones to the criteria outlined in BS8233:2014 in order to calculate the required sound reduction index of the proposed dwellings. The BS4142 rating noise level has been used for the daytime break-in assessment on facades exposed to specific commercial plant noise in order to fully protect future residents.

Location/Time Period	Façade Zone	Façade Noise Level $L_{Aeq,1hour}$ (dBA)	Adapted BS8233 Criteria (dBA)	Required Sound Reduction (dB)
Bedroom / Living Room Day	South and Western Facades	66.0*	35 dB $L_{Aeq,1hour}$	31.0 R_{w+ctr}
Bedroom Night		43.0	30 dB $L_{Aeq,8hour}$	13.0 R_{w+ctr}
Bedroom Night		61.0	45 dB L_{Amax}	16.0 R_w
Bedroom / Living Room Day	North and Eastern Facades	56.0	35 dB $L_{Aeq,16hour}$	21.0 R_{w+ctr}
Bedroom Night		48.0	30 dB $L_{Aeq,8hour}$	18.0 R_{w+ctr}
Bedroom Night		63.0	45 dB L_{Amax}	18.0 R_w

Table 8.0 – BS8233 Façade Break-In Assessment

*BS4142 Rating Noise Level

D.2 – BS8233 Open Window Assessment

The assessment below has been undertaken assuming a 15 dB attenuation from an open window to establish the internal noise levels. BS8233 states that where development is desirable noise criteria can be relaxed by 5 dB. The AVO Guide indicates at levels approximately 5 dB above the criteria there would be a low risk of overheating. Document O of the Building Regulations also stipulates internal levels of 40 dB $L_{Aeq,8hours}$ or below and L_{Amax} levels not regularly exceeding 55 dB are sufficient when using open windows for ventilation and prevention of overheating. Given this, it is reasonable to expect a 5 dB relaxation in the BS8233 criteria when assuming open windows and still achieving acceptable internal noise levels.

BS8233 Open Window Assessment				
Location / Time Period	Façade Zone	Internal Noise Level $L_{Aeq,t}$ (dBA)	BS8233 Criteria (dBA)	Exceedance (dBA)
Bedroom / Living Room Day	South and Western Facades	51.0*	40 dB $L_{Aeq,1hour}$	+11.0
Bedroom Night		28.0	35 dB $L_{Aeq,8hour}$	-7.0
Bedroom Night		46.0	50 dB $L_{Amax,8hour}$	-4.0
Bedroom / Living Room Day	North and Eastern Facades	41.0	40 dB $L_{Aeq,16hour}$	+1.0
Bedroom Night		33.0	35 dB $L_{Aeq,8hour}$	-2.0
Bedroom Night		48.0	50 dB $L_{Amax,8hour}$	-2.0

Table 9.0 – Open Window Assessment

*BS4142 Rating Noise Level

D.3 – AC Noise Calculations and Data Sheets

The following table presents the specific noise level calculations of the five nearby AC units. Where available the noise levels of each unit have been obtained from the manufacturer's noise data. Some of the units are old and thus no specific noise data for the exact make and model is available. In these instances, noise data from a similar make and model of comparable size have been utilised. To account for the positioning of the units against a wall a Q factor of 4 has been used within the distance calculations.

Specific Noise Level Calculations					
Description	Lp (dBA)	Sound Power (LwA) (dBA)	Distance (m)	Sound Level at Development (dBA)	Cumulative Specific Noise Level at Development (dBA)
Daikin RXP35L	48 dB At 1m	62.0	5	43.0	61.0
Daikin R25DBV11B	48 dB at 1m	61.0	4	44.0	
Marstair MHPUE130	42 dB at 10m	70.0	3.5	54.0	
Marstair MHPUE130	42 dB at 10m	70.0	3	55.0	
Marstair MHPUE130	42 dB at 10m	70.0	2.5	57.0	

Table 10.0 – Specific Noise Level Calculations

SPECIFICATION DETAILS

CKC		15	20	30	40	50	60	80	90	100	130	150	165	180	200
Nominal cooling capacity	kW	2.5	2.8	3.7	4.2	5.8	7.0	7.4	8.2	10.9	12.4	13.9	14.7	17.1	19.9
Operating weight kg	1Ph	45	46	48	53	64	65	66	76	-	-	-	-	-	-
	3Ph	-	-	48	53	62	63	64	73	81	101	103	103	118	173

1 Ph (230V 50Hz)

Power (nominal)	kW	1.1	1.6	1.6	2.1	2.0	2.4	3.0	4.2	-	-	-	-	-	-
Starting current LRA	A	23	28	36	50	58	61	76	114	-	-	-	-	-	-
Nominal current FLA	A	5.9	6.9	8.1	10.2	8.9	9.8	11.5	16.9	-	-	-	-	-	-

3Ph (400v 50Hz)

Power (nominal)	kW	-	-	1.6	2.0	1.9	2.4	3.0	4.1	4.3	4.4	5.3	6.0	7.0	9.4
Starting current LRA	A	-	-	18	22	26	32	40	48	51	62	68	71	71	98
Nominal current FLA	A	-	-	3.6	4.8	4.2	4.2	4.9	7.1	7.2	7.7	8.7	9.5	11.9	16.9

Sound Pressure Levels (SPL) at 10m distance in free field conditions.

Fan speed max	dBA	39.2	39.2	39.3	39.2	38.9	39.3	38.7	42.2	43.0	41.9	42.2	42.2	42.9	43.2
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Condenser fan (1Ph 230V 50Hz)

Outdoor Units			R25DV1	R35DV1
Casing Color			Ivory White	Ivory White
Compressor	Type		Hermetically Sealed Rotary Type	Hermetically Sealed Rotary Type
	Model		RC30BV1R2T	RC46AV1TRT
	Motor Output	W	700	1,100
Refrigerant Oil	Type		SUNISO 4GSD.I.	SUNISO 4GSD.I.
	Charge	L	0.4	0.5
Refrigerant	Type		R22	R22
	Charge	kg	0.76	0.95
Air Flow Rate	m³/min		28 / 30	26.5 / 28
	cfm		988 / 1,059	935 / 988
Fan	Type		Propeller	Propeller
	Motor Output	W	25	25
Running Current		A	3.77 / 4.1	5.33 / 5.28
Power Consumption		W	780 / 845	1,080 / 1,150
Power Factor		%	94.0 / 85.9	92.1 / 90.8
Starting Current		A	19 / 21	26 / 28
Dimensions (HxWxD)	mm		560x695x265	560x695x265
Packaged Dimensions (HxWxD)	mm		599x797x310	599x797x310
Weight	kg		27	33
Gross Weight	kg		30	35
Operation Sound	dBA		H : 46 / 48	H : 48 / 49
Drawing No.			3D049542	3D049543A

2-2 Technical Specifications					RXP20L	RXP25L	RXP35L	RXP50L	RXP60L	RXP71L
Heat exchanger	Length		mm		670		647	943	920	
	Rows	Quantity			1		2	1	2	
	Fin pitch		mm		1.40					
	Stages	Quantity			24			32		
	Passes	Quantity			1.6		3.1	2.2		
	Tube type				ø7 Hi-XD					
	Tube material				Copper			-		
	Fin	Type			Waffle fin (PE)					
Compressor	Model				1YC25KXD#C			2YC40JXD#C		
	Oil Amount		cm³		375			650		
	Type				Hermetically sealed swing compressor					
	Output		W		870			1,300.0		
	Oil Type				FW68DA					
Fan	Type				Propeller			Propeller fan		
	Air flow rate	Cooling	High	m³/min	27.6		28.2	-		
				cfm	975		996	-		
			Nom.	m³/min	-			43.2	47.8	
				cfm	-			1,527	1,689	
		Heating	High	m³/min	27.1		26.8	-		
				cfm	957		946	-		
			Nom.	m³/min	-			43.2	45.3	
				cfm	-			1,527	1,600	
Fan motor	Model				ZWA138S28A			D90B-37		
	Insulation grade				Class "E"			-		
	Output			W	21			58	81	
	Speed	Cooling	High	rpm	840			780	840	
			Nom.	rpm	-			710	780	
			Low	rpm	700			710	780	
		Heating	High	rpm	870		840	710	740	
			Nom.	rpm	-			710	740	
Low			rpm	720			710	740		
Sound power level	Cooling			dBA	60		62	61	63	66
	Heating			dBA	61		62	61	63	65
Sound pressure level	Cooling	High	dBA	46			48	-		
		Nom.	dBA	-			47	49	52	
	Heating	High	dBA	47			48	-		
		Nom.	dBA	-			49		52	

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