soundtesting
acoustic consultancy & air leakage specialists

Environmental Noise Impact Report

Proposed Restaurant and Residential Development
250 High Road
Benfleet
Essex
SS7 5LA

Date of Report: Monday 6th June 2022

Reference: 15335 Version 4

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Contents

1 General Information

1.1 Client Instructing Survey

Homestead Plc
Oysterfleet Hotel
21 Knightwick Road
Canvey Island
SS8 5PA

1.2 Date of Noise Survey

Friday 22nd to Monday 25th October 2021

1.3 Quality Assurance Information

	Name	Position	Date
Prepared by	Jack Holmes BSc (Hons) MIOA	Acoustic Consultant	06/06/2022
Checked By	Martin Hamer MSc MIOA	Senior Acoustic Consultant	06/06/2022

1.4 Revision History

Revision Number	Revision Date	Details	
V1	16/11/2021	First issue	JH
V2	07/12/2021	Second issue	JH
V3	16/05/2022	Removal of Outdoor Seating Area and Bifold Doors	JH
V4	06/06/2022	Proposed usage of GF changed from a Bar/ Restaurant to a Restaurant.	JH

2 Introduction

Homestead Plc has instructed Soundtesting.co.uk Limited to undertake an environmental noise survey in order to assess the impact of sound from the nearby road, as well as other general noise within the local environment, which may have an impact on future residents of the proposed development.

Sound insulation between the ground floor commercial premises has also been assessed. Soundtesting Ltd has not been instructed to assess the sound insulation between residential apartments on the first and second floor.

The proposed development site is an existing two storey commercial premises. It is proposed to convert the ground floor commercial space into a restaurant. It is proposed to construct a second floor above the existing flat roof and convert the upper floors into 8no. residential apartments.

Soundtesting Ltd has been informed that the outdoor seating area has been removed from the proposal. The bi-fold doors on the front façade have also been replaced with typical opening glazed doors.

As of this version of the report, Soundtesting Ltd has been informed that the usage of the ground floor has been changed from a bar/ restaurant to a restaurant only with no amplified music.

This report is prepared solely for Homestead Plc. Soundtesting.co.uk Limited accepts no responsibility for its use by any third party.

This document has been prepared using the various documents listed within the appendices of this report, together with drawings, technical information and additional verbal representations made by third parties. We have not audited nor independently verified the content or accuracy of any of the documents and information provided to us in the preparation of this report.

If additional information comes to light subsequent to the production of this report, we reserve the right to revise our opinions and the conclusions reached within this report.

2.1 An Environmental Noise Assessment

Soundtesting.co.uk Ltd has undertaken an environmental noise assessment at the above site with noise levels measured externally over 24-hour periods, consisting of sixteen-hour days (07:00 – 23:00) and eight-hour nights (23:00 – 07:00).

This report will state the measured noise levels and will refer to guidance relevant to the nature of this survey whilst considering Local Planning Authority guidance and conditions.

3 Assumptions, Limitations & Uncertainty

a. All suggested specifications require a good level of workmanship and for materials to be installed as the manufacture intends. Any poor workmanship may lead to weaknesses in the sound attenuation provided by the building elements.
b. It is assumed that the sound pressure levels measured on site during the environmental noise survey are typical of the site.
c. It is assumed that the technical data provided by glazing and ventilation manufacturers is up to date and correct.
d. It is assumed that drawings and information supplied by Brian Davidson Associates are up to date and correct.
e. All building elements modelled in INSUL Acoustic Prediction Software have had a 3 dB correction applied to account for a margin of error within the software.
f. It should also be noted that building elements modelled in INSUL are only an approximation of the proposed specifications due to the limitation of materials available within the software. These models are shown in the appendix.

4 Planning Policies, Guidance and Criteria

The planning policies and criteria listed below are taken from associated relevant guidance documents, all of which should be considered for the internal and external noise and vibration levels.

4.1 National Planning Policy

The National Planning Policy Framework (NPPF) July 2021 set out the Government's planning policies for England and how they are expected to be applied. It provides a framework within which the Local Authorities are to prepare local plans and use their planning powers to minimise the adverse impact of noise. It should contain the following in relation to noise impacts.

175. Planning policies and decisions should contribute to and enhance the natural and local environment by:

'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.'

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

'mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life'

NPPF previously characterised noise by grading and recommending actions and different effect levels as reproduced in Table 1

Table 1: Noise exposure hierarchy based on likely average response			
Perception	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

4.2 Criteria

4.2.1 Local Authority Criteria

As of this version of the report, Soundtesting Ltd has been informed by Alex Davison of Brian Davison Associates that the previous application for a ground floor bar/ restaurant has been refused and a new application for a ground floor restaurant only will be made. At the time of writing this report Soundtesting Ltd is unaware of any conditions or specific criteria provided by the Local Planning Authority.

The following application reference and Local Planning Authority comments relate to the previous application for a ground floor bar/ restaurant.

Application reference: 21/0738/FUL

The Local Planning Authority has provided the following commentary regarding noise.

No information has been provided assessing the potential noise and vibration impact from the intended use of the ground floor bar/restaurant on the first and second floor residential units. In light of that I cannot support the application and the application should be refused until a more detailed assessment is carried out of the potential environmental impacts of the development.

The applicant should be requested to provide further information assessing the noise and vibration impact of the ground floor bar/restaurant on the first and second floor residential units. The report should include, if appropriate, measures to be taken to mitigate excess noise impact.

The report should be prepared by a person with appropriate acoustic qualifications and should be with full regard to all relevant guidance including BS8233:2014 - Guidance on Sound Insulation and Noise Reduction for Buildings and BS4142:2014 Methods for rating and assessing industrial and commercial sound.

The applicant should ensure that the existing background noise level is not increased when measured one metre from the nearest noise sensitive elevation. In order to achieve this any mechanical plant must be designed / selected or the noise attenuated so that it is 10dB below the existing background level. This will maintain the existing noise climate and prevent 'ambient noise creep.'

Details should be submitted to the Council of the sound insulation of the floor/ ceiling/ walls separating the commercial part(s) of the premises from noise sensitive premises. Details should demonstrate that the sound insulation value $D_{nT,w}$ and $L'_{nT,w}$ is enhanced by at least 10dB above the Building Regulations value and, where necessary, additional mitigation measures should be implemented to contain commercial noise within the commercial premises and to achieve the noise criteria of BS8233:2014 within the dwellings/ noise sensitive premises.

It is very likely that music will be a feature of the development that may impact on the residential units and no assessment has been considered by the applicant. In order to control music noise, music noise levels in the 63Hz and 125Hz octave centre frequency bands (Leq) should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB (Leq), respectively.'

Given the commentary previously made by the Local Planning Authority, the following noise impact assessment will be undertaken in order to meet the criteria of BS8233:2014 and BS4142:2014.

4.2.2 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

The British Standard BS 8233:2014, Guidance on Sound Insulation and noise reduction for buildings, provides appropriate internal levels of noise within dwellings, flats and rooms in residential use when unoccupied.

Section 7.2.2 'Internal ambient noise levels in dwellings' of BS8233: 2014 states that 'In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values.

Table 2: Indoor ambient levels for dwellings			
Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Note 7 of section 7.7.2 states 'Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed up to 5 dB and reasonable internal conditions still achieved'.

In addition, Note 4 of section 7.7.2 states, '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 the absence of a specific performance criterion within BS8233 for short-term noise maxima, reference can be made to guidance published by the WHO. In particular, the WHO publication 'Guidelines for Community Noise' (1999), from which the guidance given in BS8233: 2014 is itself derived, states that 'for a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than ten to fifteen times per night'.

The WHO publication 'Guidelines for Community Noise' (1999) has since been updated in 2018; however, it is widely accepted by Local Authorities that L_{AFmax} 45dB is the target level for short-term noise maxima between 23:00-07:00.

4.2.3 BS4142:2014+A1:2019 Method for rating and assessing industrial and commercial sound

This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature.

''The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background level and the context in which it occurs.

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

4.2.4 WHO Guidelines for Community Noise

In 1999, the WHO (World Health Organisation) published Guidelines for Community Noise, stating the following internal noise levels are applicable within dwellings.

Table 3: A Summary of the Guidance Noise Levels

Specific Environment	Critical Health Effect (s)	L_{Aeq} (dB)	Time base (hours)*	L_{AFmax} (dB)
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime evening	50	16	-
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

* Typically taken to be daytime/evening - 07:00 – 23:00 and night time 23:00 – 07:00.

4.3 Criteria Summary

In order to meet the anticipated requirements of the Local Planning Authority, the assessment and recommendations will be made in reference to BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings, BS4142:2014 Method for rating and assessing industrial and commercial sound and NR Curves.

5 Site Description

The proposed development at 250 High Road is an existing two storey building situated in Benfleet, Essex. It is proposed to convert the ground floor commercial space into a restaurant. It is proposed to construct a second floor above the existing flat roof and convert the upper floors into 8no. residential apartments.

The front façade of the building faces south-west onto the B1006, High Road, which is a main road carrying traffic to and from Benfleet town centre. The rear façade faces north-east overlooking an existing car park followed by the rear of residential properties located on Thundersley Park Road. Either side of the development are buildings consisting of ground floor retail and upper floor residential. The building to the south-west is a relatively new three-storey building consisting of ground floor retail and upper floor residential. It should be noted that this development is approximately 4m closer to High Road than the proposed development at 250 High Road.

During site attendance, it was noted that the proposed development is completely detached from the buildings either side and therefore no sound insulation assessment of adjoining walls is required. The construction details of the existing external walls and separating floor was observed on site. The external walls were observed to be a minimum of 200mm solid brick, and the separating floor was observed to be 30mm screed on top of a minimum of 100mm block and beam floor.

Soundtesting Ltd are currently informed that the proposed operational hours of the ground floor restaurant are 09:00-00:00 Monday-Sunday. The front façade of the ground floor restaurant is proposed to consist of triple glazed doors in between the existing masonry columns. Soundtesting Ltd is informed that the outdoor seating area has been removed from the proposal and the bifold doors on the front façade are to be replaced with typical opening glazed doors.

5.1 Subjective Observations

During site attendance, subjectively the main source of noise was road traffic from High Road. Some noise from the pedestrian crossing outside the development was also audible.

5.2 Weather

Table 4: Weather Conditions

Description	Daytime Average	Night time Average
Temperature	12°C	7°C
Wind Speed	2.5m/s	2.0m/s
Wind Direction	W	W
Precipitation	Dry	Dry
Damp road/ wet ground	None	None
Fog/snow/ice	None	None

6 Noise Measurement Procedure

6.1 Personnel Present

William Wright BSc MIOA

6.2 Survey Equipment Used

Table 5: Survey Equipment Used			
Manufacturer	Model	Serial No.	Description
Rion	NA28	211583	Real Time Analyser Sound Level Meter
Rion	NL52	1032413	Real Time Analyser Sound Level Meter
Rion	NC74	35125832	Acoustic Calibrator
Pulsar	Model 105	59964	Acoustic Calibrator

6.3 Calibration

The sound level meters were calibrated with the field calibrator to a level of 94.0 dB @ 1 kHz prior to and on completion of the survey. No significant drift in calibration was observed. The meters used during the survey are precision grade class 1.

Calibration certificates are available on request.

6.4 External Ambient Sound Measurements

The measurement locations chosen during the survey was deemed suitable for the determination of the noise levels able to impact upon the façades of the proposed development.

The sound level meters were set to measure L_{Aeq}, L_{A90}, L_{A10}, and L_{AFmax} in 5-minute periods, as well as A-weighted 1:1 octave spectrum analysis.

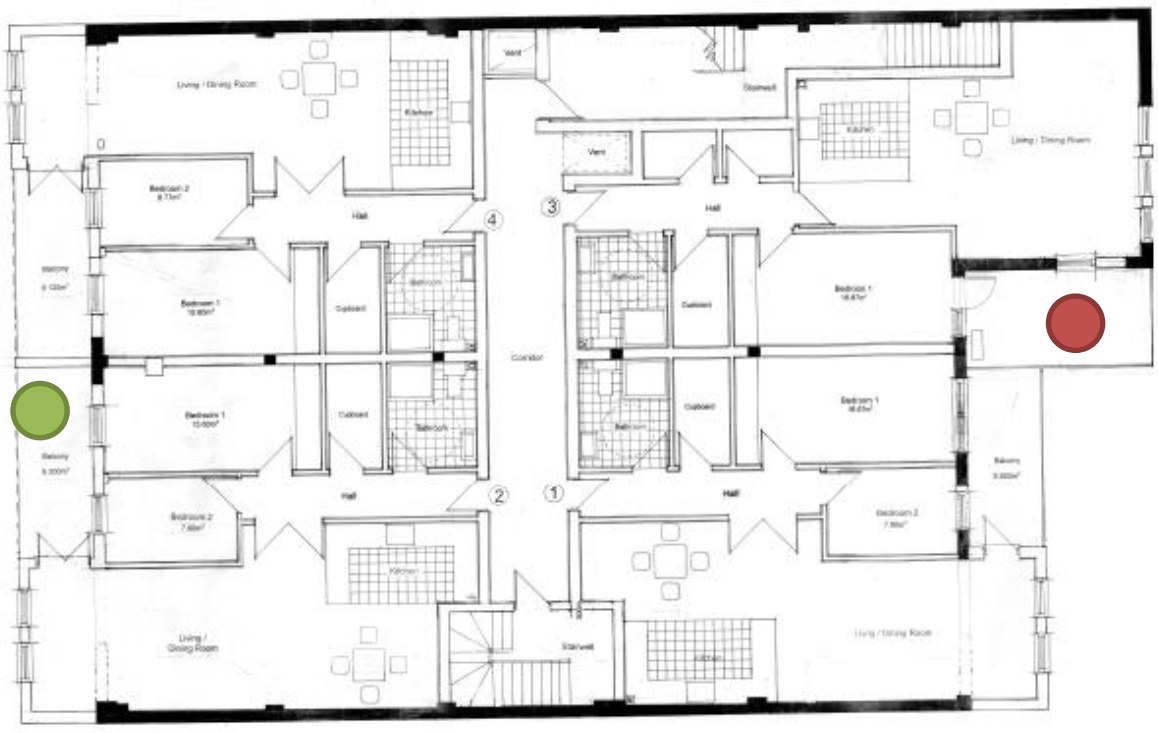
6.4.1 Monitoring Position 1

A microphone was placed 5 meters above the ground floor at first-floor level 1m from the front façade overlooking High Road.

6.4.2 Monitoring Position 2

A microphone was placed 5 meters above the ground floor at first-floor level 1m from the rear façade overlooking the rear car park. The sound level meter was set to record WAV file audio recordings for all maximum sound level events above 70 dBA.

The detail below shows the proposed development and location positions of the meters.



Monitoring Position 1

Monitoring Position 2

7 Results and Analysis

7.1 External Ambient Sound Measurement Analysis in Accordance with BS8233:2014

The following table presents the measured results from all monitoring positions.

Data charts can be found in the appendix.

Table 6: Measurement Results

Monitoring position	Day	Time Period	Time Base T (hours)	$L_{Aeq,T}$ (dB)	L_{AFmax} (dB)	L_{A90}(dB)	L_{A10}(dB)
1	Friday	Daytime	16	67.8	-	59.7	70.6
		Night time	8	60.7	58.9 – 86.1	41.6	62.5
	Saturday	Daytime	16	67.5	-	59.4	70.5
		Night time	8	60.4	55.2 – 89.3	40.1	61.1
	Sunday	Daytime	16	67.7	-	56.6	69.9
		Night time	8	60.1	43.5 – 58.1	40.5	58.1
2	Friday	Daytime	16	50.6	-	49.4	45.7
		Night time	8	40.6	40.1 – 66.8	32.1	41.0
	Saturday	Daytime	16	48.0	-	39.4	51.0
		Night time	8	39.3	35.8 – 70.3	28.7	38.8
	Sunday	Daytime	16	48.1	-	38.5	49.8
		Night time	8	40.9	34.1 – 67.5	29.9	38.5

7.2 Night-time L_{AFmax} Analysis

The L_{AFmax} measured during the night-time (23:00-07:00) has been analysed. WHO Community Noise Guidelines states "For a good night sleep it is believed that indoor sound pressure should not exceed approximately 45dB L_{AFmax} more than 10 – 15 times per night (Vallet & Vernet 1991).

7.2.1 Night Time L_{AFmax} at Monitoring Position 1

The maximum measured L_{AFmax} is 89.3 dB, which occurred at 03:05 during the Saturday night-time period. The next highest L_{AFmax} is 86.1 dB, which occurred at 00:35 during the Friday night-time period. 85.0 L_{AFmax} dB is exceeded twice and 80.0 L_{AFmax} dB is exceeded ten times during the measured weekend night-time periods.

The frequency spectrum data indicate that the L_{AFmax} 89.3dB event was from an anomalous event in close proximity to the monitoring equipment, likely a bird landing on or near the microphone.

The frequency spectrum data indicate that the L_{AFmax} 86.1dB event was likely from a vehicle pass on High Road.

The 86.1 L_{AFmax} dB event will be used for the assessment at this monitoring position as this is considered representative of other L_{AFmax} events during the night-time period.

7.2.2 Night Time L_{AFmax} at Monitoring Position 2

The maximum measured L_{AFmax} is 70.3 dB, which occurred at 23:10 during the Saturday night-time period. The next highest L_{AFmax} is 67.5dB, which occurred at 06:55 during the Sunday night-time period. 70.0 L_{AFmax} dB is exceeded once and 65.0 L_{AFmax} dB is exceeded five times during the measured weekend night-time periods.

The WAV file recordings and frequency spectrum data indicate that the L_{AFmax} 70.3 dB event was from traffic noise.

The 70.3 L_{AFmax} dB event will be used for the assessment at this monitoring position as this is considered representative of other L_{AFmax} events during the night-time period.

7.3 L_{A90} Background Measurements in Accordance with BS4142:2014

7.3.1 Monitoring Position 1

All background levels are expressed as integers on the basis that a value of 0.5 is rounded up.

Table 7: Daytime Values of $L_{A90,\ 1\ hour}$ at Monitoring Position 1

Time	Friday	Saturday	Sunday
	$L_{A90,\ 1\ hour}$ (dB)	$L_{A90,\ 1\ hour}$ (dB)	$L_{A90,\ 1\ hour}$ (dB)
09:00 – 10:00	60	61	59
10:00 – 11:00	60	61	61
11:00 – 12:00	60	61	62
12:00 – 13:00	61	61	62
13:00 – 14:00	61	61	62
14:00 – 15:00	60	60	60
15:00 – 16:00	61	61	60
16:00 – 17:00	62	61	60
17:00 – 18:00	62	62	60
18:00 – 19:00	62	61	58
19:00 – 20:00	61	60	56
20:00 – 21:00	58	57	54
21:00 – 22:00	55	55	50
22:00 – 23:00	52	53	47

The lowest measured $L_{A90,1hour}$ background level during the daytime operational hours was 47dB(A) which occurred once throughout the surveyed daytime periods.

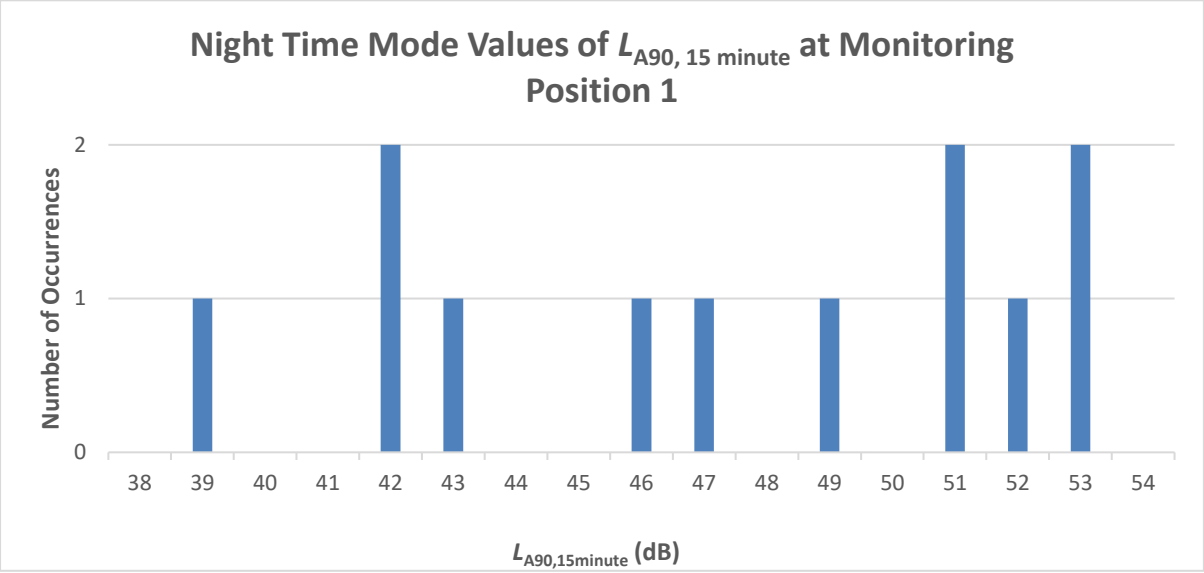
7.3.2 Monitoring Position 2

All background levels are expressed as integers on the basis that a value of 0.5 is rounded up.

Table 8: Daytime Values of $L_{A90,\ 1\ hour}$ at Monitoring Position 2			
Time	**Friday**	**Saturday**	**Sunday**
	$L_{A90,\ 1\ hour}$ (dB)	**$L_{A90,\ 1\ hour}$ (dB)**	**$L_{A90,\ 1\ hour}$ (dB)**
09:00 – 10:00	42	41	40
10:00 – 11:00	42	40	40
11:00 – 12:00	48	40	41
12:00 – 13:00	54	40	42
13:00 – 14:00	54	40	42
14:00 – 15:00	54	40	41
15:00 – 16:00	53	40	41
16:00 – 17:00	55	40	40
17:00 – 18:00	54	40	39
18:00 – 19:00	54	40	38
19:00 – 20:00	53	39	37
20:00 – 21:00	50	38	37
21:00 – 22:00	48	38	34
22:00 - 23:00	46	36	33

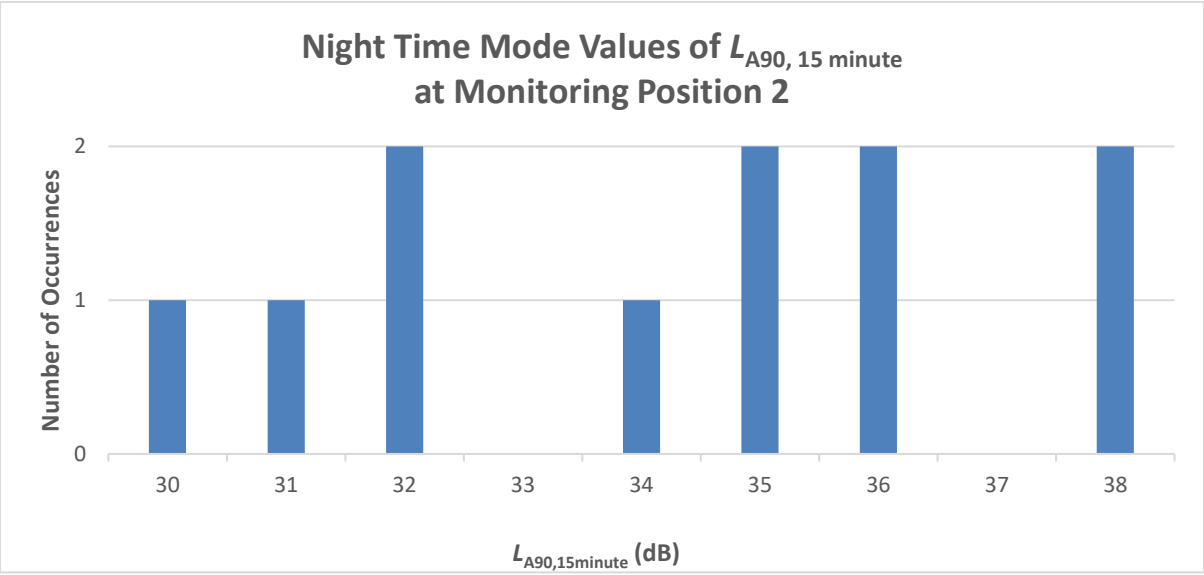
The lowest measured $L_{A90,1hour}$ background level during the daytime operational hours was 33dB(A) which occurred once throughout the surveyed daytime periods.

The following graph shows the background levels measured at monitoring position 1 between 23:00-00:00 over the weekend measurement period. Soundtesting Ltd are currently informed that the proposed ground floor restaurant is to operate until 00:00.



The lowest modal $L_{A90,15minute}$ background level during the night-time operational hours was 42dB(A) which occurred twice during the surveyed night-time periods. The 42dB $L_{A90,15minute}$ will be used for the noise breakout assessment of the ground floor restaurant.

The following graph shows the background levels measured at monitoring position 2 between 23:00-00:00 over the weekend measurement period.



The lowest modal $L_{A90,15minute}$ background level during the night-time operational hours was 32dB(A) which occurred twice during the surveyed night-time periods. The 32dB $L_{A90,15minute}$ will be used for the assessment of mechanical plant in accordance with BS4142:2014.

7.3.3 Summary of Background L_{A90} Measurement Analysis in Accordance with BS4142:2014 + A1:2019

The table below shows the background L_{A90} to be used in the following assessment.

Table 9: Background L_{A90} Measurement Analysis in Accordance with BS4142:2014 + A1:2019

Monitoring Position	Period	$L_{A90,1hour}$ dB(A)	$L_{A90,15minute}$ dB(A)
1	Daytime	47	-
	Night-time	-	42
2	Daytime	33	-
	Night-time	-	32

8 NR Curve Analysis of Separating Floor

The proposed restaurant noise in the worst case will be located directly below a bedroom and a living room area of the residential flat above. In order to calculate the NR Curve rating from the effect of sound that will likely be produced by the restaurant on the above residential flats, an approximation must be made of the sound likely to be generated within the restaurant during busy periods.

The Little Red Book of Acoustics. A Practical Guide. Third Edition. R. Watson & O. Downey provides octave band spectral noise data for a "Busy Restaurant". The "Busy Restaurant" is rated at 80 dBA.

Comments made by the EHO stress the likelihood of amplified music within the ground floor premises; therefore, A "Busy Restaurant" is considered to be a suitable approximation for the sound levels that will be produced in the pub based on the direct relation to the activity and premises type.

The 1:1 octave frequency band data for the different sound sources is shown in the table below.

Table 10: Approximate Sound Levels of Different Sound Sources

Sound Source	Un-weighted Octave Band Centre Frequency (Hz)							dBA
	63	125	250	500	1K	2K	4k	
Busy Restaurant	60	70	75	75	75	75	70	80

8.1 Acoustic Performance of Existing Separating Floor

During site attendance, an inspection of the existing separating floor was carried out. The existing construction was observed to be:

- 30mm screed
- A minimum of 100mm block and beam floor

An image of the existing floor is shown in the Appendix.

The floor to ceiling height on the ground floor was measured to be 3.95m.

Based on the above construction details observed during site attendance, it is the consultant's opinion that improvements will need to be made in order to control the transfer of operational noise from the proposed ground floor restaurant into the existing first floor residential property.

8.2 Sound Insulation Analysis of Existing Separating Floor

The following table shows the estimated sound levels within the first-floor residential from estimated sound generated within the ground floor restaurant.

Table 11: Estimated Sound Insulation Analysis of Existing Partition Between Ground Floor Commercial and First Floor Residential							
	Un-weighted Octave Band Centre Frequency (Hz)						
	63	125	250	500	1K	2K	4k
Estimate of sound generated within commercial premises (dB)	60	70	75	75	75	75	70
Modelled sound reduction of existing separating floor partition (R(dB))	35	39	38	38	46	54	60
Estimated sound level in first floor residential living room (dB)	25	31	37	37	29	21	10

8.3 Sound Insulation of Recommended Separating Floor

The following table shows the estimated sound levels within the proposed first floor residential from estimated sound generated within the ground floor commercial premises, based on the recommended improvements to the separating floor outlined in section 10.

Table 12: Estimated Sound Insulation Analysis of Recommended Partition Between Ground Floor Commercial and First Floor Residential							
	Un-weighted Octave Band Centre Frequency (Hz)						
	63	125	250	500	1K	2K	4k
Estimate of sound generated within commercial premises (dB)	60	70	75	75	75	75	70
Modelled sound reduction of recommended separating floor partition (R(dB))	49	60	64	63	70	74	90
Estimated sound level in first floor residential (dB)	11	10	11	12	5	2	-20

8.1 NR Curve Analysis of Separating Floor

NR Curve analysis is used to gain a greater understanding of the frequency content of a sound.

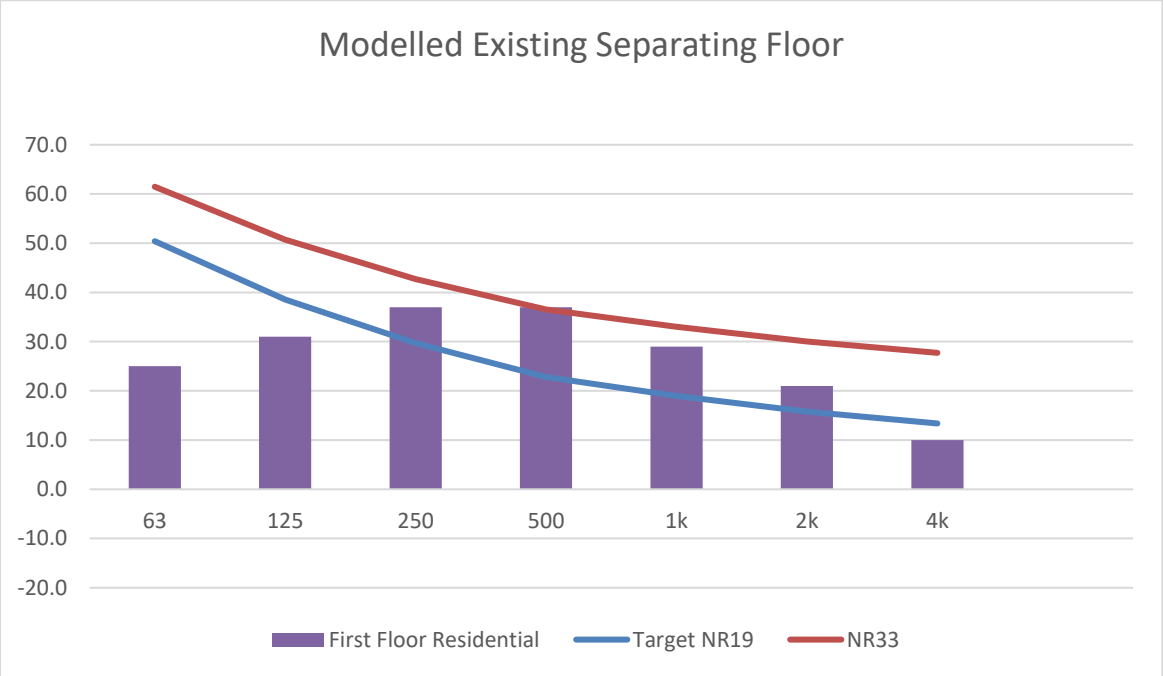
Soundtesting Ltd are currently informed by the client that the proposed operational hours of the restaurant are 09:00-00:00 and will therefore operate during the first hour of the night-time period 23:00-00:00.

In order for noise levels within the first-floor residential rooms to meet BS8233:2014 criteria the NR level within the first floor is required to be NR19. This target is selected based on daytime criterion in living areas being 30dB(A) and NR levels being equivalent to approximately 6dB less than the single figure dB(A) value as well as allowing 5dB for the effects of cumulative sound levels of external ambient sound break-in.

It should be noted that this target does not mean that all L_{AFmax} or low frequency sound events will be inaudible.

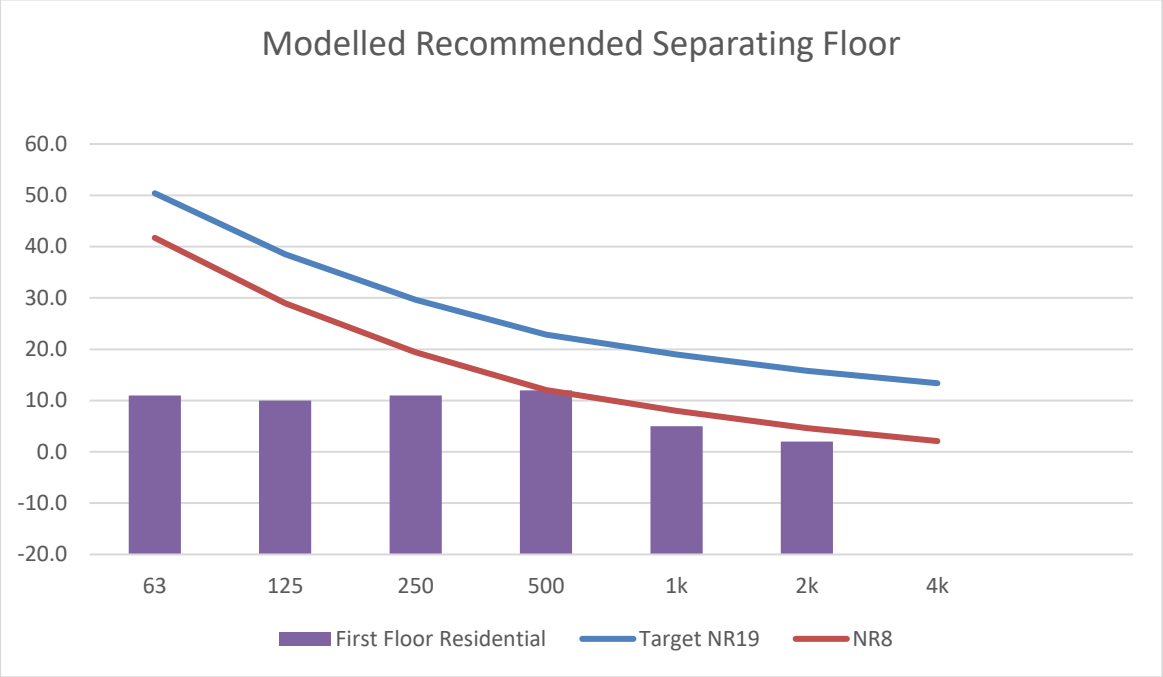
8.1.1 NR Curve Analysis of Existing Floor

The below chart demonstrates that the measured existing construction is estimated to meet NR33 during the busiest periods of the ground floor restaurant's opening hours.



8.1.2 NR Curve Analysis of Recommended Separating Floor

The below chart demonstrates that the recommended separating floor construction detailed fully in the recommendations section is estimated to meet NR8 during the operational hours of the ground floor restaurant.



In order to achieve NR19 in the first-floor residential, enhancements will need to be made to the existing ground floor ceiling and flanking routes will need to be addressed. Recommended enhancements are outlined in section 10 of this report.

The INSUL model of the proposed floor is shown in the Appendix. The model shows that the proposed floor is expected to achieve a performance of R_w 73dB. Generally, an R_w figure is approximately 10dB higher than we would expect to measure a $D_{nT,w}$ on site. Therefore, the proposed floor construction would be expected to achieve a $D_{nT,w}$ around 60dB. The guideline values stated in the Building Regulations Approved Document E, state a requirement for separating floors to achieve a $D_{nT,w}$ of 43dB. Therefore, the proposed floor construction is expected to meet the EHO's requirements of 10dB above the Building Regulations as well as achieving the internal noise criteria outlined in BS8233:2014.

As a further assessment of the estimated sound reduction of the separating floor, the $D_{nT,w}$ has been calculated based on the modelled R_w and the room sizes at the proposed development taken from drawings provided by the architect.

HTM08-01: Acoustics states for masonry walls/floors:

$$R_w = D_{nT,w} + 10 \log (S/V) + 11.$$

where:

S is the area of the separating wall or floor in the field in square metres (m^2);

V is the volume of the receiving room in the field in cubic metres (m^3).

The room dimensions have been taken from the smallest bedroom directly above the ground floor restaurant. The surface area of the separating floor (*S*) is shown to be 11.6m^2 and the room volume (*V*) is shown to be 29m^3. Given that the R_w has been modelled to be 73dB, the D_{nT} can be calculated with the following formula:

$D_{nT,w}$ - 10 log (11.6/29) – 11

$D_{nT,w}$ = 58dB.

The calculated D_{nT} has been shown to be 58dB. As previously stated, the guideline values stated in the Building Regulations Approved Document E, state a requirement for separating floors to achieve a $D_{nT,w}$ of 43dB. Based on the above model and calculations, the proposed floor construction should meet the EHO's requirements of 10dB above the Building Regulations as well as achieving the internal noise criteria outlined in BS8233:2014.

It should be noted that the above calculations do not account for flanking or other on-site weaknesses. Soundtesting Ltd has previously carried out sound insulation tests on beam and block floors. The main issues being the minimal mass that a beam and block floor offers as well as the fact that there are often gaps within the flooring in between the blocks. There are often issues with flanking due to continuous block walls supporting the beam and block floor system which also needs to be considered. The INSUL modelling software does not account for flanking or the weaknesses within the beam and block floor. The model has been based on a lightweight concrete floor with minimal mass. The recommended floor detail outlined in section 11 considers all of the above weaknesses.

8.1.3 Further Analysis of 63Hz and 125Hz

The criteria outlined by the local authority has requested further analysis of the 63Hz and 125Hz octave bands due to potential music within the ground floor bar/restaurant.

"In order to control music noise, music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB (L_{eq}), respectively."

Given that the proposed usage of the ground floor has been changed to a restaurant only without any amplified music, the Local Authority criteria relating to low frequency noise may not be relevant; however, the table below shows the expected sound level in both the 63Hz and 125Hz octave bands.

Table 13: Analysis of 63Hz and 125Hz

Frequency	**63Hz**	**125Hz**
Criteria within first floor residential (**dB**)	47	41
Estimated within first floor residential (**dB**)	11	10

The table above indicates that the resultant sound level in both the 63Hz and 125Hz octave bands from noise generated within the ground floor restaurant is within the exceedance levels stated by the local authority.

9 BS4142:2014 Assessment of Noise from the Mechanical Plant

9.1 Background L_{A90} Measurement Analysis in Accordance with BS4142:2014 + A1:2019

Due to the proposed usage of the ground floor area, it is likely that mechanical plant will be installed to the rear of the development. Soundtesting has not been provided any further information regarding the location or specification of any proposed mechanical plant. The background measurements at monitoring position 2 will be analysed during the proposed operational hours of the ground floor restaurant, and exceedance levels for any mechanical plant will be provided.

9.1.1 Specific Sound Level of Mechanical Plant

At the time of writing this report, Soundtesting Ltd is unaware of any plans to install mechanical plant. Given the intended usage of the ground floor, it is likely that mechanical plant will be installed to either the rear or roof area. For the purpose of this assessment, exceedance levels at the nearest receptor will be provided and if further information is provided regarding plant type, location and proposed usage, then a full assessment could be provided.

9.2 Subjective Assessment

BS 4142:2014 states that where appropriate a rating penalty should be established for a sound on a subjective assessment of its characteristics and to correct the Specific Sound Level if a tone, impulse or other characteristics occur.

BS4142:2014 says of Impulsivity:

"A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible."

BS4142:2014 says of Intermittency:

"When the specific sound has identifiable on/off conditions, the specific sound level should be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

BS4142 says of tonality:

"… a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible and 6dB where it is highly perceptible."

Due to insufficient information regarding the mechanical plant type, location and usage, Soundtesting Ltd are unable to determine whether the plant could be considered impulsive or intermittent. In the consultant's opinion, most modern condenser units are designed not to be tonal.

9.3 Numerical Assessment

9.3.1 Assessment of Mechanical Plant

At the time of writing this report, Soundtesting Ltd is unaware of any proposed mechanical plant. Given the proposed usage of the ground floor, it is likely that some form of mechanical plant will be required. It is assumed that if plant is to be installed, it will be installed to the rear or roof of the development; therefore, the exceedance levels will be based on the background levels measured at monitoring position 2.

The table below outlines the exceedance levels for any mechanical plant at the nearest receptor, should it be installed. If mechanical plant is chosen that exceeds the levels detailed below, an acoustic enclosure providing enough reduction to meet the figures below should be installed. The exceedance levels shown below.

Table 14: Exceedance Levels for Mechanical Plant

Monitoring Position	$L_{A90,15minute}$ dB(A)	Exceedance Level at Nearest Receptor dB(A)
2	32	**22**

It should be noted that this assessment is based on mechanical plant operating during the proposed operational hours only. This does not account for plant such as freezers that may be required to run throughout the night-time period. Should further information be provided to Soundtesting Ltd regarding the proposed mechanical plant usage, further assessment could be provided.

10 Noise Breakout Assessment of Ground Floor Restaurant

10.1 Composite Sound Reduction Index of the Front Façade

Soundtesting Ltd are currently informed that the frontage of the ground floor restaurant is proposed to be triple glazed bifold doors in between the existing masonry pillars.

In order to demonstrate the performance of the proposed façade, this has been modelled in INSUL modelling software.

The following table shows the composite sound reduction index of each element. The triple glazed area is assumed to be 6mm glass/ 12mm void/ 4mm glass/ 12mm void/ 4mm glass.

Table 15: Composite Sound Reduction Index of Walls and Roof

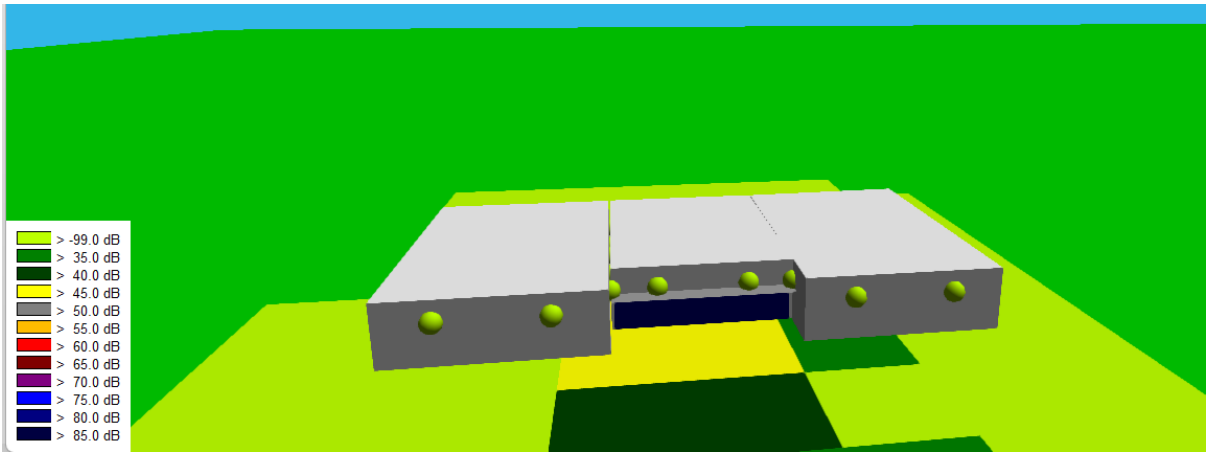
	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1K	2K	4k
200mm Brick Wall	36	35	39	47	55	61	65
6mm glass/ 12mm void/ 4mm glass/ 12mm void/ 4mm glass	24	19	15	28	41	41	47

A composite calculation of the façades acoustic performance has been undertaken in order to assess the total noise transfer through the whole element.

10.2 CadnaA Noise Modelling Software

The composite calculation of the façade has been used to calibrate a noise model of the development site in CadnaA Noise Modelling Software.

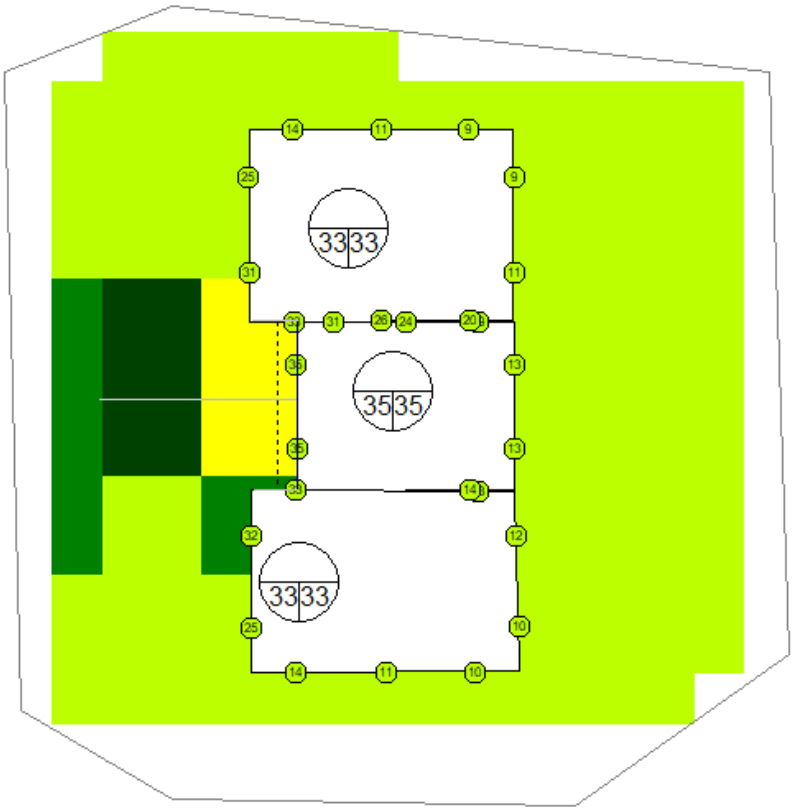
The figure below shows the 3D model of the development site and the nearest receptors identified on the first floor.



10.3 Resulting Restaurant Noise at Nearest Receptor Window

CadnaA Noise Modelling Software has been used to calculate the resultant noise at the nearest receptor.

The model below shows a façade calculation at the location of the first-floor residential window when the doors on the ground floor are closed.



The resulting operational noise at the nearest receptor window is presented below.

An assessment if the resulting sound levels at the receptor with the doors closed has been undertaken.

Table 16: Resulting $L_{Aeq,1hour}$ at 1m from Nearest Receptor Window	
Noise Level within Restaurant (dB(A))	80
Noise level at Nearest Receptor (Doors Closed) (dB(A))	35

10.4 Comparison Against Background

The below tables compare the estimated noise resulting from restaurant operations against the lowest measured $L_{A90,1hour}$ and $L_{A90,15minute}$ during the proposed operational hours of the restaurant with the doors closed.

All breakout levels have been modelled in CadnaA Noise Modelling software to account for reflections, attenuations and line of sight between the ground floor restaurant and first floor residential.

Table 17: Comparison of Breakout Noise Against Daytime Background Level	
Resultant Noise from Restaurant	35
Daytime $L_{A90,1hour}$	47
Difference	-12
Difference to -10dB EHO Criteria	-2

Table 18: Comparison of Breakout Noise Against Night-time Background Level	
Resultant Noise from Restaurant	35
Night-time $L_{A90,15minute}$	42
Difference	-7
Difference to -10dB EHO Criteria	+3

The above tables demonstrate that with the doors fully closed, the breakout noise is expected be 12dB under the lowest measured $L_{A90,1hour}$ during the daytime, and 7dB under the modal $L_{A90,15minute}$ during the night-time.

10.5 BS8233:2014 Type Assessment of Noise Breakout

In order to gain further understanding of the noise impact from the ground floor restaurant, the internal ambient noise levels have been calculated in accordance with BS8233:2014 based on the recommended glazing and ventilation specification outlined in section 11.

In the worst case, the resultant noise level at the nearest noise sensitive receptor is 35dB(A).

The table below demonstrates the estimated internal noise levels within the living rooms during the daytime and bedrooms during the night-time based on the recommended glazing and ventilation specification.

Table 19: BS8233 Assessment of Noise Breakout

Specification	Time period	Residential Windows Open/Closed	Measured External $L_{Aeq,T}$ (dB)	Estimated Internal $L_{Aeq,T}$ (dB)	BS8233:2014 Criteria $L_{Aeq,T}$ (dB)
Front Facade	Night-time (23:00 – 00:00)	Closed	35	0	30
		Open	35	20	30
	Daytime (07:00 – 23:00)	Closed	35	0	35
		Open	35	20	35

The table above demonstrates that with residential windows open and closed, the noise impact from the breakout noise of the ground floor restaurant is expected to be within the recommended internal noise levels outlined in BS8233:2014.

It should be noted that NOTE 5 in section 7.7.2 of BS8233:2014 states “if relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.”

The glazing and ventilation specification outlined in section 11 has been designed in order to offer appropriate alternative ventilation to opening windows and therefore the above figures could be deemed acceptable.

11 Recommendations

The estimated internal noise levels attributed by the external noise sources have been assessed over an average of $L_{Aeq,T}$ from the daytime and night-time survey periods and L_{AFmax} values from the night time. This along with the results from building element evaluation provide the basis for the following recommendations.

11.1 Glazing Specification for all Bedrooms facing High Road

The glazing specification in bedrooms facing High Road should consist of at least 10mm glass / 20mm void / 8.8mm Pilkington Optiphon laminated glass double glazed unit; in well-sealed frames and without trickle vents.

11.2 Glazing Specification for all other Habitable Rooms facing High Road

The glazing specification in all other habitable rooms facing High Road should consist of at least 10mm glass / 12mm void / 6mm glass double glazed unit; in well-sealed frames and without trickle vents.

11.3 Glazing Specification for all other Habitable Rooms on other Facades

The glazing specification in all other habitable rooms on other facades should consist of at least 6mm glass / 12mm void / 4mm glass double glazed unit; in well-sealed frames and without trickle vents.

11.4 Ventilation Specification for all Bedrooms facing High Road

The ventilation can be a quality mechanical system such as MVHR/ MEV or a passive acoustic wall vent such as Greenwoods MA3051.

11.5 Ventilation Specification for all other Habitable Rooms

The ventilation can be a quality mechanical system such as MVHR/ MEV or a passive acoustic window vent such as Greenwoods EA5000 (with 2 acoustic sets).

11.5.1 Notes on Ventilation

NOTE 5 in section 7.7.2 of BS8233:2014 states "if relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level."

The above calculations and recommendations have shown that all dwellings are to be ventilated either with passive window/ wall vents or mechanically ventilated in order to meet the criteria outlined in BS8233:2014. Where mechanical ventilation is utilised, the system is to be designed by a suitably qualified engineer or M&E consultant. The system shall be designed so the sound levels from any external plant or inlet/outlets do not exceed the background noise level at any noise receptor, i.e. outside a neighbouring window. This may require further assessment once the type and location of system has been specified.

The glazing and ventilation suggestions have been calculated assuming the windows are tightly closed. However, it must be noted that windows are suggested to be openable to provide rapid or purge ventilation or means of escape.

Although the calculations demonstrate that the wall vent can be installed on any façade; it is recommended where possible to avoid installing ventilation systems on the façade that face the High Road. Where possible, installing ventilation on quieter facades would be beneficial to the overall acoustic performance.

11.6 External Balconies

The architect's drawings show balconies on both the front and rear facades of the proposed development. In the worst case, balconies at the front overlooking High Road are expected to experience a daytime $L_{Aeq,16hour}$ of 67.8dB which is considerably higher than the upper guideline value of 55dB. All balconies at the rear are expected to experience an $L_{Aeq,16hour}$ within the guideline values with the worst-case measurement being 50.6dB.

Section 7.7.3.2 of BS8233:2014 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 $L_{Aeq,T}$, 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.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate.

Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.

As amenity space, such as gardens and patios cannot be provided on this development, balconies and terraces are an acceptable way of providing outdoor amenity space for residents. Although the measured levels exceed the guideline values at the front façade, it may be reasonable to suggest that providing any form of amenity to these apartments is more desirable than nothing at all.

11.7 Recommendations to Sound Insulation Between Ground and First Floor

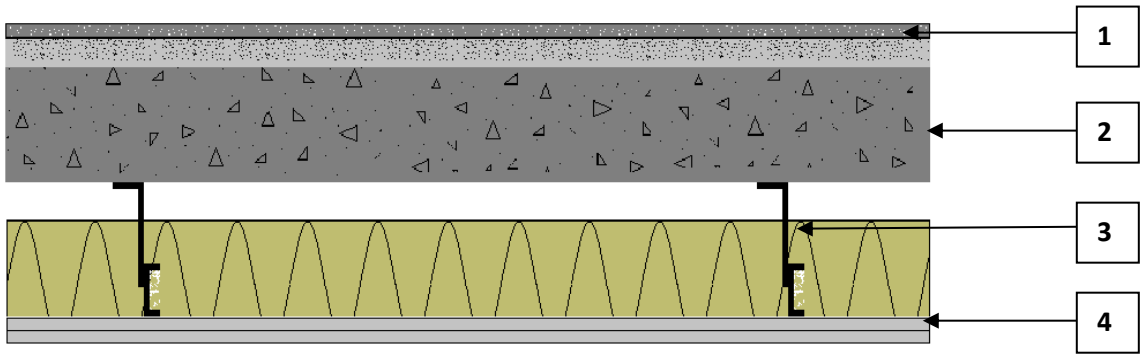
In terms of sound insulation between the proposed ground floor restaurant and first floor residential, the above assessment has shown that improvements to the existing ceiling need to be made. It is recommended to:

- Make good the existing floor/ceiling. Any penetrations should be well sealed.
- Install 20mm screed board above the existing screed to add mass.
- Install an independent metal frame ceiling on acoustic hangers with a minimum cavity of 200mm.
- Install 100mm of mineral wool insulation (45kg/m^3) within the void.
- Fix 2x15mm SoundBloc plasterboard to the underside of the MF Ceiling.
- All perimeters should be well sealed with acoustic mastic.
- The independent ceiling should completely enclose any steel beams.

It should be noted that the sound insulation assessment and NR Curve analysis does not account for any flanking or other on-site acoustic weaknesses. During site attendance it was noted that the block and beam floor is supported by a continuous masonry wall which is potentially a flanking risk. In order to mitigate the risk of flanking sound transmission, it is recommended to install an independent wall lining on all external walls on either the ground or first floor. It is recommended to:

- Install an independent timber stud with a minimum gap of 20mm from the existing wall.
- Install mineral wool insulation (45kg/m^3) within the void.
- Fix 2 x 15mm SoundBloc Plasterboard to the independent stud.
- If installing on the ground floor, ensure the MF ceiling is constructed first, fitted tightly to the existing external wall and well-sealed with acoustic mastic.

The detail below shows the recommended floor construction.



1. Proposed 20mm screed board on top of existing 30mm screed.
2. Existing 100mm block and beam floor.
3. Proposed MF Ceiling with 100mm mineral wool insulation (45kg/m^3).
4. 2x15mm SoundBloc plasterboard to the underside of the MF Ceiling.

11.8 Calculation Methodology

The BRE Building Envelope Insulation calculator has been used for the noise break in calculations for the BS8233:2014 assessment which is based on the rigorous calculation method of BS8233:2014 and BS EN 12354-3.

To calculate the glazing recommendations, the values have had a façade correction of 3dB applied so that it is comparable to a free-field sound pressure level.

The calculations are based on one vent per room. If more ventilation is required then further calculations will need be carried out.

All room dimensions used in calculations are based on drawings provided by the architect.

The calculations assume the external walls to be brick and block as stated in BS8233:2014.

The calculations assume each room has a reverberation time of 0.5 seconds.

The predictions also have been calculated assuming all windows are tightly closed.

11.9 Building Elements

The following table shows the expected performance of the recommended building elements.

Table 20: Table showing recommended building elements

Element	Description*	$R_w/D_{n,e,w}$ C; C_{tr} (dB)	Octave Centre Frequencies (Hz) SRI / $D_{n,e}$ (dB)					
			125	250	500	1k	2k	4k
Glazing	10mm/20mm/8.8mm Pilkington Optiphon laminated glass	46 (-2;-6)	28	36	43	47	49	58
	10mm/12mm/6mm (BS6262)	35 (-2;-5)	25	29	34	39	37	46
	6mm/12mm/4mm (BS6262)	32 (-2;-4)	23	21	24	39	36	40
Ventilation	Greenwoods MA3051	55 (-3)	47	46	49	56	66	69
	Greenwoods EA5000 (2 Acoustic Sets)	42 (-4)	40	38	32	47	53	48

**The selected units or products described have been used as a guide to form part of the specification. Other similar units or products can be used provided they can achieve the given minimum acoustic performance.*

11.10 Example of Estimated Performance

The following table compares the estimated performance values with the measured values.

Table 21: Estimated performance					
Specification	Time period	Measured External		Estimated Internal	
		Average $L_{Aeq,T}$ (dB)	L_{AFmax} (dB)	$L_{Aeq,T}$ (dB)	L_{AFmax} (dB)
Front Facade	Night-time (23:00 – 07:00)	60.7	86.1	26.0	43.3
	Daytime (07:00 – 23:00)	67.8	-	29.9	-
Rear Facade	Night-time (23:00 – 07:00)	40.9	70.3	9.5	42.8
	Daytime (07:00 – 23:00)	50.6	-	19.5	-
Noise Breakout from Restaurant	Night-time (23:00-00:00) (Residential Windows Closed)	35	-	0	-
	Night-time (23:00-00:00) (Residential Windows Open)	35	-	20	-
	Daytime (07:00-23:00) (Residential Windows Closed)	35	-	0	-
	Daytime (07:00-23:00) (Residential Windows Open)	35	-	20	-
Assessment to Adjacent Flats					
Noise Breakout from Restaurant	Operational Hours (07:00 – 00:00) (Residential Windows Open)	33	-	18	-

The above table demonstrates that the internal ambient noise levels outlined in BS8233:2014 can be achieved in all habitable rooms based on the existing noise climate. It can also be seen that the internal noise levels can be achieved based on the noise impact from the proposed ground floor restaurant, should the recommended glazing and ventilation specification be installed.

12 Conclusion

This report demonstrates that by following our recommendations noise levels described in BS8233:2014 and WHO Guidelines for Community Noise can be achieved for internal noise levels in all habitable rooms and external balconies to the rear.

The internal noise levels are expected to meet the guidance levels during periods when the ground floor restaurant is in operation.

The external balconies at the front overlooking High Road are expected to exceed the noise levels described in WHO Guidelines for Community Noise.

The sound insulation assessment between the proposed ground floor restaurant has shown that the internal ambient noise levels outlined in BS8233:2014 can be achieved in all areas should the recommended floor construction be installed. The recommended floor construction is also expected to achieve 10dB above the building regulations as requested by the EHO.

The noise breakout assessment of the ground floor restaurant has shown that the resultant noise level at the nearest receptor is expected to be lower than measured background levels, indicating a likely low impact.

13 References

National Planning Policy Framework (NPPF)

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

World Health Organisation Guidelines for Community Noise

BS 7445-1:2003 Description and measurement of environmental noise – Part 1: Guide to quantities and procedures

BS 6262-2:2005 Glazing in buildings – Part 2: Code of practice for energy, light and sound

Health Technical Memorandum 08-01: Acoustics

INSUL Modelling Software by Marshall Day Acoustics

www.google.co.uk/maps

13.1 Drawing References

1634-300

1634-301 (proposed 1st)

1634-302 (proposed 2nd)

1634-303-A (proposed elevations)

1634-304 (existing elevations)

1634-306-A (Existing Plans)

1634-L1 (Existing Location Plan)

Appendix

Figure 1: Picture Showing Monitoring Position 1

Figure 2: Picture Showing Monitoring Position 2

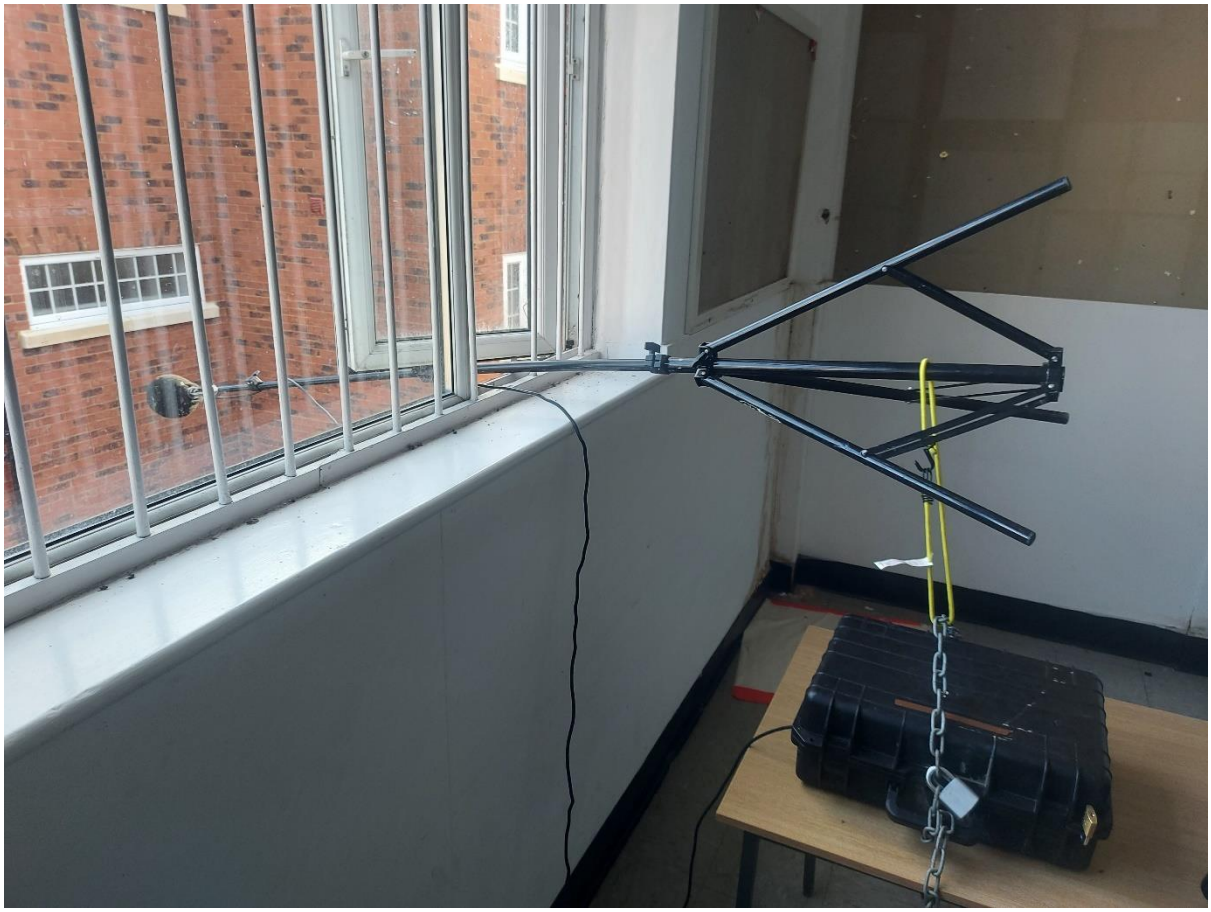
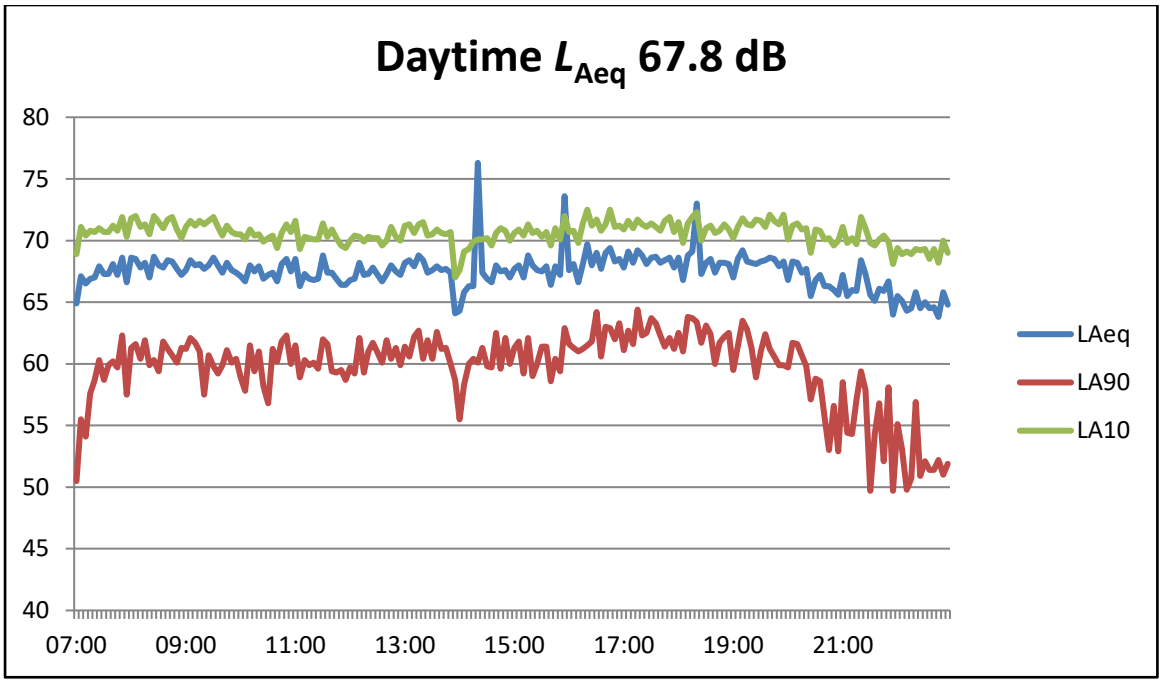


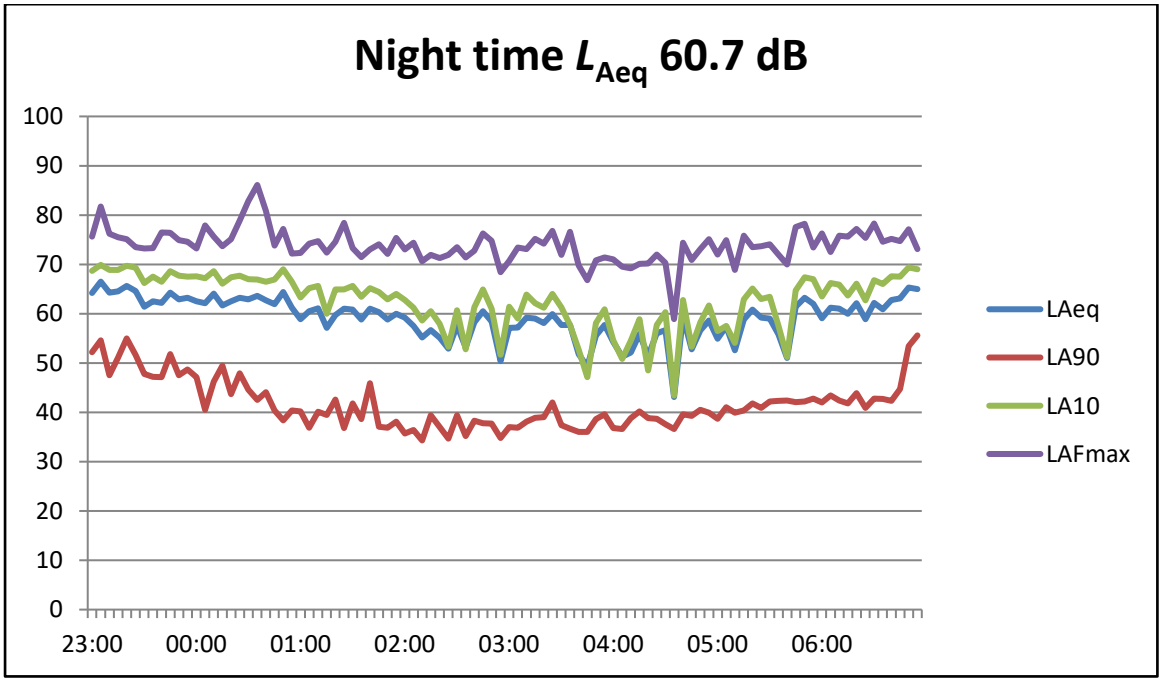
Figure 3: Picture Showing Existing Separating Floor Construction

Measurement Results

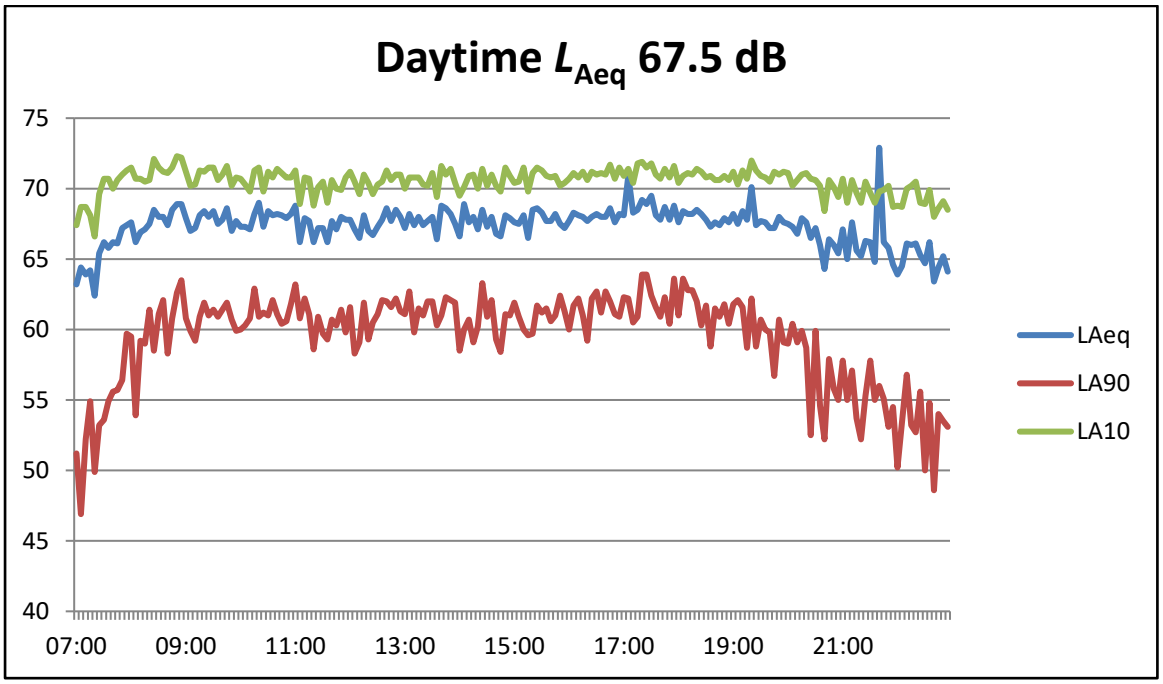
Monitoring Position 1

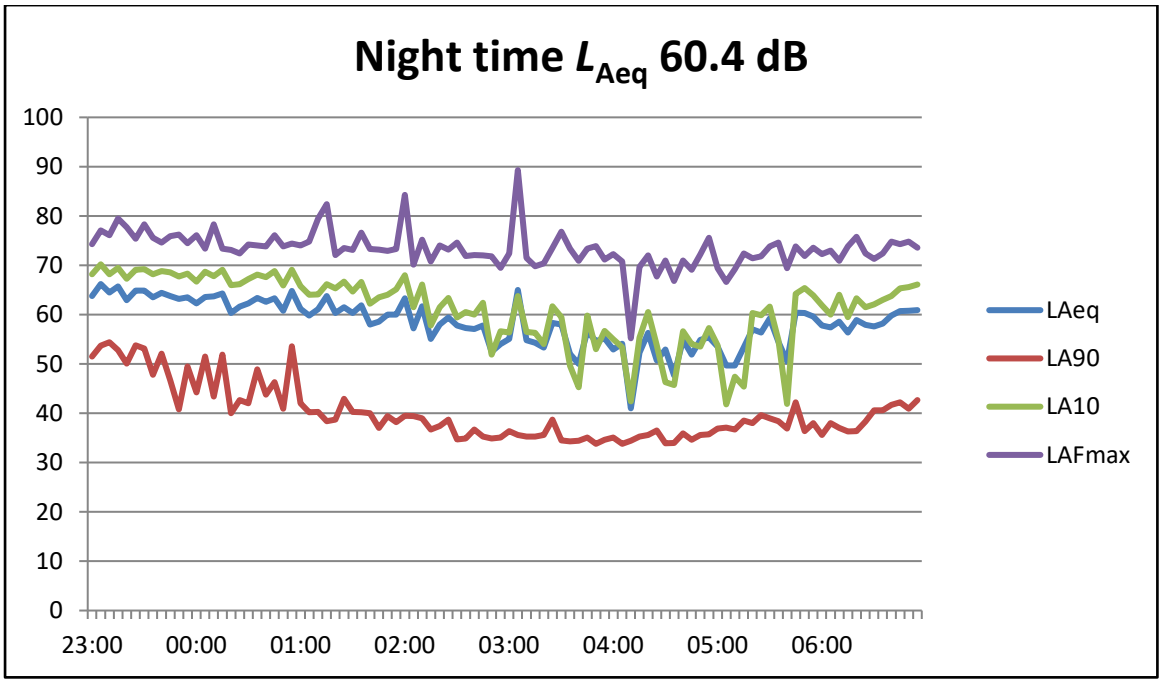
Friday



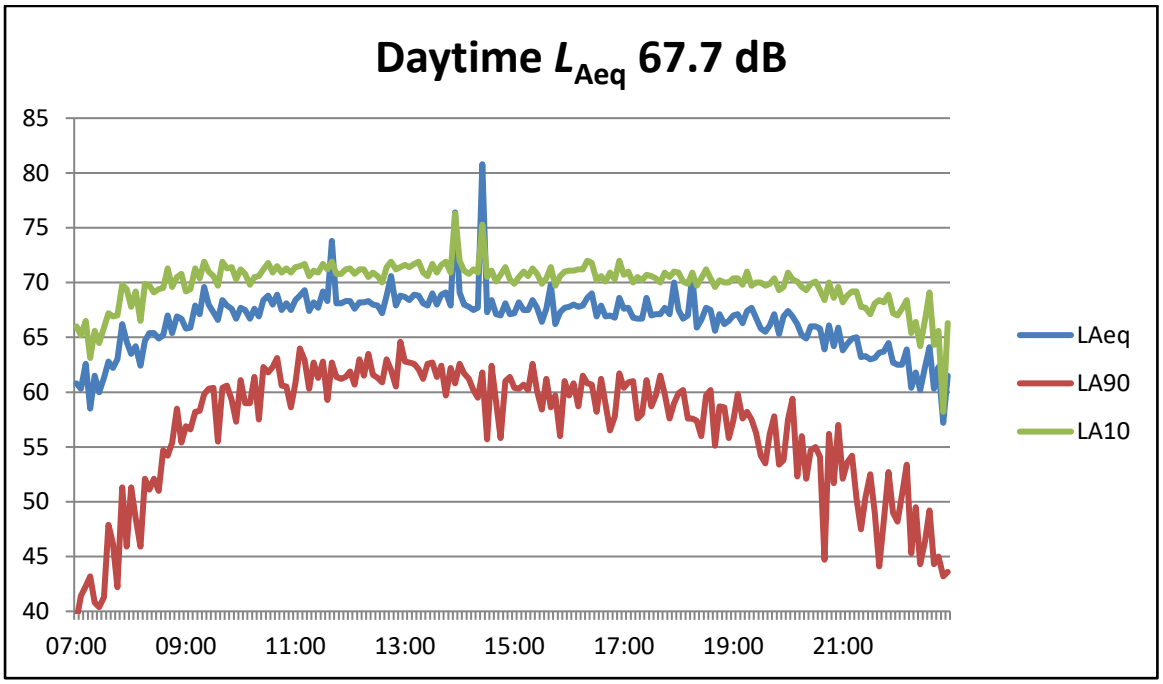


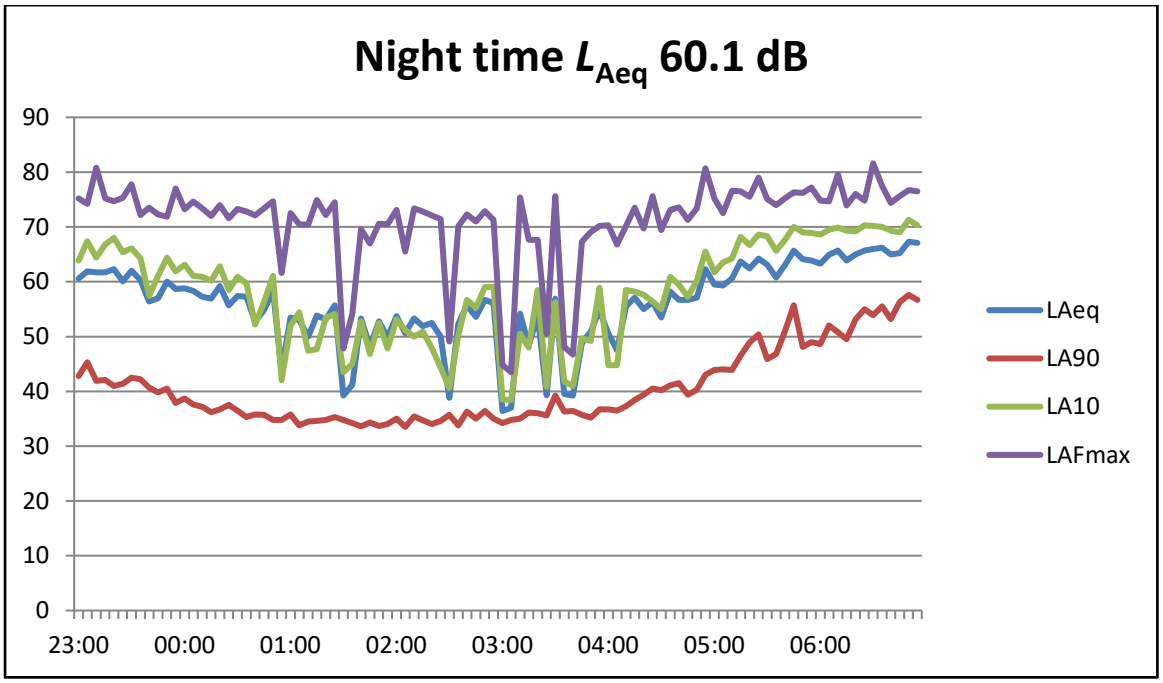
Saturday


Daytime L_{Aeq} 67.5 dB
75
70
65
60
55
50
45
40
07:00
09:00
11:00
13:00
15:00
17:00
19:00
21:00
LAeq
LA90
LA10


Night time L_{Aeq} 60.4 dB
100
90
80
70
60
50
40
30
20
10
0
23:00
00:00
01:00
02:00
03:00
04:00
05:00
06:00
LAeq
LA90
LA10
LAFmax

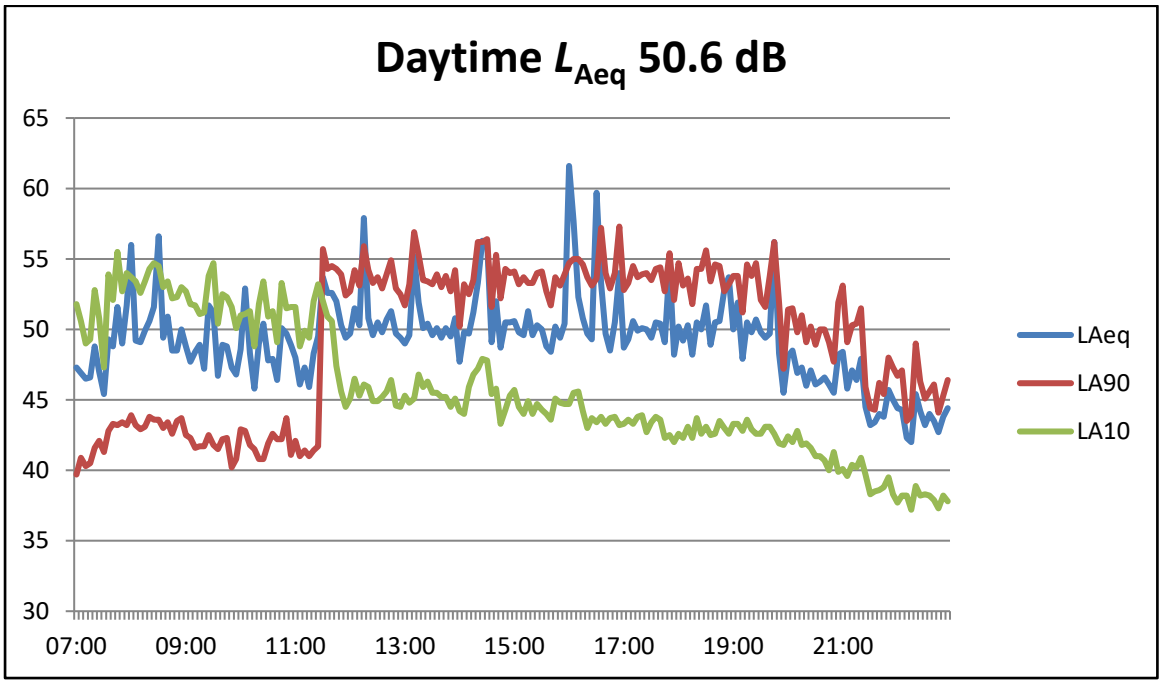
Sunday

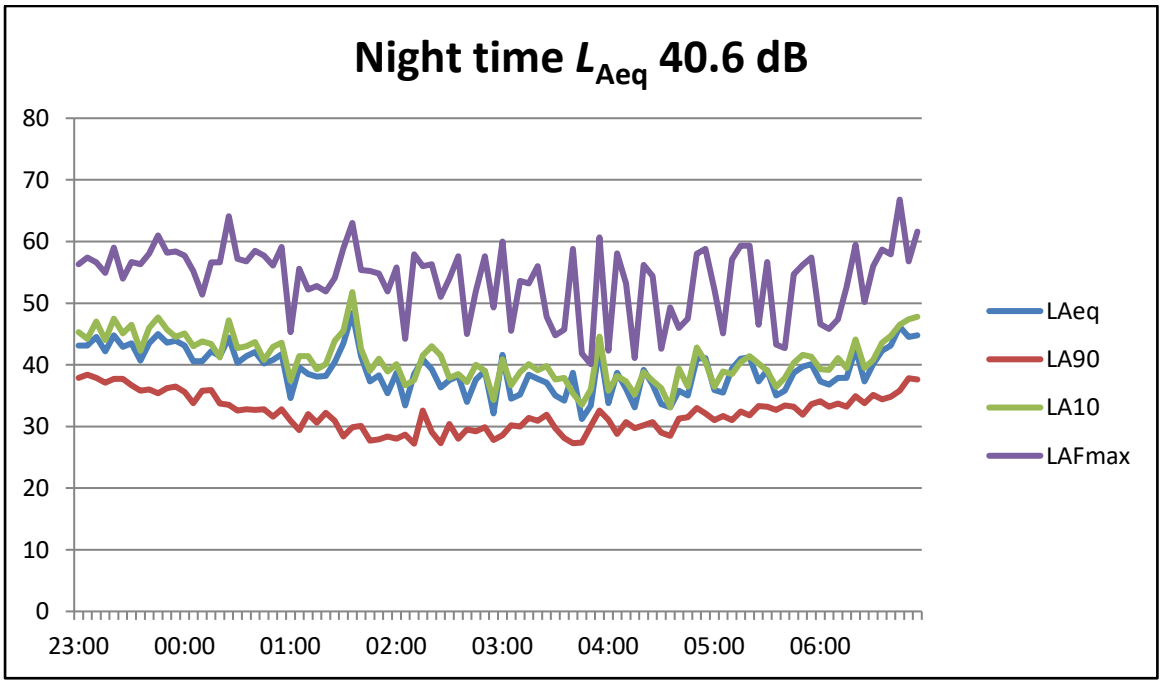

Daytime L_{Aeq} 67.7 dB
85
80
75
70
65
60
55
50
45
40
07:00
09:00
11:00
13:00
15:00
17:00
19:00
21:00
LAeq
LA90
LA10


Night time L_{Aeq} 60.1 dB
90
80
70
60
50
40
30
20
10
0
23:00
00:00
01:00
02:00
03:00
04:00
05:00
06:00
LAeq
LA90
LA10
LAFmax

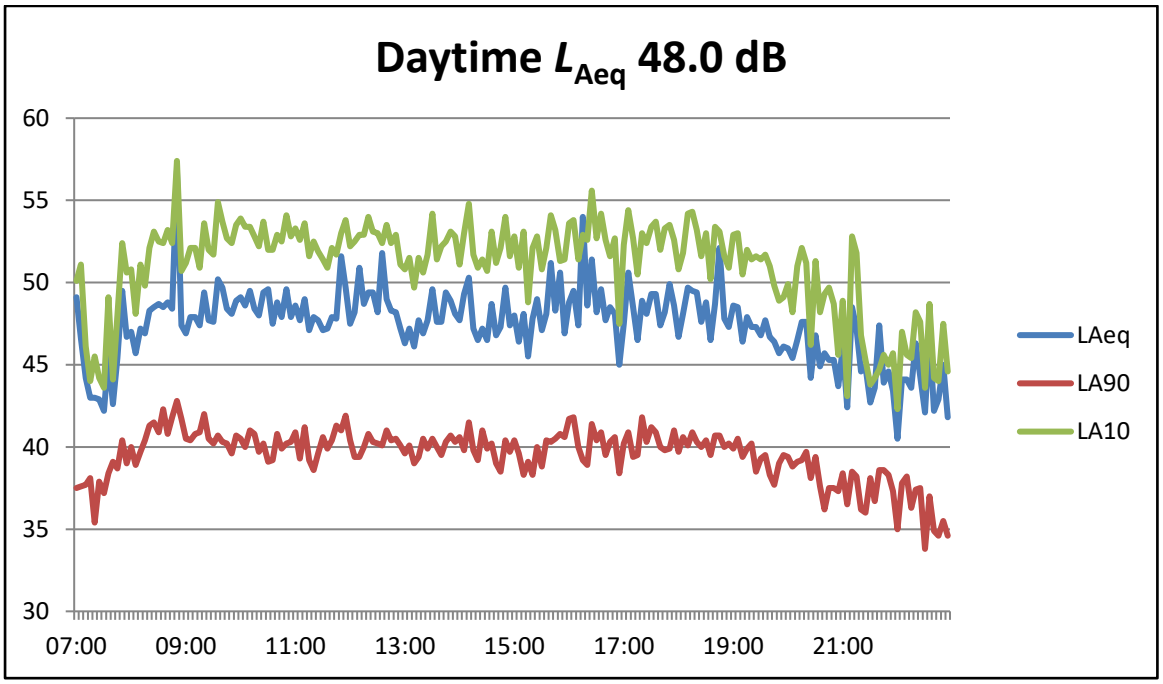
Monitoring Position 2

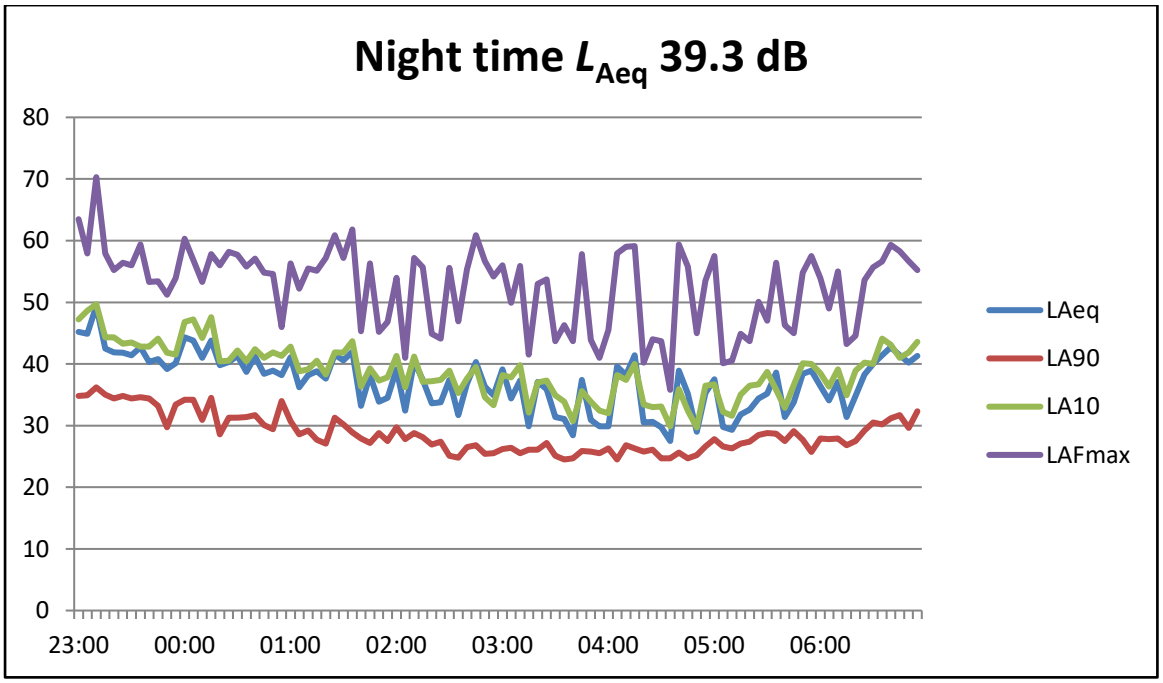
Friday



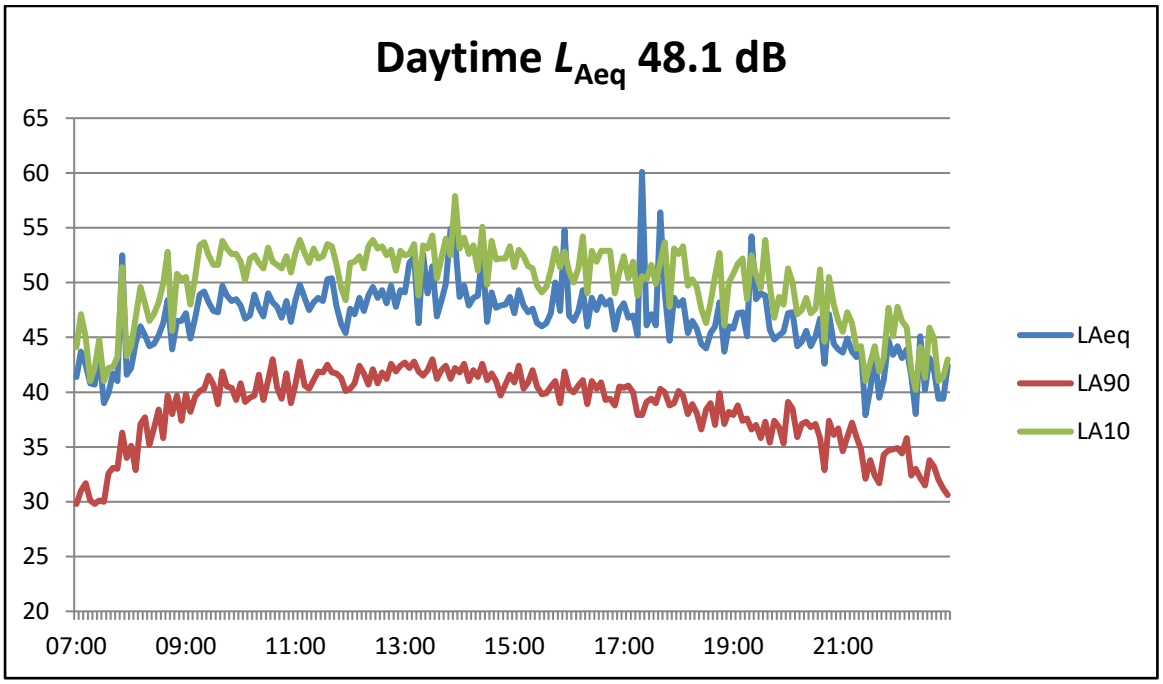


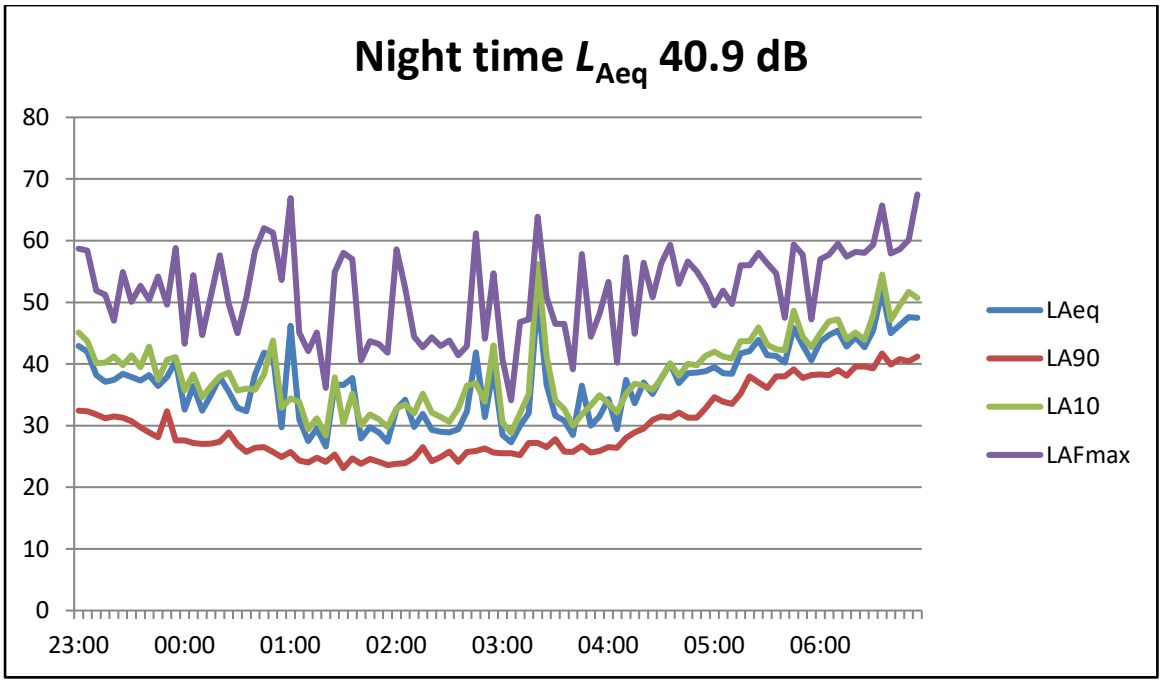
Saturday


Daytime L_{Aeq} 48.0 dB
60
55
50
45
40
35
30
07:00
09:00
11:00
13:00
15:00
17:00
19:00
21:00
LAeq
LA90
LA10

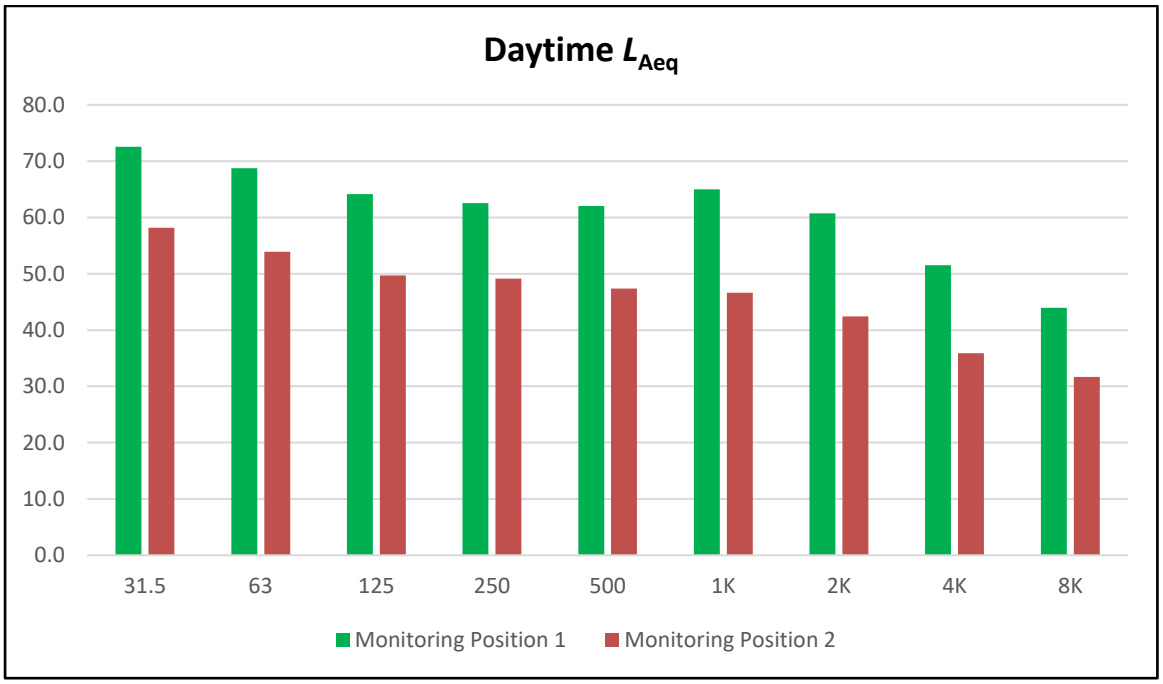

Night time L_{Aeq} 39.3 dB
80
70
60
50
40
30
20
10
0
23:00
00:00
01:00
02:00
03:00
04:00
05:00
06:00
LAeq
LA90
LA10
LAFmax

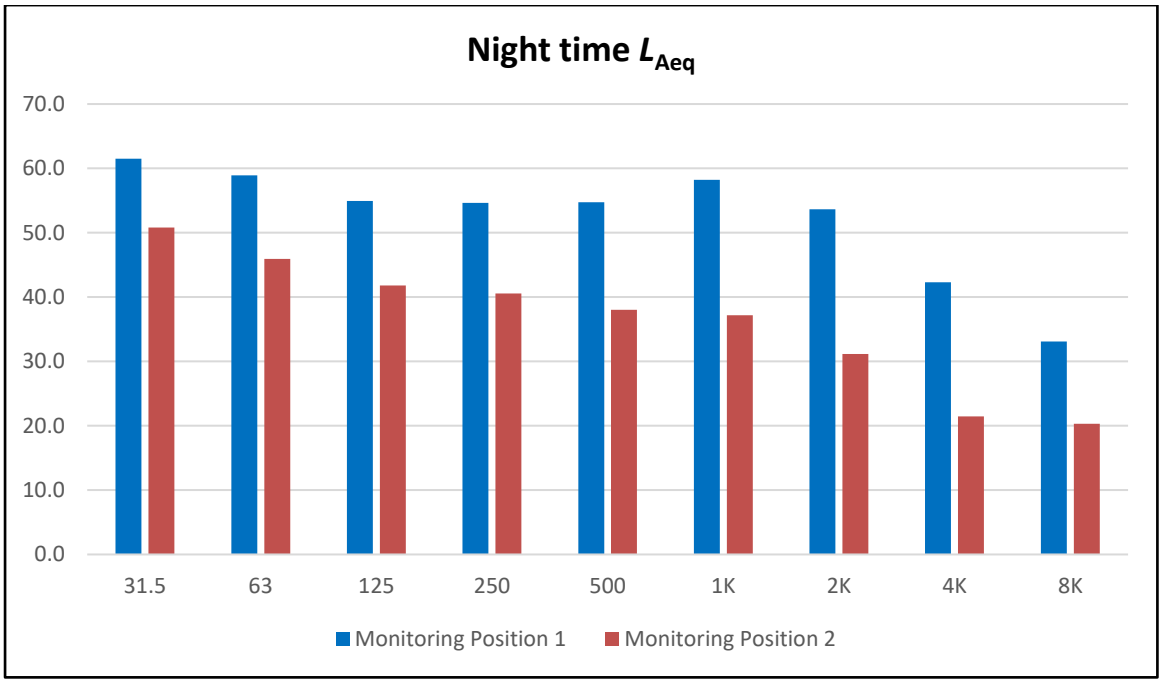
Sunday

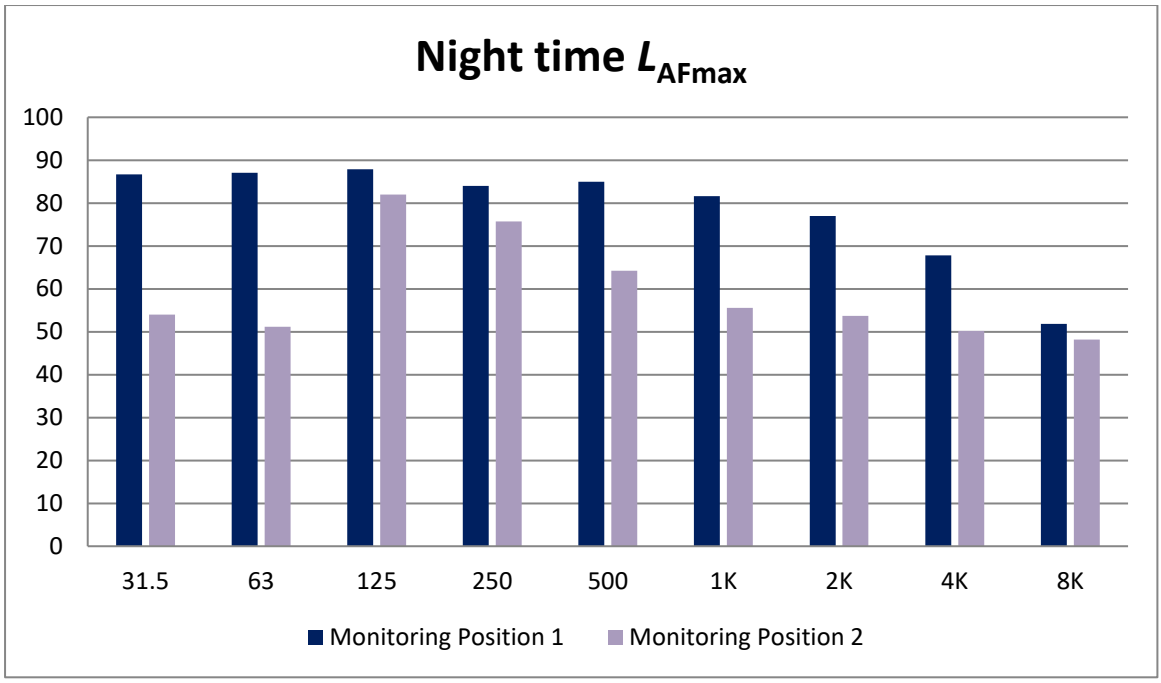

Daytime L_{Aeq} 48.1 dB
65
60
55
50
45
40
35
30
25
20
07:00
09:00
11:00
13:00
15:00
17:00
19:00
21:00
LAeq
LA90
LA10


Night time L_{Aeq} 40.9 dB
80
70
60
50
40
30
20
10
0
23:00
00:00
01:00
02:00
03:00
04:00
05:00
06:00
LAeq
LA90
LA10
LAFmax

Un-weighted 1:1 Octave Results






Night time L_{AFmax}
100
90
80
70
60
50
40
30
20
10
0
31.5
63
125
250
500
1K
2K
4K
8K
Monitoring Position 1
Monitoring Position 2

Model Used for Sound Insulation Prediction of Triple Glazed Windows

Sound Insulation Prediction (v9.0.22)

INSUL

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within Rw ±3 dB
- Key No. 2516
Job Name:
Job No.: Initials:Jack Holmes
Date:09/11/2021
File Name:

Notes:

Rw 31 dB
C -2 dB
Ctr -7 dB

Mass-air-mass resonant frequency = =188 Hz , 351 Hz
Panel Size = 2.0 m x 1.5 m
Partition surface mass = 35.5 kg/m²

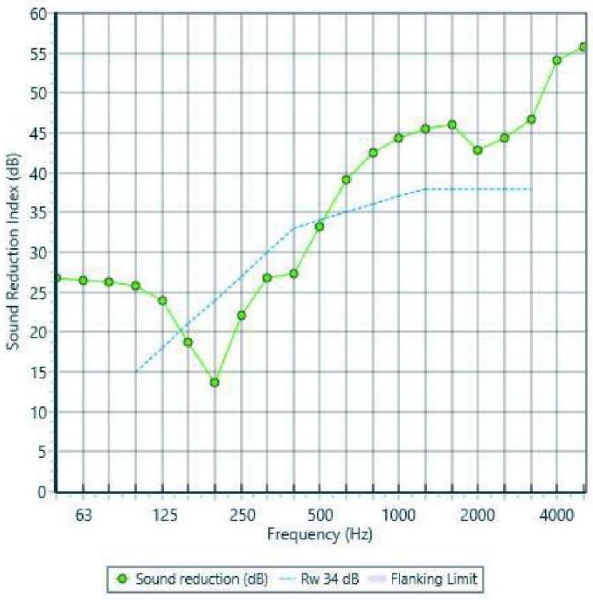
System description

Pane 1 : 1 x 6 mm Glass

air: 12 mm
Pane 2 : 1 x 4 mm Glass

air: 12 mm
Pane 3 : 1 x 4 mm Glass

freq.(Hz)	R(dB)	R(dB)
50	27	
63	26	27
80	26	
100	26	
125	24	22
160	19	
200	14	
250	22	18
315	27	
400	27	
500	33	31
630	39	
800	42	
1000	44	44
1250	45	
1600	46	
2000	43	44
2500	44	
3150	47	
4000	54	50
5000	56	

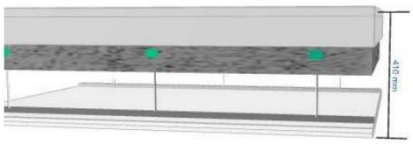


INSUL Model of Proposed Floor

Sound Insulation Prediction (v9.0.22)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within Rw ±3 dB
- Key No. 2516
Job Name:
Job No.: Initials:Jack Holmes
Date:08/11/2021
File Name:

Notes:



Rw 73 dB
C -1 dB
Ctr -3 dB

Mass-air-mass resonant frequency = =21 Hz
Panel Size = 2.7 m x 4.0 m
Partition surface mass = 257 kg/m²

System description

Panel 1 : 1 x 30 mm Lightweight concrete + 1 x 100 mm Concrete Block

Frame: AMC Akustik+Sylomer 1 hangers (50 mm x 50 mm), Stud spacing 600 mm ; Cavity Width 250 mm , 1 x Rockwool (48kg/m3) Thickness 100 mm ...
Panel 2 : 2 x 15 mm Gyproc SoundBloc 15mm

freq.(Hz)	R(dB)	R(dB)
50	49	
63	54	52
80	58	
100	61	
125	63	63
160	65	
200	67	
250	68	67
315	66	
400	64	
500	66	66
630	69	
800	71	
1000	74	73
1250	76	
1600	78	
2000	77	77
2500	78	
3150	90	
4000	94	93
5000	98