

Environmental Noise Report

56 Norfolk Street
Baltic Triangle
Liverpool
Merseyside
L1 0BE

Date of Report: Tuesday 14th March 2017

Reference: 9372E Rev 2

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North Office

44 Canal Street
Bootle
Liverpool
L20 8QU

t 0151 933 6186

f 0151 922 7742

e info@soundtesting.co.uk

Midlands Office

4a Swan Park Business Centre
Kettlebrook
Tamworth
Staffordshire
B77 1AG

t 01827 767 227

e midlands@soundtesting.co.uk

South Office

117 Knyvett House
Watermans Business Park
The Causeway
Staines-upon-Thames
TW18 3BA

t 020 3286 2019

e south@soundtesting.co.uk



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1 General Information

1.1 Site Address

56 Norfolk Street
Liverpool
L1 0BE


1.2 Client Instructing Survey

Borden Properties Limited
56 Norfolk Street
Liverpool
L1 0BE

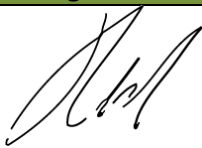
1.3 Date of Noise Survey

Friday 3rd March to Tuesday 7th March 2017

1.4 Report Author

	Name	Position	Signature	Date
Prepared by	Mr B Bielicki BSc AMIOA	Acoustic Consultant		14/03/2017
For and on behalf of: Soundtesting.co.uk Ltd				

1.5 Report Checked

	Name	Position	Signature	Date
Report Checked	Mr J Howell BSc (Hons) Acoustics MIOA	Acoustic Consultant		14/03/2017
For and on behalf of: Soundtesting.co.uk Ltd				



2 Introduction

Borden Properties Limited has instructed Soundtesting.co.uk Ltd to undertake an environmental noise survey in order to assess the impact of sound from the local environment on future residents of the proposed development.

The proposed development site is an existing two storey building that currently comprises of a garage on the ground floor. It is proposed to demolish the existing building to make way for a commercial and residential development of 171 apartments.

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). The measurements were carried out during week days and over a weekend (23:00 Friday – 07:00 Tuesday).

This report will state the measured noise levels, and will refer to guidance contained within BS8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' and WHO 'Guidelines for Community Noise' for recommended internal noise levels within living spaces.

The sound insulation between the ground floor commercial and first floor residential will be assessed to provide an estimated performance of separating structure, which is an enhancement above Building Regulations Document E 2003, by using guidance criteria in BS8233:2014 Annex H.

3 Assumptions & Limitations

- 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 façade.
- 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 drawings and information supplied by the architect are up to date and correct.
- d. This report does not consider sound transmission between adjacent residential dwellings within the development, the report only deals with the sound insulation performance between commercial and residential.
- e. It was not possible to measure sound levels at elevations higher than the first floor level. It is possible the sound levels may differ at higher elevations due to minimised screening from neighbouring buildings.
- f. It was also only possible to measure sound levels on one façade using a fixed microphone position for security reasons. This position subjectively is similar to the other building facades.



- g. The separating floor element modelled in Insul Acoustic Prediction Software has a correction of 10 dB applied to the modelled performance values to account for real life situations where on-site conditions such as flanking may occur.



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 Noise Policy Statement for England (NPSE)

The NPSE provides clarification to the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The principal aims of the NPSE are stated as follows in Section 1.7 of the document:

Noise Policy Aims

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

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life*

4.2 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) set out the Government's planning policies for England and how they are expected to be applied. It provides a framework within which local authorities are to prepare local plans and use their planning powers to minimise the adverse impact of noise. It contains the following in relation to noise impacts found in Section 11, paragraph 123:

Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*



4.3 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, gives guidance on internal noise levels within dwellings, flats and rooms in residential use when unoccupied. The following criteria are for Living and Dining Rooms for daytime use and Bedrooms for night time.

Table 1: BS 8233:2014 Recommended Internal Noise Levels			
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 $L_{Aeq,8hour}$

In addition, BS 8233 suggests, “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”.

4.4 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 2: A Summary of the WHO 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.



4.5 Building Regulations Approved Document E - Section 0: Performance

The acoustic requirements of residential buildings are normally given in national building regulations and associated guidance documents. For England, acoustic performance requirements are given in the Building Regulations Approved Document E 2003.

Approved Document E provides guidance on how the Regulations may be satisfied and sets acoustic performance standards. The required levels of insulation for airborne and impact sound are summarised in the following tables.

Table 3: Approved Document E – Sound Insulation Requirements		
Table 0.1a: Dwelling-houses and flats - performance standards for separating walls, separating floors, and stairs that have a separating function.		
	Airborne sound insulation sound insulation $D_{nT,w} + C_{tr}$ dB (Minimum values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum values)
Purpose built dwelling-houses and flats		
Walls	45	-
Floors and stairs	45	62
Dwelling-houses and flats formed by material change of use		
Walls	43	-
Floors and stairs	43	64
Table 0.1b: Rooms for residential purposes - performance standards for separating walls, separating floors, and stairs that have a separating function.		
	Airborne sound insulation sound insulation $D_{nT,w} + C_{tr}$ dB (Minimum values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum values)
Purpose built rooms for residential purposes		
Walls	43	-
Floors and stairs	45	62
Rooms for residential purposes formed by material change of use		
Walls	43	-
Floors and stairs	43	64

For Commercial Separation:

“0.8 The performance standards set out in Tables 1a and 1b are appropriate for walls floors and stairs that separate spaces used for normal domestic purposes. A higher standard of sound insulation may be required between spaces used for normal domestic purposes and communal and non-domestic purposes. In these situations the appropriate level of sound insulation will depend on the noise generated in the communal or non-domestic space. Specialist advice may be needed to establish if a higher standard of sound insulation is required and, if so, to determine the appropriate levels.”



4.6 BS8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' – Annex H

The following table demonstrates design criteria adopted by hotel groups for airborne sound insulation between spaces.

Table 4: BS8233 Airborne Sound Insulation	
Table H.1 Airborne sound insulation	
Room areas	Performance
Bedroom – Bedroom	Walls: 43 dB $D_{nT,w} + C_{tr}$ Floors: 45 dB $D_{nT,w} + C_{tr}$
Bedroom – Bathroom (different rooms)	
Bathroom – Bathroom	
Bedroom – Restaurant/Bar	60 dB $D_{nT,w}$
Bedroom – Kitchen	60 dB $D_{nT,w}$
Bedroom – Other tenancies	65 dB $D_{nT,w}$
Bedroom – Corridor	Walls: 43 dB $D_{nT,w} + C_{tr}$
Bathroom – Corridor	45 dB $D_{nT,w}$
Bedroom – Laundry	43 dB $D_{nT,w} + C_{tr}$
Bedroom – Plant room	60 dB $D_{nT,w}$
NOTE It might be important to take account of the purpose of the room.	

4.7 Local Authority Criteria

At the time of writing this report, the consultant is unaware of any Local Authority criteria.

4.8 Criteria Summary

All recommendations will be made in order to meet the criteria of BS8233:2014; with reference to WHO Community Noise Guidelines.

The sound insulation between the commercial and residential will be assessed to provide an estimated performance of the separating structures, with all recommendations made in order to meet the criteria of BS8233:2014, adopted by hotel groups, which is an enhancement on the criteria stated within Building Regulations Approved Document E.



5 Site Description

The proposed development at 56 Norfolk Street is an existing two storey building situated in the Baltic Triangle area within the city centre of Liverpool. The front façade of the building faces south-east onto Norfolk Street, which runs perpendicular to A5037, Jamaica Street and A561, St. James Street.

The rear façade of the building faces north-west on to Watkinson Street and the south-west boundary of the site shares a wall with the neighbouring property. The north-east façade overlooks a small car park at the rear of the neighbouring property at 54 St. James Street Conference and Business Centre, an eight-storey building containing rental office space and a café on the ground floor.

On the opposite side of St. James Street is St. Vincents Church and Chung Wah Supermarket with associated car park. There is also a bus stop on the road outside of the supermarket.

The surrounding area is mostly industrial with a number of residential developments. There are also several cafés, bars and music venues within a 250m radius of the site. The nearest being Kitchen Street, a music venue, approximately 150m north—west of the site. Kitchen Street has regular events and it is believed there were late night events occurring on the nights during the measurement period.

Directly opposite the front façade of the building on Norfolk Street is a large partly built residential development. It is our understanding that construction work at the development was on hold during the measurement period. Due to the building site, one side of the road was taken up by fencing which may have affected the flow of traffic, although Norfolk Street is a relatively quiet road, with minimal traffic.

There was only one window accessible for secure external sound level monitoring purposes, which was located on the first floor level on the Norfolk Street façade.

The ground floor of the building is currently a mechanics garage. Our understanding is that the garage is open Monday – Friday and was closed over the weekend.

During site attendance, subjectively the main source of noise was road traffic from the surrounding area.



6 Noise Measurement Procedure

6.1 Personnel Present

Ben Bielicki BSc AMIOA

6.2 Survey Equipment Used

Table 5: Survey Equipment Used			
Manufacturer	Model	Serial No.	Description
Rion	NL-52	1054205	Real Time Analyser Sound Level Meter
Brüel & Kjær	Type 4231	1897560	Acoustic Calibrator

6.3 Calibration

The sound level meter was 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 meter used during the survey is precision grade Class 1.

Calibration certificates are available on request.

6.4 Weather Conditions

During the measurement period the temperature averaged around 5 - 8°C, the sky was mostly cloudy with some broken sun. The wind speeds averaged approximately 2 - 5 m.s⁻¹ with occasional gusts which may have exceeded 5 m.s⁻¹, blowing in various directions. There was some light precipitation during the Friday night-time period, which may have also caused the road surfaces to become wet during some of the Saturday morning period. There was also some rainfall during most of the Sunday daytime period and part of the Monday night-time period.

6.5 External Ambient Sound Measurements

The sound level meter was set to measure L_{A90} , L_{A10} , L_{Aeq} and L_{AFmax} in 5 minute periods, as well as A-weighted 1:1 octave spectrum analysis, for the period between Friday 3rd and Tuesday 7th March.

Monitoring Position 1

A microphone was positioned at the first floor level overlooking Norfolk Street on the south-east façade. The microphone was set on a pole approximately 6m above the pavement surface and 1m from the building façade.



7 Results and Analysis

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

The following table presents the measured results from monitoring position 1.

Table 6: Measured Results of External Ambient Sound						
Day	Time Period	Time Base T (hours)	$L_{Aeq,T}$ (dB)	L_{AFmax} (dB)	L_{A90} (dB)	L_{A10} (dB)
Friday	Night-time	8	55.5	57.7 – 82.6	48.2	57.3
Saturday	Day-time	16	58.7	-	51.2	60.5
	Night-time	8	54.3	61.5 – 81.9	46.4	56.6
Sunday	Day-time	16	59.6	-	52.9	60.6
	Night-time	8	51.4	52.4 – 83.8	43.1	52.0
Monday	Day-time	16	60.1	-	49.8	60.9
	Night-time	8	51.6	54.8 – 84.5	42.2	53.1

Due to the garage being in operation on the Monday and the adverse weather conditions during some of the measurement period, the assessment will be based on the daytime and night-time measurements from the Saturday, when one can be certain that the adverse weather and noise from the garage will not have influenced the measurement results.

Night-time L_{AFmax} Analysis

WHO Community Noise Guidelines specifically states that “For a good sleep, it is believed that indoor sound pressure levels should not exceed 45 dB L_{AFmax} more than 10–15 times per night (Vallet & Vernet 1991).”

The L_{AFmax} measured during the Saturday night time period (23:00 - 07:00) has been analysed. It is noted that the maximum measured L_{AFmax} is 81.9 dB, which occurred at 04:00 during the Saturday night-time period. 80.0 L_{AFmax} dB is exceeded once during each of the Friday and Saturday night-time periods; twice on the Sunday, and three times during the Monday night-time period.

The WAV file recordings indicate that the majority of the L_{AFmax} events were from passing vehicles, apart from around 06:30 on the Monday and Tuesday mornings where the loudest L_{AFmax} events were from the sound of shutter doors, presumably from the garage opening.

The event of L_{AFmax} 81.9 dB will be used for the assessment as this is common of the other noise events during the night-time periods.



8 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.

8.1 Glazing & Ventilation Specification for all Habitable Rooms

The glazing specification in all habitable rooms should consist of at least 10 mm glass / 12 mm void / 6 mm double glazed units or similar; in well-sealed frames and without trickle vents.

The ventilation in all rooms shall be a quality mechanical system as specified by an M&E consultant.

8.2 Notes on Ventilation

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. Noise levels in habitable rooms will exceed the recommended values with windows opened.

8.3 Design and Positioning of Mechanical Plant

Although at this stage, the specification and location of any mechanical air conditioning plant is unknown, it is suggested that where possible, all external mechanical plant should be positioned as far away from windows as is physically possible.

While the design of the extraction system itself is the responsibility of others; it is respectfully noted that attention should be paid to the following as a principle of good practice:

1. The fan assembly should be isolated from the ductwork by means of a flexible collar to reduce the likelihood of structural borne noise and vibration entering habitable rooms.
2. The fans and associated ductwork should be mounted on anti-vibration mounts to isolate them from the building roof and façades.
3. Attenuation may be required on both the supply side and delivery side of the fan assembly. This may be in the form of silencers at the fan or acoustic louvres at the exhaust point.
4. It may also be advisable for mechanic plant to be located within an acoustic enclosure.

8.4 Floor/Ceiling Construction Detail between Commercial and Residential

It is our understanding that the separating floors are to be concrete construction. For the sound insulation performance of the floor/ceiling between the ground floor commercial and first floor residential to be greater than $D_{nT,w}$ 60 dB, we recommend the use of a metal frame ceiling, suspended from the underside of the concrete with acoustic hangers. There should be a minimum void of 150mm with at least 100mm mineral wool 45kg/m³ insulation and two layers of 15mm Gyproc Soundbloc plasterboard attached to the underside. (See Insul model in appendix). We would also suggest that



the masonry cavity walls within the commercial area are independently lined with an independent 50mm stud, 50mm 40-45Kg/m³ mineral wool insulation, and a single layer of 15mm Soundbloc attached, to reduce the reduction in performance by flanking sound.

8.5 Calculation Methodology

The noise break-in calculations for the BS8233:2014 assessment are based on the calculation methodology outlined in BS 8233:2014 and BS EN 12354-3.

A façade correction of 3dB has been applied to the external ambient sound level measurements in order to approximate free-field sound pressure levels.

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.

8.6 Building Elements

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

Table 7: Expected Performance of Building Elements									
Element	Description*	R_w (dB)	Octave Centre Frequencies (Hz)						
			SRI (dB)						
			63	125	250	500	1k	2k	4k
Double Glazing	10mm/12mm void/6mm (BRE)	-	-	26	27	34	40	38	-
External Wall	Brick and block (BS8233:2014)	-	-	40	44	45	51	56	56
Separating Floor/Ceiling	150mm concrete floor, suspended MF ceiling with insulation and 30mm Soundbloc (Insul)	73	51	59	60	68	76	82	87

*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.

8.7 Example of Estimated Performance

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

Table 8: Estimated Performance					
Location	Time period	Measured External		Predicted Internal	
		Average $L_{Aeq,T}$ (dB)	L_{AFmax} (dB)	$L_{Aeq,T}$ (dB)	L_{AFmax} (dB)
Front Façade, 1 st Floor	Daytime (07:00 – 23:00)	58.7	-	21.0	-
Front Façade, 1 st Floor	Night time (23:00 – 07:00)	54.3	81.9	16.8	43.3



9 Conclusion

When installing the recommended glazing and ventilation detail as discussed in the recommendations section, the recommended internal noise levels described in BS8233:2014 and World Health Organisation Guidelines for Community Noise can be achieved for internal noise levels in all habitable rooms.

The recommended separating elements between commercial and residential should provide sufficient sound insulation performance to comply with BS8233:2014 Annex H and provide an enhancement above Building Regulations Approved Document E.

It was not possible to measure sound levels at elevations above first floor level; therefore, in order to understand the sound levels at higher elevations, it will be necessary to undertake further sound level measurements once the main steel structure of the building has been constructed to confirm the specification on different facades and levels. The specifications in this report are therefore a guide based on the measurements possible at this stage of development.

10 References

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

Noise Policy Statement for England (NPSE)

National Planning Policy Framework (NPPF)

INSUL Modelling Software by Marshall Day Acoustics

www.google.co.uk/maps

10.1 Drawing References

P-AE-20-XX-001

Design & Access Statement March 2017



Appendix

Figure 1: Aerial View of Development Showing Monitoring Position 1

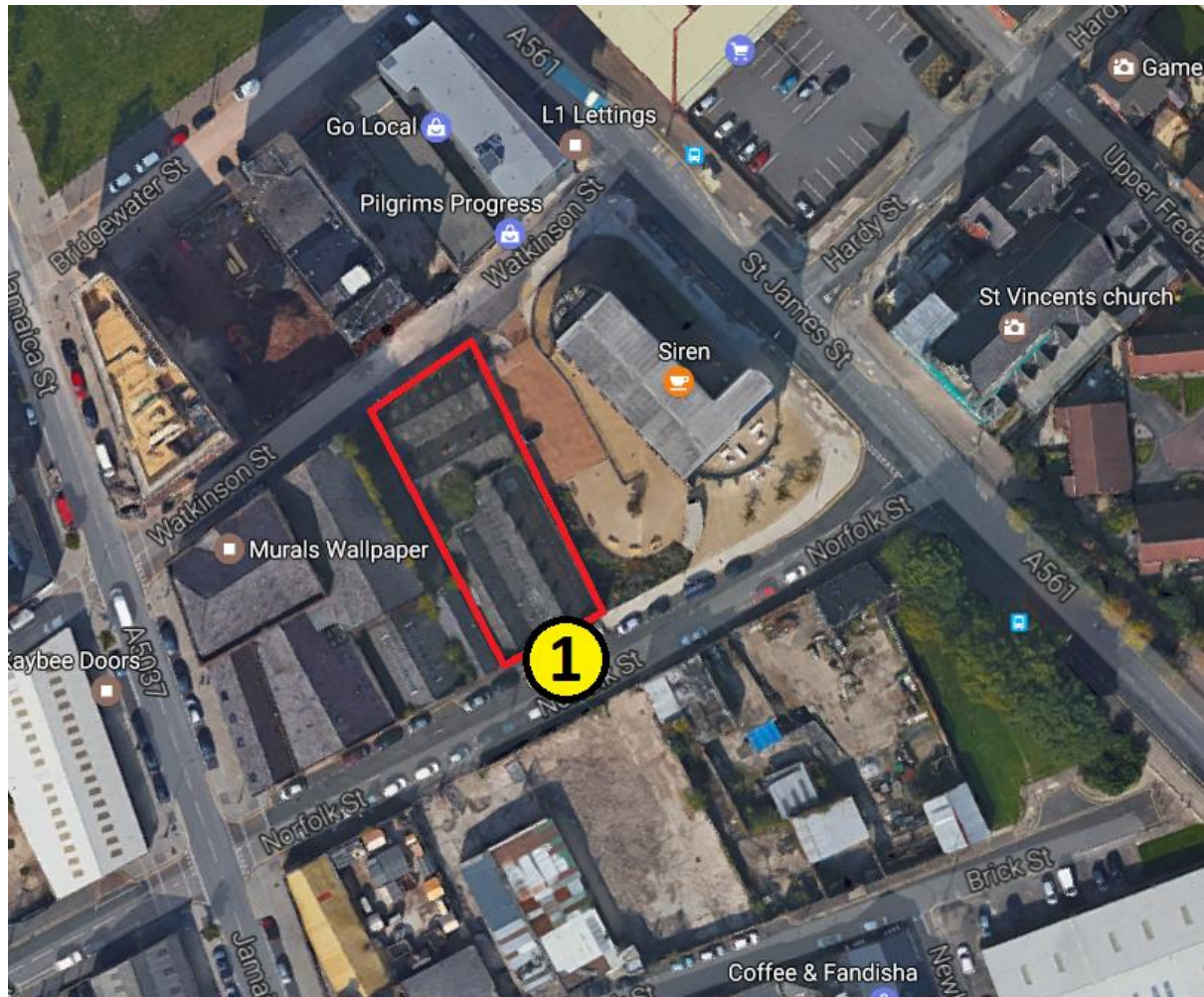




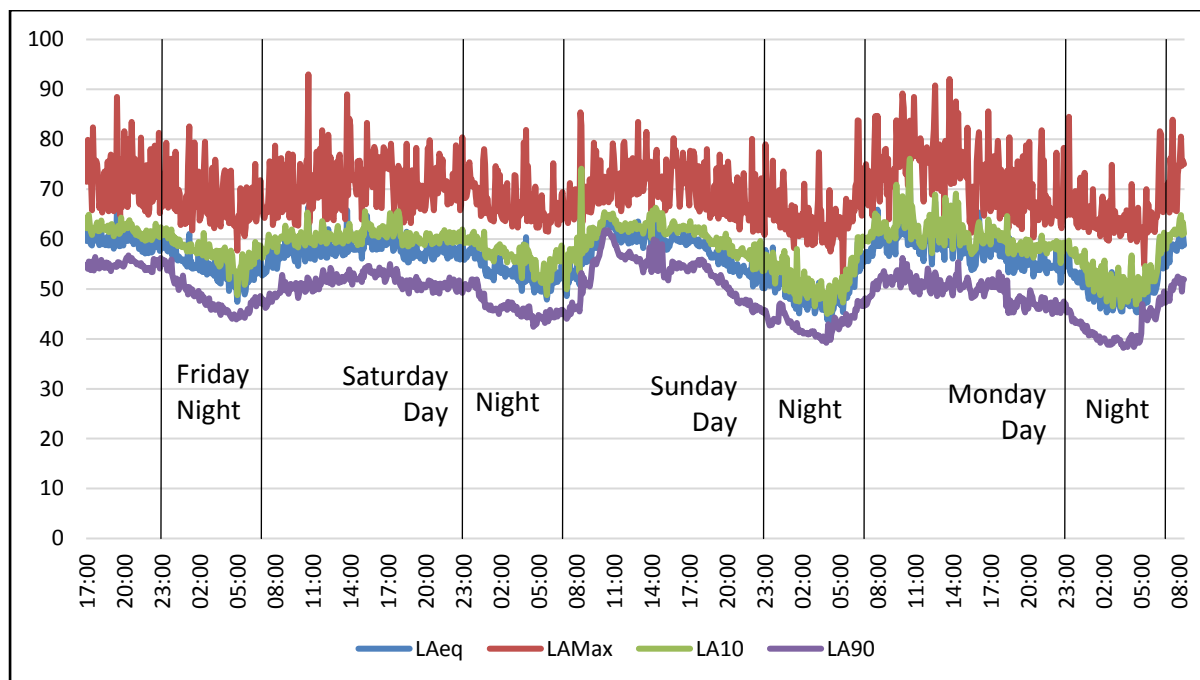
Figure 2: Picture Showing Monitoring Position 1



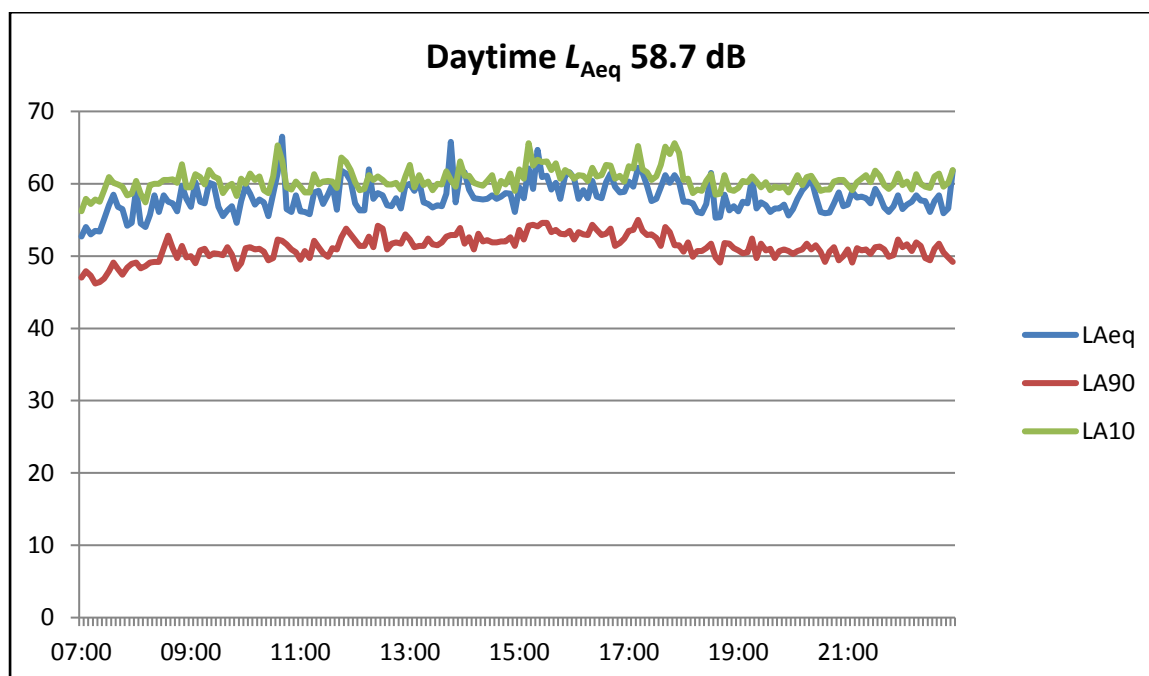


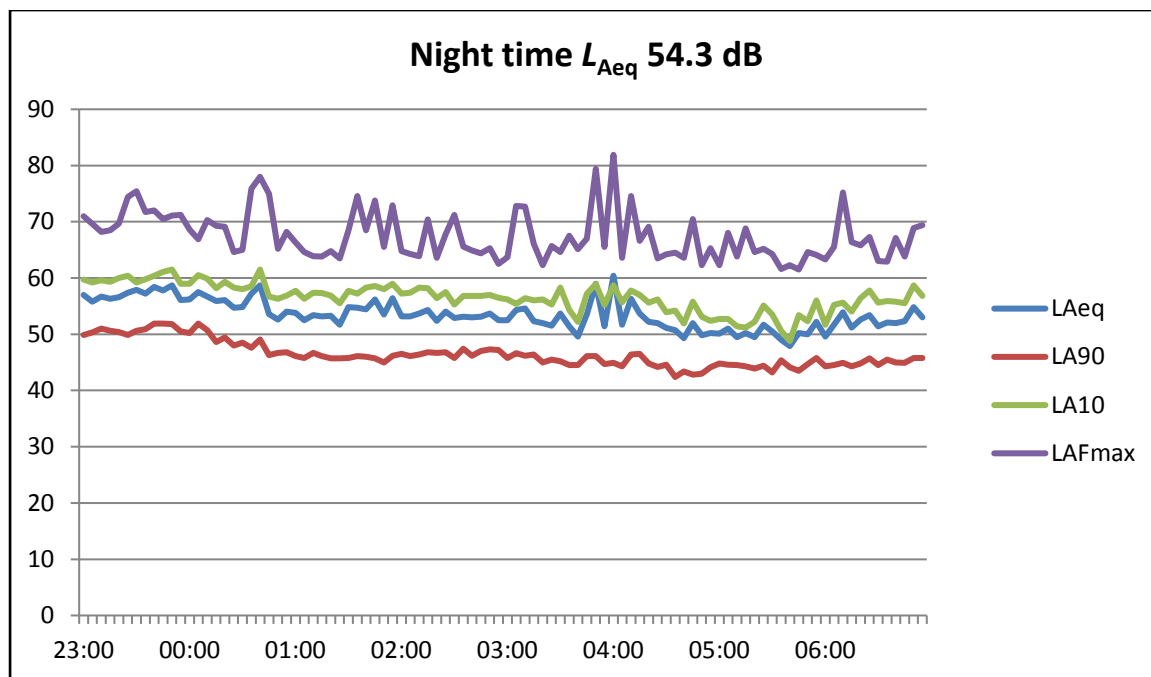
Measurement Results

Complete Measurement Duration

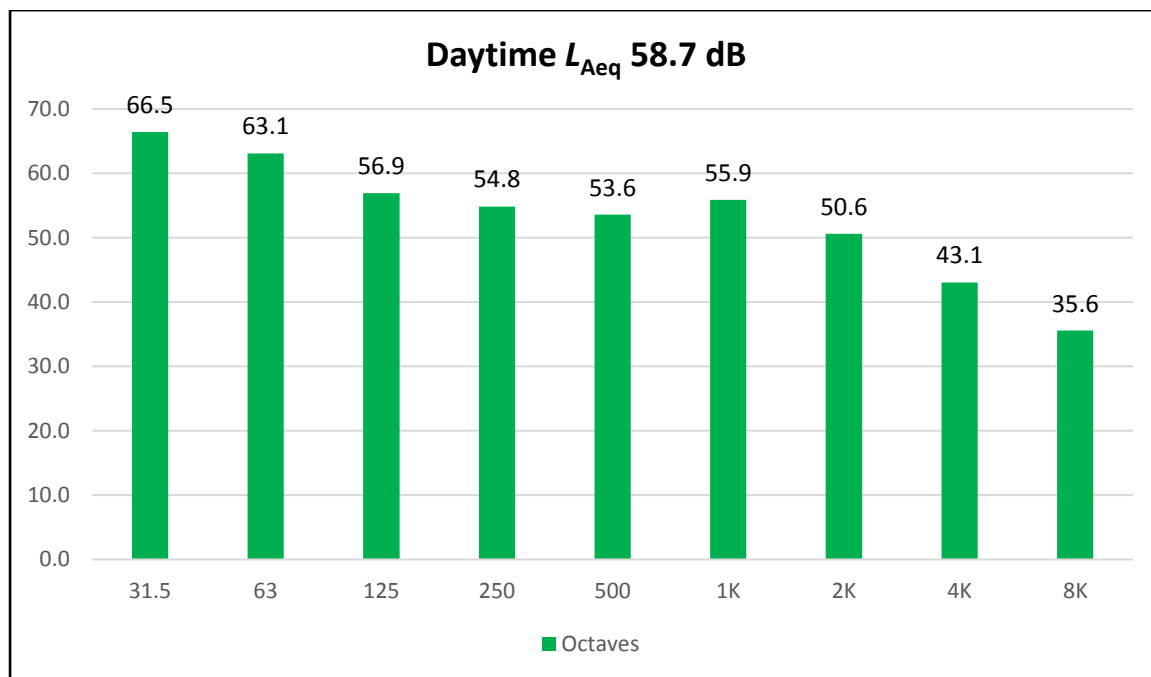


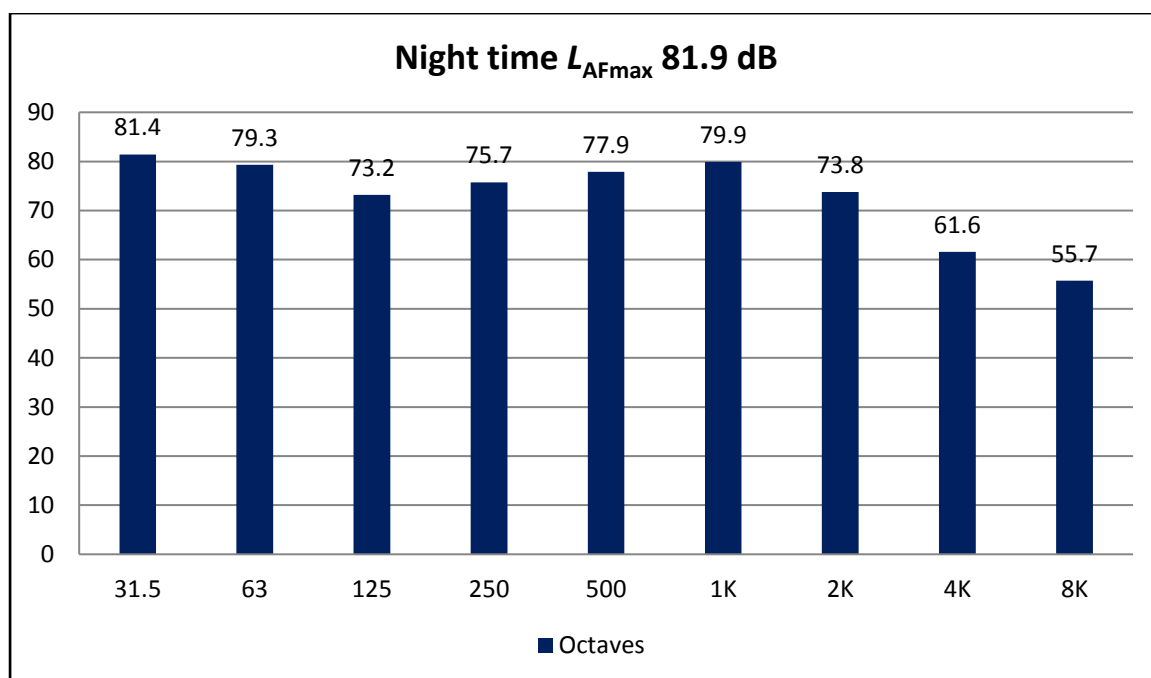
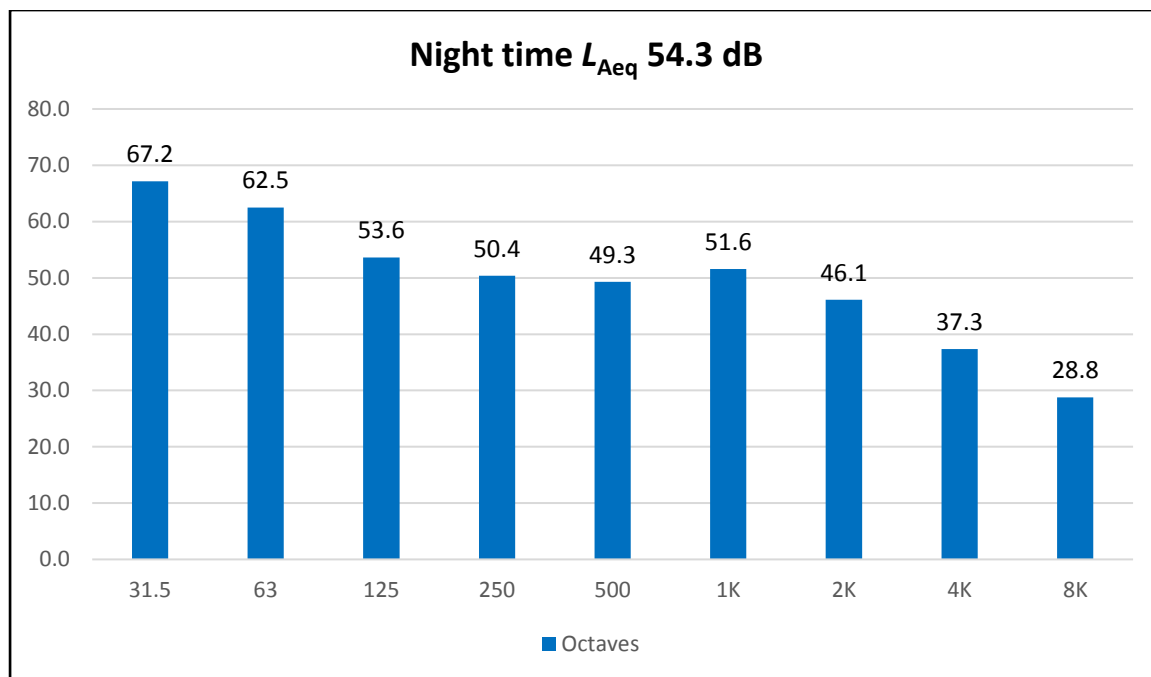
Saturday





Un-weighted 1:1 Octave Results







Acoustic Prediction Model for Separating Floor/Ceiling Detail

Sound Insulation Prediction (v7.0.13)

Program copyright Marshall Day Acoustics 2012

- Key No. 2516

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

Job Name:

Job No.:

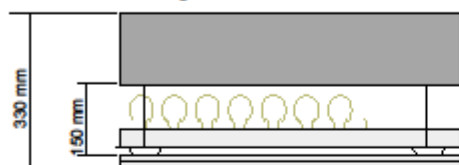
Page No.:

Notes:

Date: 29 Mar 17

Initials:HPUser

File Name: ceiling detail3.txt



R_w 73 dB

C -2 dB

C_{tr} -5 dB

System description

Panel 1 Outer layer: 1 x 150.0 mm Concrete- ($m=351.0$ kg/m², $f_c=199$ Hz, Damping=0.01) Profile

Cavity: Suspended light steel grid @ 600 mm, Infill: Rockwool (48kg/m³) Thickness 100 mm

Panel 2 Inner layer: 2 x 15.0 mm Gyproc SoundBloc 15mm- ($m=25.2$ kg/m², $f_c=2246$ Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =27 Hz

frequency (Hz)	R(dB)	R(dB)
50	48	
63	52	51
80	55	
100	58	
125	59	59
160	60	
200	58	
250	61	60
315	63	
400	66	
500	68	68
630	71	
800	74	
1000	76	76
1250	80	
1600	81	
2000	83	82
2500	83	
3150	85	
4000	87	87
5000	89	

Panel Size 2.7x4 m

