



INVICTA HOUSE

2-4 ATKINSON STREET
MANCHESTER
M3 3HH

HENRY BOOT DEVELOPMENTS &
KE HOTELS

ENVIRONMENTAL NOISE SURVEY

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KE Hotels, 2-4 Atkinson Street, Manchester

Noise planning report

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Summary

Sandy Brown has been commissioned by Emmaus Consulting Ltd to provide acoustic advice in relation to a proposed new build hotel development at 2-4 Atkinson Street, Manchester.

The proposed project consists of nine storey new-build hotel development. It is understood that the Atkinson Street facade is being retained. The proposed hotel operator is Moxy Hotels which is part of the Marriott group.

An environmental noise survey has been carried out to determine the existing background sound levels in the area and setting appropriate plant noise limits in line with the requirements of Manchester City Council.

The environmental noise survey was performed between 16:02 on 6 November 2015 and 19:47 on 8 November 2015.

The representative background noise levels were $L_{A90,15min}$ 58 dB during the daytime, $L_{A90,15min}$ 62 dB during the evening and $L_{A90,15min}$ 61 dB at night.

Based on the requirements of Manchester City Council and on the results of the noise survey, the cumulative noise level from plant at 1m from the worst affected window of the nearby noise sensitive premises is to be at least 5 dB below the representative background noise levels measured.

The results of the survey have been used to determine the required acoustic performances of the facade, and provide guidance on the ventilation strategy. Overall facade sound insulation performances to meet the internal noise criteria and control noise egress from a proposed bar and restaurant have been provided.

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1 Introduction

Sandy Brown has been commissioned by Emmaus Consulting Ltd to provide acoustic advice in relation to a proposed new build hotel development at 2-4 Atkinson Street, Manchester. The proposed hotel operator is Moxy Hotels which is part of the Marriott group.

As part of this, an environmental noise survey is required, the purpose of which is to establish the existing background sound levels in the vicinity of nearby noise sensitive premises and to set appropriate limits for noise egress from building services plant.

The background noise levels measured during the survey are used as the basis for setting limits for noise emission from building services plant. These limits are set in accordance with the requirements of the Manchester City Council.

This report presents the survey method, results of the environmental noise survey, and a discussion of acceptable limits for noise emission from building services plant, amplified sound egress and advice on minimum sound insulation requirements for the building envelope.

2 Site description

2.1 The site and its surrounding

The site location in relation to its surroundings is outlined in Figure 1. The site is located in Manchester city centre, and currently contains a 3 floor office building at 2-4 Atkinson Street. It is bounded by Atkinson Street to the south, a private car park and 1 Hardman Street to the north, 184-186 Deansgate to the east and 3 Hardman Street to the west.

It is understood that the Atkinson Street facade is to be retained with the remainder of the development being new build.



Figure 1 Site map (courtesy of Google Earth Pro)

2.2 Adjacent premises

The area is predominantly commercial and office accommodation. The nearest office accommodation is in Sunlight House and 190 Deansgate to the south, 3 Hardman Street to the west and 1 Hardman Street to the north, these are highlighted in yellow, orange, green and blue respectively in Figure 1.

It is understood that some rooms for residential purposes are located within the Oddfellows offices on the Deansgate side of The Courthouse Building located approximately 20 m to the east at 184-186 Deansgate. The rooms for residential purposes are completely screened from the development site by The Courthouse Building. This building is highlighted in red in Figure 1.

3 Method

Details of the equipment used, the noise indices and the weather conditions during the survey are provided in Appendix A. Further information on the specific survey method is provided in this section.

3.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 4 days to determine the existing background sound levels in the vicinity of nearby noise sensitive premises.

The unattended measurements were performed over 15 minute periods between 16:02 on 6 November 2015 and 09:02 on 9 November 2015. The equipment was installed and collected by Jose M. Gonzalez.

The measurement position used during the survey is indicated in Figure 1, denoted by the letter 'L'. This location was chosen to be reasonably representative of the noise levels experienced by the nearest noise sensitive premises.

The microphone was positioned out of a window on the second floor of the building approximately 1 m from the facade of the building and approximately 6 m above local ground level, the microphone had an unobstructed view of Atkinson Street.

3.2 Attended measurements

Attended sample measurements were performed by Jose M. Gonzalez at the front and rear facade of 2-4 Atkinson Street. These are indicated in Figure 1 as positions 1 and 2. The attended measurements were carried out on 16 November 2015, over 5 minute periods, with the purpose of determining the existing noise levels from road traffic, pedestrians and other significant noise sources in the area.

In each case the microphone was mounted on a tripod approximately 1.5 m above the ground level and at a distance of 1 m from the facade.

4 Measurement results

4.1 Observations

The dominant noise sources observed at the site during the survey consisted of road traffic and plant.

Less significant noise sources included pedestrian conversations and pass by, aircraft overhead, distant car horn, distant siren and slamming door.

Due to the close proximity to bonfire night, it is understood that fireworks occurred during the measurement time. Occupants of the existing building moved the monitoring equipment into a room on Sunday 8 November 2015 at 19:47. The measurement results after the equipment was disturbed are considered not representative and have been excluded from the assessment.

The purpose of the unattended measurements was to determine minimum background noise levels and the measurements are considered to have obtained a sufficiently representative sample of noise data.

4.2 Unattended measurement results

The results of the unattended noise measurements are summarised in the following tables. A graph showing the results of the unattended measurements is provided in Appendix B.

The day and night time ambient noise levels measured during the unattended survey are presented in Table 1.

Table 1 Ambient noise levels measured during the survey

Date	Daytime (07:00 – 23:00) $L_{Aeq,12h}$ (dB)	Evening (19:00 – 23:00) $L_{Aeq,4h}$	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Friday 6 November 2015	66 ¹	67	64
Saturday 7 November 2015	67	70	66
Sunday 8 November 2015	63	- ²	-

¹ Measurement not made over full period due to monitoring start and end time (the measurement on 6 November 2015 was over 3 hours).

² Measurements not made over full period. Microphone removed from its original measurement position. These measurements are considered not representative and have therefore been excluded from the assessment.

The maximum 1 hour ambient noise measurements were $L_{Aeq,1h}$ 72 dB during the day, $L_{Aeq,1h}$ 72 dB during the evening and $L_{Aeq,1h}$ 67 dB at night.

Maximum noise levels at the unattended measurement position varied between L_{AFmax} 70 dB and L_{AFmax} 102 dB. Due to the measurements being taken near to bonfire night, the maximum noise levels are higher than would be expected for this area. Maximum noise levels are discussed further in Section 4.4.

In line with Manchester City Council criteria, for the purpose of analysis and establishing representative background sound levels, day, evening and night time typical levels have been quantified using statistical analysis from the continuous logging measurements.

Daytime and night time statistical analysis of representative values for the site are given in Figure 2 to Figure 4.

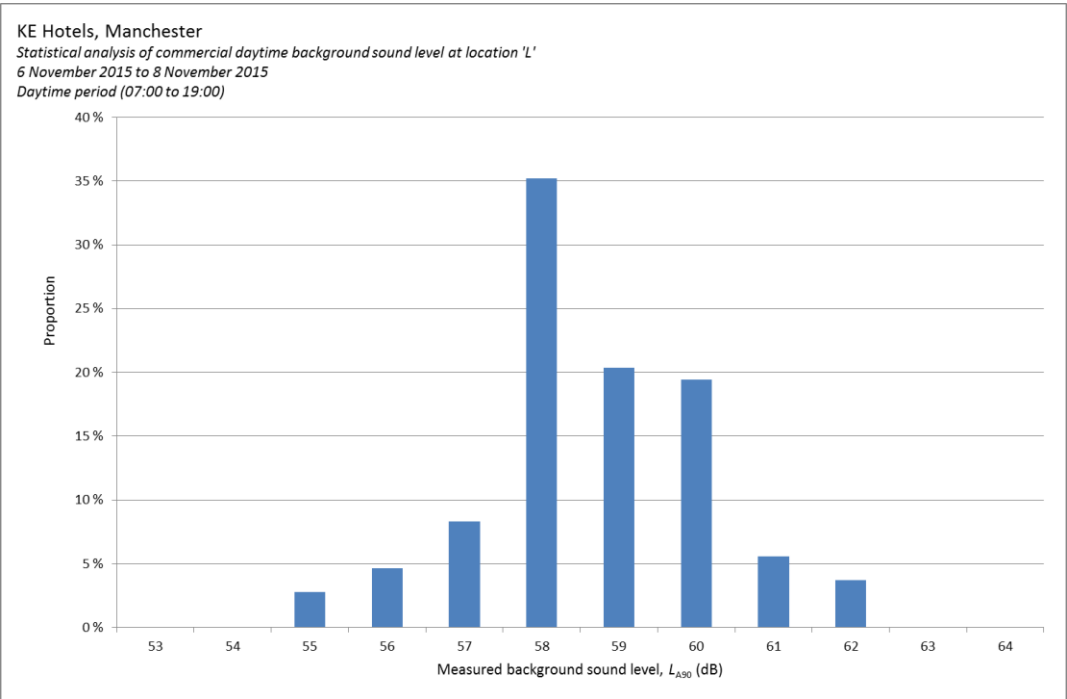


Figure 2 Statistical analysis of daytime background sound measurement results

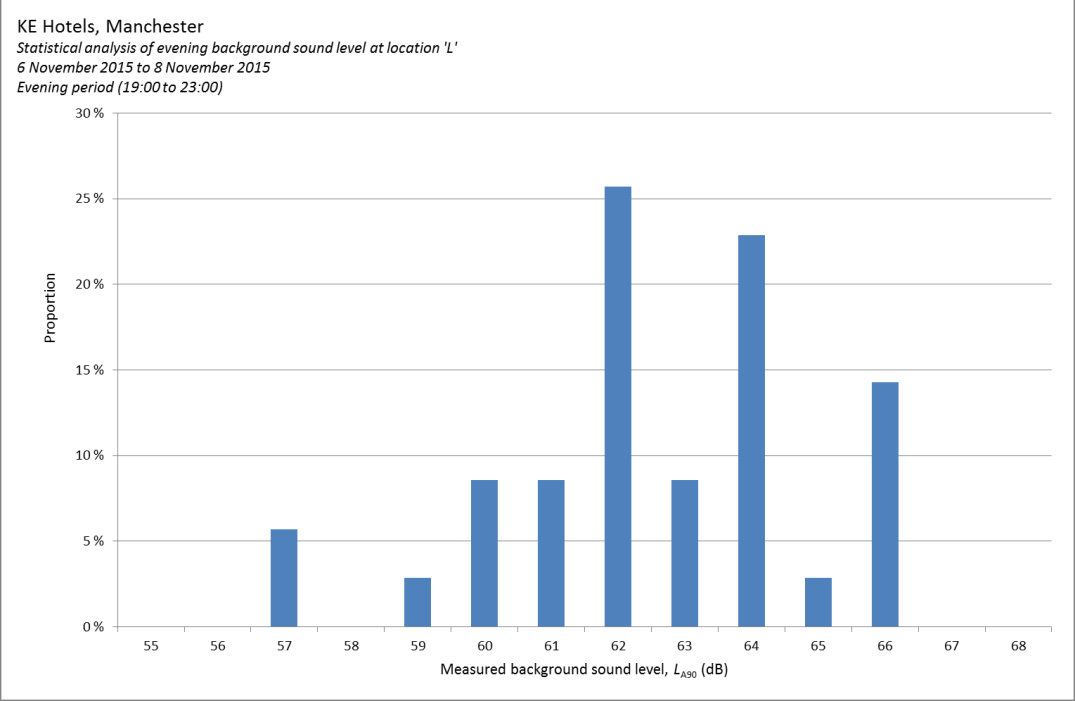


Figure 3 Statistical analysis of evening background sound measurement results

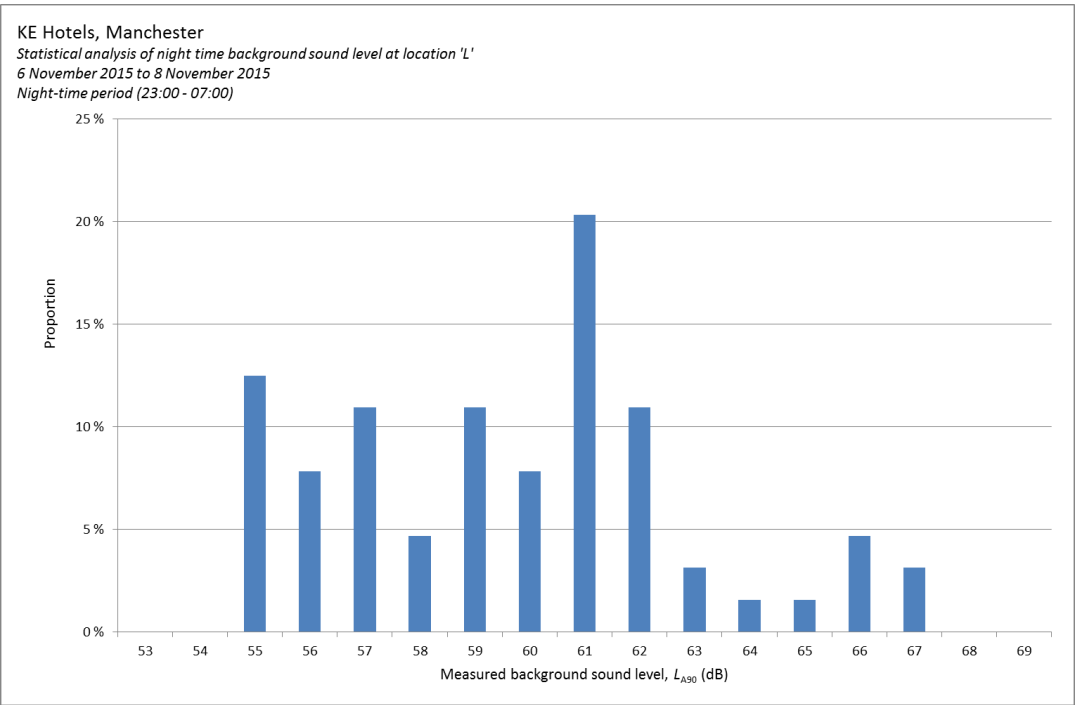


Figure 4 Statistical analysis of daytime background sound measurement results

From this analysis, the representative background sound levels measured during the survey were $L_{A90,15\text{min}}$ 58 dB during the day, $L_{A90,15\text{min}}$ 62 dB during the evening and $L_{A90,15\text{min}}$ 61 dB at night.

4.3 Attended measurement results

The sound pressure levels recorded during the attended measurements are summarised in Table 2. The dominant noise sources noted during the measurements are also described in Table 2. All the attended measurements were performed over 5 minute periods.

Table 2 Sound pressure levels from attended measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5\text{ min}}$	$L_{AFmax,5\text{min}}$	$L_{A90,5\text{min}}$	
1	13:11	64	75	60	Cars pass by, distant road traffic, pedestrians pass by, distant plant, slamming door, distant beeping, distant construction from Quay House building site.
	13:16	64	79	60	
	13:21	64	77	60	
	13:48	64	79	59	Cars pass by, distant road traffic, pedestrians pass by, distant plant, slamming door, distant beeping, distant construction from Quay House building site, aircraft overhead, and distant group conversation at Sunlight House.
	13:53	62	77	58	
	13:58	63	72	59	
2	13:29	55	64	53	Distant road traffic, distant plant, slamming door, car engine, distant phone conversation, distant reverse beeping.
	13:34	55	63	54	
	13:39	55	76	54	
	14:06	55	69	53	Distant road traffic, distant plant, slamming door, distant phone conversation, distant reverse beeping, aircraft overhead, distant siren.

4.4 Representative maximum noise levels

Maximum noise levels at the unattended noise monitoring position varied between L_{Amax} 70 dB and L_{Amax} 102 dB. From an analysis of the data there appear to be a couple of results in the range L_{Amax} 95 dB to L_{Amax} 102 dB, which are expected to be due to unusual events. There are also a number of maximum noise events in the L_{Amax} 90 dB to L_{Amax} 95 dB range during the evening which are expected to be due to fireworks. As the hotel operator requirements for maximum noise levels also apply during the day, the assessment has been based on typical daytime L_{Amax} levels, which do not regularly exceed L_{Amax} 90 dB. Night time maximum noise levels are not expected to exceed this under typical conditions.

5 Assessment criteria

5.1 NPPF and NPSE

The National Planning Policy Framework (NPPF) sets out the government planning requirements, and supersedes previous guidance notes such as PPG24. No specific noise criteria are set out in the NPPF, or in the Noise Policy Statement for England (NPSE) to which it refers.

The NPPF states:

‘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.’*

The NPSE states that its aims are as follows:

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

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

As such, although neither of these documents sets out specific acoustic criteria for new residential development, the requirement to control both the effect of existing noise on the new development and the effect of noise from the development on the surroundings needs to be considered.

5.2 Local Authority criteria

5.2.1 External noise criteria (plant noise)

Manchester City Council (MCC) provides guidance in relation to plant noise emissions in *Planning and Noise Technical Guidance* (December 2015), which states the following in relation to plant noise egress:

'The development should be designed so as to achieve a rating level of 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'

Corrections for tonal or attention catching characteristics would need to be applied to the rating level in accordance with BS4142: 2014.

5.2.2 External noise criteria (amplified music)

MCC in their *Planning and Noise technical Guidance* document dated December 2015 stipulates the following in relation to amplified music associated with a new development:

'Entertainment noise (L_{Aeq}) should be controlled to 10 dB below the background noise level (L_{A90}) without the entertainment noise present, in each octave band at the nearest noise sensitive location.'

5.2.3 Internal noise criteria (hotel guestrooms)

Based on the latest MCC Planning & Noise Technical Guidance (December 2015) and further to discussion with Richard Knightley (EHO for MCC), it is understood that there are no specific internal noise criteria for hotel accommodation and that MCC indoor ambient noise levels criteria in Planning & Noise Technical Guidance only apply for residential accommodation. For hotel developments, controlling noise ingress on the basis for of operator requirements is typically accepted.

5.3 Moxy Hotels standard criteria

Moxy Hotels give details of their acoustic criteria in document *MOXY EUROPE - ALL CHAPTERS FRANCHISED* dated June 2016.

The document states 'Short Term Noise: 50 dBA for short term (day/night) noise such as sirens and low level helicopter flights'. It has been assumed that this refers to maximum noise events measured using L_{Amax} (dB). As maximum noise events are sporadic in nature, it is generally acceptable to remove measurements caused from irregular events. Internal noise level criteria are summarised in Table 3.

Table 3 Proposed internal noise limits

Internal space	Internal noise limit, L_{Aeq} (dB)	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Bedroom internal noise limit, $L_{Aeq,1h}$ (dB)	45	40
Bedroom internal noise limit, L_{Amax} (dB)	50	50
Meeting spaces internal noise limit, L_{Aeq} (dB)	40	40

It has been assumed that the internal noise level due to maximum noise events is based on a representative maximum external noise event.

6 Plant noise limits- noise egress

6.1 Basic limits

Based on the above criteria and the measurement results, the cumulative noise level resulting from the operation of all new plant at 1 m from the worst affected windows of the nearest noise sensitive premises should not exceed 5 dB below the typical broadband (L_{A90}) external noise level.

Table 4 Plant noise limits at 1 m from the nearest noise sensitive premises

Location	Maximum sound pressure level at 1 m from noise sensitive premises ($L_{Aeq,15min}$ dB)		
	Daytime 07:00-19:00	Evening 19:00-23:00	Night 23:00-07:00
Nearby noise sensitive locations	53	57	56

Where an item of plant contains tonal characteristic, corrections for tonal or attention would need to be applied to the rating level in accordance with BS4142: 2014.

6.1.1 Assessment

At this stage, no information is available in relation to the proposed installation of building services plant, and this will need to be assessed in detail as the design progresses. However, all plant items will be designed to achieve the plant noise limits set out above, including any corrections for attention catching features.

7 Amplified sound egress

7.1 Noise egress to nearby noise sensitive premises

The cumulative noise level resulting from amplified sound egress at 1metre from the most affected windows of the nearest noise sensitive premise should not exceed 10 dB below the existing background sound level in octave bands. These limits are set out in Table 5.

Table 5 Octave band amplified music limits at 1m from the nearest noise sensitive premises

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Daytime (07:00 – 19:00)	55	52	49	45	43	39	32
Evening (19:00 – 23:00)	57	53	50	49	47	43	37
Night-time (23:00 – 07:00)	58	52	49	47	47	42	35

7.1.1 Assessment

At this stage, no information is available in relation to the proposed internal amplified sound activities, and this will need to be assessed in detail as the design progresses. Internal noise limits will be based the proposed facade constructions and to achieve the noise limits set out above.

8 Facade sound insulation – noise ingress

This section discusses internal noise level criteria and assesses the required facade sound insulation performance. In principle, the required facade specification depends on two factors – the external noise levels at the site, and the internal noise criteria.

8.1 Predicted external noise levels

Based on the environmental noise survey measurement results, the predicted external noise levels at each of the proposed facades are set out in Table 6, as well as the predicted maximum noise levels (L_{AFmax}).

Table 6 External noise level at proposed facade zones

Facade zones		Predicted external noise level range, $L_{Aeq,1hour}$ (dB)		Predicted maximum noise level, L_{AFmax} (dB)
		Daytime 07:00-23:00	Night 23:00-07:00	
Zone A		70-72	65-67	90
Zone B		65-69	60-64	84
Zone C		60-64	55-59	76

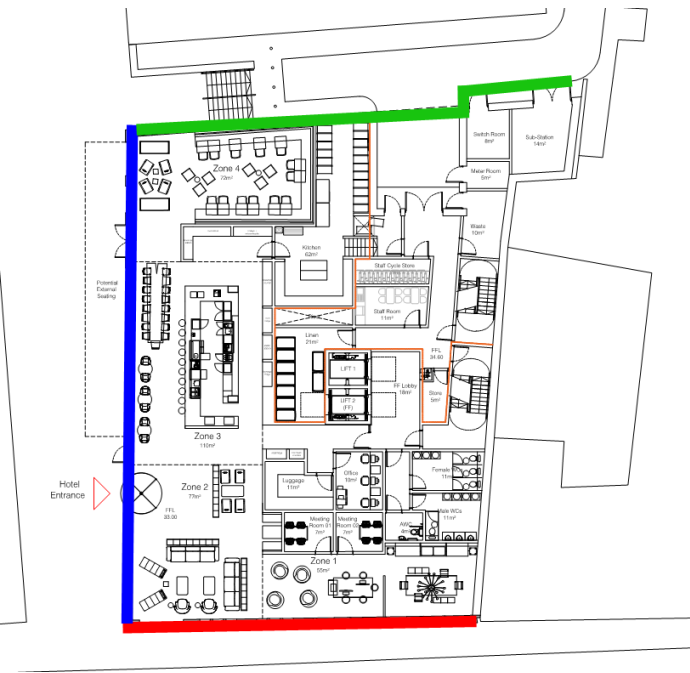


Figure 5 Ground floor and floor 2 predicted external noise levels

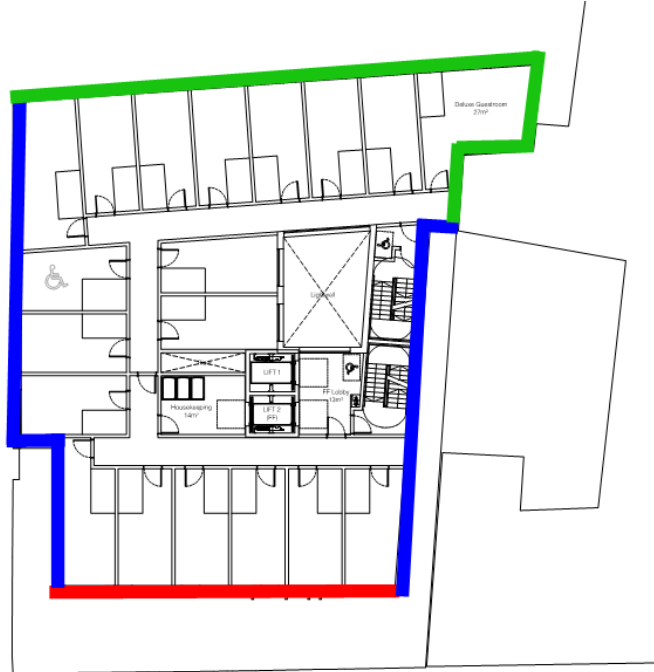


Figure 6 Floor 3 to floor 9 predicted noise levels

8.2 Facade sound insulation performance

The required facade specification depends on the two following factors:

- External noise levels at the site
- Internal noise criteria

Overall facade sound insulation performances are provided based on meeting the internal noise criteria given in Section 5.3.

8.3 Building envelope sound insulation performance

Table 7 sets out the recommended minimum overall sound insulation requirements for the different facades. It is understood that no detailed plans have been developed at this stage. Therefore, the minimum sound insulation requirements are presented in terms of achieving a range of internal ambient noise levels.

Please note that the following sound insulation performances given assume that the contribution from building services is sufficiently attenuated so as to not result in an increase of the overall internal ambient noise levels. This would mean controlling the resulting ambient noise level from building services to 10 dB below the criteria given in Section **Error! Reference source not found.**

If this is not feasible, the sound insulation performances given below will need to be improved in order to ensure Moxy internal ambient noise levels are achieved within the proposed spaces.

Table 7 Minimum overall facade sound insulation performance

Facade zone		Minimum overall sound insulation performance $R'_w + C_{tr}$ (dB)
Zone A		40 ¹
Zone B		34 ¹
Zone C		26 ¹

¹ - Minimum overall sound insulation performance determined by achieving internal maximum noise level requirement.

For design guidance, recommended minimum sound insulation requirements for the glazing elements are presented in Table 8. These have been determined assuming a 30% facade area of glazing for a typical hotel room volume of 45m³, and taking the glazed elements as the determining factor in the envelope sound insulation performance (ie, the solid elements must have a performance at least 10 dB greater than those provide in Table 8).

Table 8 Recommended glazed element sound insulation performance

Facade zone		Guidance on minimum required glazing sound insulation performance $R'_w + C_{tr}$ (dB)
Zone A		35 ¹
Zone B		28 ¹
Zone C		20 ¹

¹ Minimum overall sound insulation performance determined by achieving internal maximum noise level requirement.

8.4 Guidance on facade construction, glazing, and ventilation strategy

The following table sets out some examples of glazing build ups and ventilation strategies that could be employed to achieve the required sound insulation performance for the various elevations.

Table 9 Example glazing configurations and ventilation strategies

Sound insulation $R_w + C_{tr}$ (dB)	Example glazing configuration	Ventilation Strategy
25-27	6 mm/12 mm/6 mm	Attenuated passive ventilation (eg, trickle vents)
30-33	6.4 mm/12 mm/6 mm	Attenuated passive ventilation
35	12.8mm/15 mm/8.8 mm	Mechanical ventilation (eg, whole house ventilation)
38 and to meet low frequency requirements	12 mm/15 mm/8.8 mm acoustic glass	Mechanical ventilation (eg, whole house ventilation)

The performance required by each element will depend on the construction of the solid elements, the glazing specification, the relative areas of the solid and glazed elements, and noise contributions from internal building services.

As the design progresses, a more detailed facade sound insulation assessment will need to be performed, taking into account the factors listed above, to ensure that the overall performance requirements will be met.

9 Conclusion

A noise survey has been carried out to determine the existing sound levels in the vicinity of the site and surrounding noise sensitive premises. To the south of the site, the representative background sound levels measured during the survey were $L_{A90,15min}$ 58 dB during the day, $L_{A90,15min}$ 62 dB during the evening and $L_{A90,15min}$ 61 dB at night.

Based on the requirements of Manchester City Council and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises is to be at least 5 dB below the typical background sound levels measured.

In line with Manchester City Council criteria and the results of the noise survey, limits have been provided for noise egress from the operation of new plant and amplified music associated with restaurant and bar at ground level.

Based on the predicted external noise levels, example glazing configurations and ventilation strategies are provided for the hotel guest rooms. Standard thermal double glazing is expected to sufficiently control external noise ingress for guest rooms except those overlooking Atkinson Street.

Based on the predicted external noise levels, higher glazing sound insulation performances of up to $R'_w + C_{tr}$ 35 dB will be required to meet internal noise criteria within guest rooms overlooking Atkinson Street.

Appendix A

Survey details

Equipment

A Rion NL-52 sound level meter was used to undertake the unattended measurements. The attended measurements were carried out using a Norsonic 118 sound level meter. The calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/00932326	Rion	24 Feb 17	1502114
Microphone	UC-59/035549	Rion	24 Feb 17	1502114
Pre-amp	NH-25/32354	Rion	24 Feb 17	1502114
Calibrator	NC-74/34125432	Rion	24 Feb 17	1502110
Sound level meter	Nor118/31754	Norsonic	2 Mar 17	08241
Microphone	40AF/62396	Gras	2 Mar 17	08241
Pre-amp	1206/30873	Norsonic	2 Mar 17	08241
Calibrator	1251/31322	Norsonic	20 Feb 17	08208

Calibration of the sound level meters used for the tests is traceable to national standards. The calibration certificates for the sound level meters used in this survey are available upon request.

The sound level meters and microphones were calibrated at the beginning and end of the measurements using their respective sound level calibrators. No significant deviation in calibration occurred.

Noise indices

The equipment was set to record a continuous series of broadband sound pressure levels. Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period with a fast time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

The L_{A90} is considered most representative of the background sound level for the purposes of complying with any local authority requirements.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*.

Weather conditions

During the attended measurements carried out on 16 November 2015, the weather was generally clear and dry and no rain occurred. Wind speeds were less than 5 m/s.

During the unattended noise measurements between 6 November 2015 and 8 November 2015, weather reports for the area indicated that temperatures varied between 7°C at night and 16°C during the day, and the wind speeds varied between approximately 4 m/s and 7 m/s.

Rain showers occurred throughout the survey however, the survey duration was sufficiently long to include periods unaffected by adverse weather and no variation in noise levels was seen to correlate with the weather. These measurements are consequently considered to have obtained a representative sample of noise data

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements at location 'L'

KE Hotel, Manchester
Results of noise logging survey at location 'L'
6 November 2015 to 8 November 2015

