



Consultants in Sound and Vibration

Report

19-0010-R5

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Moxy Hotel, Manchester

Entertainment Noise

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1 Introduction

- 1.1 Planning permission has been granted (Ref: 12949/JO/2021) for the development of a scheme providing hotel accommodation in Spinningfields, Manchester. The scheme comprises the demolition of the existing Invicta House, with retention of some facade elements, to be replaced by a new eight storey hotel building. A number of conditions have been set as part of the planning permission. This report relates to Planning Conditions 12 and 14 which state:

[Condition 12] "A scheme for acoustically insulating and mechanically ventilating (a) the hotel accommodation against noise from adjacent roads and (b) any noise transfer from other areas of the hotel use to the hotel rooms, shall be submitted to and approved in writing by the City Council as local planning authority and implemented in full before the use commences.

Where entertainment noise is proposed the LAeq (entertainment noise) shall be controlled to 10dB below the LA90 (without entertainment noise) in each octave band at the facade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63Hz and 125Hz octave frequency bands shall be controlled so as not to exceed (in habitable rooms) 47dB and 41dB, respectively.

In relation to the use hereby approved, these premises shall be acoustically insulated and treated to limit the break out of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as Local Planning Authority before the use hereby approved commence. The scheme proposed shall normally include measures such as acoustic lobbies at access and egress points of the premises, acoustic treatment of the building structure, sound limiters linked to sound amplification equipment and specified maximum internal noise levels. Any scheme approved in discharge of this condition shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as Local Planning Authority."

[Condition 14] "a) Before the first occupation of the hotel, an acoustic assessment and details of proposed opening hours for any restaurant / bar area should be submitted to and approved by the local planning authority. The scheme shall be implemented and thereafter managed and maintained in accordance with the approved details should be submitted for approval in writing by the City Council, as Local Planning Authority. Where entertainment noise is proposed the LAeq (entertainment noise) shall be controlled to 10dB below the LA90 (without entertainment noise) in each octave band at the facade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63Hz and 125Hz octave frequency bands shall be controlled so as not to exceed (in habitable rooms) 47dB and 41dB, respectively.

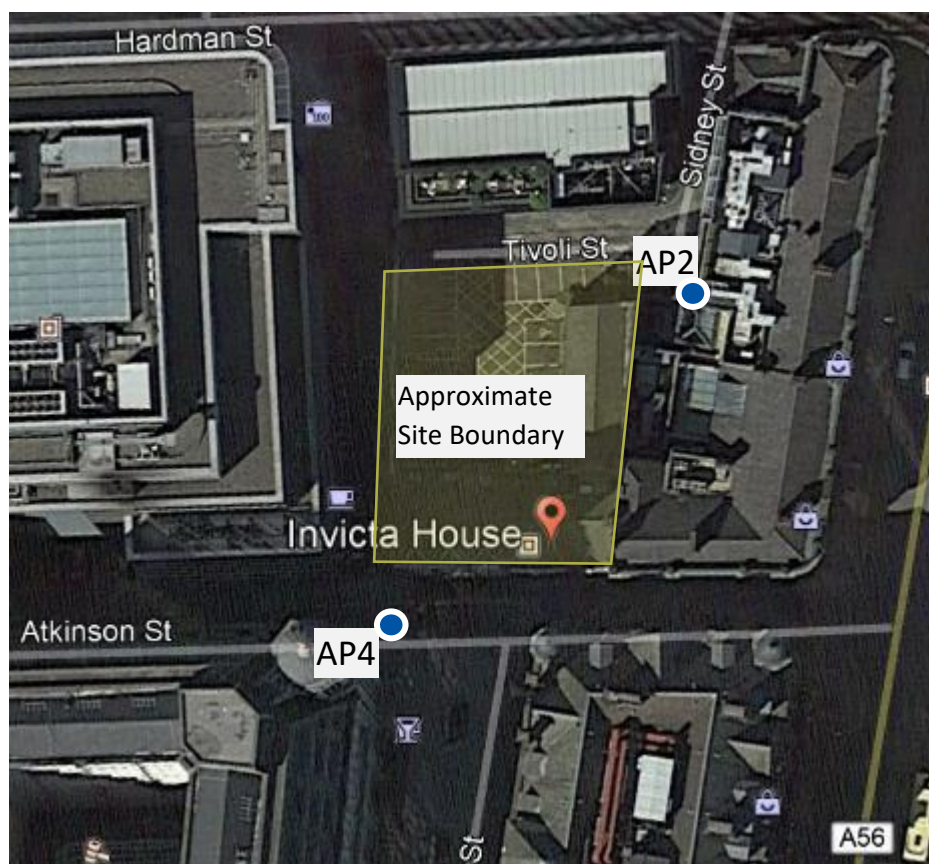
b) Upon completion of the development and before the use hereby approved becomes operational, a verification report shall be undertaken to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that above criteria is met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the noise criteria. This report shall be submitted to and approved in writing by the City Council as local planning authority before the use becomes operational along with a timescale that confirms when any necessary changes will be implemented."



- 1.2 Condition 12 has the same requirements as original condition 14 from permission reference 116164/FO/2017. Details pertaining to this condition are set out in BY Acoustics (BYA) report 19-0010-R3-2, which was submitted as part of evidence for the original condition. Part A of Condition 14 has also been covered in BYA report 19-0010-R3-2.
- 1.3 This report sets out the details of completion measurements undertaken on site in order to establish the sound insulation performance of the Bar façade, and the sound insulation performance between the Bar and the first floor bedrooms.

2 Site Description

- 2.1 The original Invicta House site is located at 2-4 Atkinson St, Manchester. The site is surrounded by commercial premises. It comprised a vacant, three-storey building, formerly used as offices, with car parking to the rear (accessed from Tivoli Street off Hardman Street, which is located to the north, beyond other commercial buildings). This building is now demolished, aside from the retained elements, with the new development fully constructed.
- 2.2 Atkinson Street forms the southern boundary and it carries little traffic; but the junction with the busy Deansgate is approximately 30 m east of the site. During the site visit for this survey work, Atkinson Street was closed to road traffic by fencing and equipment for this site, such as the crane to the south east of the building. The western boundary is with a pedestrian walkway, which separates the site from the neighbouring building to the west.
- 2.3 The nearest noise sensitive receptors are described as follows and shown on F2.1 below:



F2.1 Site plan showing location of proposed development site (© Google)



- AP2 – West façade of Oddfellows House
 - AP4 – North façade, closest building to south of Atkinson St
- 2.4 Assessment Position references reflect those used in the plant noise assessment outlined in BYA report 19-0010-R3-2. AP2 and AP4 contain residential elements and therefore only these buildings are considered the nearest noise sensitive receptors at all times for the purposes of this analysis.
- 2.5 Licensing for the ground floor premises allows use of the space as a public house with recorded and live music playing from 08h00 to 02h00 from Sunday to Wednesday and 08h00 to 03h00 from Thursday to Saturday.

3 Noise Limits

- 3.1 Noise limits applicable to this site are to achieve a level of 10 dB below the background level (L_{A90}) without entertainment noise. As the premises has permission to operate until 02h00 and 03h00 depending on the day, the night time background noise levels are appropriate here. BY Acoustics report 19-0010-R1, as previously submitted, sets out the details of a noise survey undertaken at this site. The lowest measured $L_{A90, 15 \text{ minutes}}$ at locations equivalent to the assessment positions during this survey are as follows:
- AP2 – Sun to Weds, 08h00 to 2h00: 53 dB L_{A90} ; Thurs to Sat 08h00 to 03h00: 51 dB L_{A90}
 - AP4 – Sun to Weds, 08h00 to 2h00: 59 dB L_{A90} ; Thurs to Sat 08h00 to 03h00: 58 dB L_{A90}
- 3.2 The entertainment noise criteria apply at 1m from the nearest noise sensitive façade to the development. The following Table 3.1 sets out the limits based on the above stated measured background levels.

Location	Entertainment Noise Limit, dB $L_{Aeq, 15 \text{ min}}$	
	Sun-Weds (08h00-02h00)	Thurs-Sat (08h00-03h00)
AP2 – Oddfellows House	43	41
AP4 – South of Atkinson St	49	48

Table 3.1: Entertainment Noise Limits

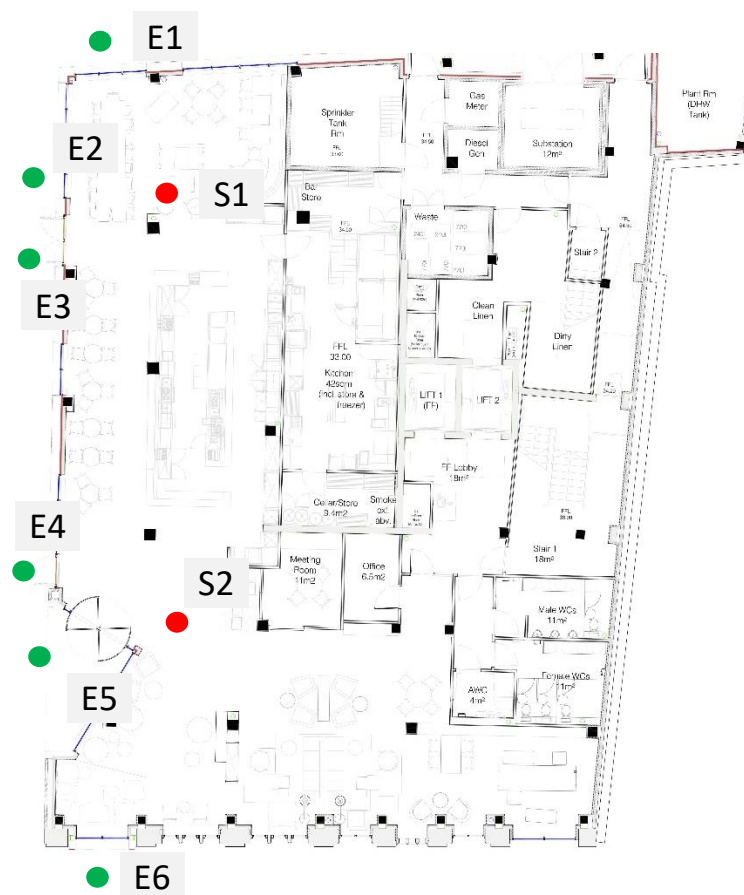
- 3.3 It is unlikely that noise levels in the bar would vary on different days, and if so the likelihood would be for slightly elevated levels on the weekend nights. Therefore, the noise break-out assessment will be based on the more onerous noise limits for Thursday to Saturday nights.

4 Bar Noise Break Out

- 4.1 Due to the nature of the planning condition, to meet noise levels below the prevailing background noise level, it is not possible to directly measure. Instead, noise levels were measured both internally and externally with a noise source playing in the bar area, with the measured levels used to calculate resultant noise levels at the receptors.



- 4.2 Measurements were undertaken externally at three locations for each of two speaker positions as shown in F4.1 overleaf.



F4.1 Ground floor plan snapshot showing bar layout and measurement positions

- 4.6 Speaker position S1 was used for external measurement positions E1 to E3 and S2 for E4 to E6. The external measurement locations were selected to be adjacent to the “weakest” element of the façade in terms of sound insulation – this meant 1m from the centre of the doors in most cases (E3, E4, and E5). E5 was undertaken approximately 2m from the rotating door to ensure it was not screened from noise from the rest of the façade by the entrance lobby.
- 4.7 External measurements were typically undertaken at 1m from the façade, apart from E5 as noted above, while the internal source level was established by measurements undertaken at 1m internally from the façade in the vicinity of the external measurement locations.
- 4.8 The following Table 4.1 sets out the measured internal and external levels. To avoid influence from external noise sources all measurements were 30 seconds in length.

Parameter	Sound Level (dB, $L_{Aeq, 30 \text{ seconds}}$) at Octave Band Centre Frequency (Hz)								
	A	63	125	250	500	1000	2000	4000	8000
S1 Internal	101	92.2	97.5	94.2	92.7	92.3	93.7	94.8	93.7
E1 External	65	66.7	69.6	63.2	59.3	57.5	57.1	52.0	60.8



Parameter	Sound Level (dB, $L_{Aeq, 30 \text{ seconds}}$) at Octave Band Centre Frequency (Hz)								
	A	63	125	250	500	1000	2000	4000	8000
E2 External	70	73.1	76.6	65.0	61.3	61.8	64.0	60.8	57.6
E3 External	72	72.5	78.5	65.5	63.0	64.9	65.6	62.8	60.8
S2 Internal	98	88.1	93.9	92.1	90.2	90.2	91.6	92.1	91.4
E4 External	69	75.6	77.4	69.1	62.8	61.6	60.5	58.6	55.1
E5 External	64	71.1	72.6	64.7	57.0	57.4	57.7	51.3	46.7
E6 External	63	71.3	68.1	60.9	58.1	58.4	53.4	50.0	48.2

Table 4.1 Octave band levels measured at internal (S) and external (E) measurement positions

- 4.9 The source level utilised was significantly louder than that expected in a typical bar with recorded music playing. BYA report 19-0010-R3-1 set out a typical source level for such a bar. The following Table 4.1 repeats this level, along with the resultant level at each of the positions based on the façade reduction established from the above Table 4.2 levels.

Parameter	Sound Level (dB, $L_{Aeq, T}$) at Octave Band Centre Frequency (Hz)								
	A	63	125	250	500	1000	2000	4000	8000
Typical bar with music	82	78	76	77	76	78	74	72	93.7
E1 External	47	52.5	48.1	46.0	42.6	43.2	37.4	29.2	39.1
E2 External	51	58.9	55.1	47.8	44.6	47.5	44.3	38.0	35.9
E3 External	54	58.3	57.0	48.3	46.3	50.6	45.9	40.0	39.1
E4 External	54	65.5	59.5	54.0	48.6	49.4	42.9	38.5	35.7
E5 External	49	61.0	54.7	49.6	42.8	45.2	40.1	31.2	27.3
E6 External	49	61.2	50.2	45.8	43.9	46.2	35.8	29.9	28.8

Table 4.2 Octave band levels at external measurement positions based on expected levels in bar

- 4.10 Based on these levels, the level at the nearest noise sensitive receptor was calculated, with pessimistic assumptions applied in terms of noise propagation and radiation. These calculations indicate levels of **43-48 dB $L_{Aeq, T}$** at **AP4** (limit of 53 dB $L_{Aeq, T}$) and levels of up to **39 dB $L_{Aeq, T}$** at **AP2** (limit of 41 dB $L_{Aeq, T}$).
- 4.11 It is noteworthy that the noise levels calculated are based on pessimistic assumptions, both in terms of noise propagation and the locations of the nearest noise sensitive receptors. In reality, the noise levels at the nearest actual receptors are expected to be lower than this.
- 4.12 On this basis, it is considered that the external noise level requirements of Conditions 12 and 14 are met.



- 4.13 It is expected that sensible management of the bar, such as would be required by the hotel management, should be sufficient to ensure that the noise limits are not exceeded by entertainment noise within the bar.
- 4.14 If management desire to control this in a stricter fashion, it is considered suitable to install noise limiters with a fixed limit of 84 dB $L_{Aeq, 5 \text{ minutes}}$. This is the recommended limit, due to the calculated receptor levels as noted above being 2 dB above the typical level in a bar with music of 82 dB $L_{Aeq, T}$. If applied, the noise limit should be based on measurements undertaken at 1m inside the façade at a distance at least 5m from the nearest speaker (with restrictions also likely to apply to speaker locations). Further advice can be provided if this approach is to be taken.

5 Internal Noise Transfer

- 5.1 As part of commissioning measurements to show compliance with Building Regulations and Moxy Hotel management requirements, sound insulation testing was undertaken between the bar and a number of first floor hotel bedrooms. Full details of the testing are set out in BYA Report 19-0010-R4-1.
- 5.2 Measurements were undertaken in Bedrooms 102, 103, 110, 111, and 112. In each case a noise source was set up directly below the footprint of the bedroom. The calculated sound insulation performance varied from 55 to 63 dB $D_{nT,w} + C_{tr}$. The lowest performing measured level difference, D , from the bar to these bedrooms was **39.5 dB** at 63 Hz and **46.9 dB** at 125 Hz.
- 5.3 Based on the worst case floor performances and the typical bar source level as set out in Table 4.2, the highest noise levels calculated in the bedrooms are **26 dB(A)**, with **39.5 dB** at 63 Hz and **29.1 dB** at 125 Hz.
- 5.4 It can be seen that these levels are notably lower than those required in Planning Conditions 12 and 14 for structurally adjoined residential properties.

6 Conclusion

- 6.1 BY Acoustics has undertaken measurements and analysis of the noise transfer from the ground floor bar at Moxy Hotel, Invicta House to the first floor bedrooms and external noise sensitive receptors. The results of the measurement and analysis are set out within this report.
- 6.2 It has been shown that the requirements of Planning Conditions 12 and 14 are met both in terms of noise break-out externally to the nearest noise sensitive receivers, as well as noise transfer internally to the first floor hotel bedrooms.
- 6.3 On this basis, and in combination with the conclusions and design advice set out in BY Acoustics report 19-0010-R3-2, as previously submitted, it is recommended that both Condition 12 and Condition 14 be discharged.



Glossary of Terms

decibel: Usually written as decibel or dB, it is a logarithmic scale used for two purposes. One is to make the expression of numerical sound levels more convenient (with a smaller range and fewer digits). The other is to express sound levels in a manner aligned with human interpretation of differences in sound level, which itself is logarithmic in nature.

A-weighting: Applies different weight to sound levels at different frequencies, to represent the variation in sensitivity of the typical human ear with frequency. Thus, a single-value expressed in terms of dBA or dB(A) is the A-weighted sound level, which takes account of the frequency content of the sound.

T: Can vary in meaning, depending on where it is used. For example, when used with L_{Aeq} or L_{Ar} (see below) it represents a specified time period. When used with $D_{nT,w}$ or T_{mf} for example, it represents the reverberation time (see below).

L_{Aeq} : The A-weighted equivalent continuous sound level in dB. This unit can be described as the notional steady noise level that would, over a period, contain the same energy as the fluctuating noise source. It is often considered as the energy average level. This unit is typically used to describe day and night period noise levels, $L_{Aeq,T}$ where T is the time period.

L_{A90} : The A-weighted sound level (in dB) exceeded for 90% of the time specified. This level gives an indication of the sound level during the quieter periods of time in any given fluctuating sound sample. It is used to describe the "background sound level" of an area.

L_{A10} : The A-weighted sound level (in dB) exceeded for 10% of the time specified. This level gives an indication of the sound level during the louder periods of time in any given fluctuating sound sample. It is typically used to help define, measure, and assess road traffic noise.

L_{A01} : The A-weighted sound level (in dB) exceeded for 1% of the time specified. This level can help to quantify the impact of short-duration events (in addition to, or as an alternative to L_{Amax} – see below). For example, it is used in criteria for transient noise potentially affecting teaching and learning in schools.

L_{Amax} : The maximum A-weighted level (in dB) of sound measured in any given period. This unit is used to measure and assess transient noises, particularly those such as individual vehicles, etc impacting on sensitive receptors at night. Unless otherwise stated, the L_{Amax} level is measured using a "fast" sound level meter response (i.e. $L_{Amax,F}$).

L_{AX} , L_{AE} , or SEL: The sound exposure level which contains, within a notional 1-second period, the same quantity of sound energy as the time varying level contained in a single noise event. It could be considered an L_{Aeq} level normalised to 1 second. The use of this unit allows the calculation of the $L_{Aeq,T}$ level over a given period of time (T) for a known number of such single noise events.

L_{Ar,T_r} : The BS 4142:2014+A1:2019 defined rating level comprising the specific noise level for a given source over a given time period, T_r , plus any adjustment for the characteristic features of the noise.

T_{60} : Reverberation time, which is a characteristic of a given room. It is the time taken for sound energy to decay by 60 dB. It is usually impractical to measure directly, so is represented by T_{20}



(which is an estimate of the T_{60} based on the time taken for sound energy to decay by 20 dB), or the similar T_{30} .

T_{mf} : The mid-frequency reverberation time defined in BB93. It is the arithmetic average of the reverberation time in the 500 Hz, 1 kHz and 2 kHz octave bands, which constitute important speech frequencies.

$D_{nT,w}$: The level difference between one room and another, across a sound insulating separating element, normalised to a reverberation time of 0.5 seconds, and weighted to provide a single figure value.

$L'_{nT,w}$: The noise level in a room when the floor in the room above is excited by a calibrated tapping machine or similar, and normalised to a 'standard' reverberation time of 0.5 seconds, and weighted to provide a single figure value.

R_w : This is the sound reduction index, weighted to provide a single figure value, of a particular construction under laboratory conditions, where there is no contributing flanking sound transmission and where the test sample is constructed exactly in accordance with manufacturer's details.

R'_w : This value is the same as R_w but is measured under field conditions, where flanking details, workmanship, or other factors may cause a reduction in performance to that measured under laboratory conditions