

853 ASHTON OLD ROAD, MANCHESTER - PROPOSED HOTEL DEVELOPMENT

ENTERTAINMENT & PLANT NOISE ASSESSMENT

**On behalf of:
PH Architecture**

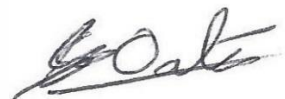
853 ASHTON OLD ROAD, MANCHESTER - PROPOSED HOTEL DEVELOPMENT

ENTERTAINMENT & PLANT NOISE ASSESSMENT

Report prepared by:
Hepworth Acoustics Ltd
21 Little Peter Street
Manchester
M15 4PS

On behalf of:
PH Architecture

Report prepared by:
Samuel Oates BSc MSc AMIOA - Consultant



Report checked by:
Paul Bassett BSc MSc FIOA - Technical Director



CONTENTS

1.0	INTRODUCTION	1
2.0	PLANT NOISE	2
3.0	SOUND INSULATION BETWEEN THE RESTAURANT/BAR AND HOTEL ROOMS	4
4.0	SUMMARY & CONCLUSION	8
FIGURE 1: PROPOSED LAYOUT DRAWINGS		9
APPENDIX I: NOISE UNITS & INDICES		10

1.0 INTRODUCTION

- 1.1 Hepworth Acoustics Ltd was commissioned by PH Architecture to carry out a noise assessment in connection with a proposed planning application for a hotel development at 853 Ashton Old Road, Manchester.
- 1.2 The development proposals are for conversion of the first and second floors of the existing building to form 19 hotel rooms. The ground floor of the building is comprised of an existing restaurant/bar, with associated kitchen, which is to be retained. The proposed development layout drawings are shown in Figure 1.
- 1.3 This assessment was commissioned specifically to assess the potential noise impact from entertainment noise and plant noise from the ground floor restaurant/bar premises on the proposed hotel rooms as a basis for recommending appropriate noise mitigation measures for the development.
- 1.4 The noise assessment has included:
- An inspection of the development building;
 - Measurement of plant noise levels outside the most exposed proposed hotel room windows;
 - Indicative sound insulation testing between the ground and first floors;
 - Measurement of peak trading noise levels in the restaurant/bar and the resulting levels in the spaces above;
 - Calculation of plant noise break-in via the windows;
 - Assessment of entertainment noise transmission to the hotel rooms above; and,
 - Recommendations for appropriate noise mitigation measures.
- 1.5 The various noise units and indices referred to in this report are described in Appendix I. All noise levels mentioned in the text have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 PLANT NOISE

Noise Measurements

- 2.1 The kitchen extract plant is mounted on the rear elevations of the building as indicated in Figure 1. We understand that the kitchen extract plant operates until midnight at the very latest.
- 2.2 Due to the steady nature of the plant noise, measurements of the ambient plant noise levels outside the most exposed proposed hotel windows were carried out in discrete short-term measurements.
- 2.3 All of the noise measurements used in this assessment were taken using a fully calibrated Brüel & Kjær 2250 'Class 1' sound levels meter (S/N: 3011706), field calibration checks were also carried out before and after the measurements with no deviation in calibration level.
- 2.4 During the noise measurements the kitchen extract plant was set to operate at the maximum intensity that it is used as we understand from the proprietor.
- 2.5 The measurements were taken outside windows of rooms F8, F9 and F1 on the rear elevation. The ambient noise levels measured with the plant operating are shown in Table 1 below.

Table 1: Measured External Plant Noise Levels

Description	Octave Band Centre Frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Outside window of rear bedroom F8 plant on	66	72	64	55	50	47	46	38	60
Outside window of rear bedroom F9 plant on	74	75	69	62	58	52	54	45	66

Calculations & Assessment

- 2.8 Criteria for hotel rooms is generally provided by the developer in their brand standards, however as none are available in this case it is necessary to adopt appropriate criteria for plant noise break-in based on relevant national guidance and our experience.
- 2.9 Whilst BS 4142:2014 is appropriate for assessment of industrial/commercial noise sources such as externally mounted plant, the guidance deals specifically with external noise levels.

- 2.10 BS 8233:2014 provides criteria for bedrooms during the night-time where internal ambient noise levels should be controlled within 30 dB $L_{Aeq,8hr}$ from sources without a specific character (e.g. transport noise) and suggests that noise from other sources such as commercial should be controlled to lower levels.
- 2.11 On this basis and the broadband nature of the plant noise we have adopted a criterion of 25 dB $L_{Aeq,T}$ within the hotel rooms for noise from plant.
- 2.12 We have carried out detailed noise break-in calculations based on BS 8233:2014 methodology to determine the glazing and ventilation specification required in order to control the plant noise to within 25 dB $L_{Aeq,T}$. Our recommendations based on these calculations are as follows.

Recommendations

- 2.13 Glazing and ventilation:
- Double windows (secondary glazing) formed of 10mm glass - 200mm cavity - 6mm glass in rooms F8, F9, S9 and S10 with mechanical ducted ventilation terminated on the roof or the side elevation - or in wall background ventilation with a minimum $D_{n,e,w} + C_{tr}$ rating of 52 dB, such as the Greenwood MA3051.
 - Standard 4mm glass - 12mm cavity - 4mm glass double glazing with Aereco EHA acoustic trickle ventilation with acoustic canopy and sleeve (EAR206 + AEA851) or other acoustic ventilation with minimum 42 $D_{n,e,w} + C_{tr}$ for the rest of the hotel room windows in the rear elevation (i.e. F1, F2, F3, S1, S2 and S3).
- 2.14 Whilst we have not been commissioned to provide advice regarding structural vibration, we would also recommend that the externally mounted kitchen extract plant is fitted with proprietary anti-vibration mounts and fixings to mitigate any vibration from being transmitted through the building structure.

3.0 SOUND INSULATION BETWEEN THE RESTAURANT/BAR AND HOTEL ROOMS

Noise Measurements

- 3.1 A site visit was carried out to inspect what could be seen of the existing floor/ceiling construction and to take indicative measurements of the existing sound insulation between the ground floor and first floor spaces.
- 3.2 Based on our site inspection and our conversations with the proprietor we understand that the existing construction is as follows (top down):
- T&G floorboards c18mm on 220mm timber joists, separate 220mm timber ceiling joists forming a 600mm cavity laid with mineral wool with a ceiling formed of SoundBloc plasterboard fixed directly to the underside of the ceiling joists.
- 3.3 During our visit the rooms on the first-floor level were stripped to the shell with semi-complete floors, aside from the office which was in a fully finished state with floor and wall linings in place.
- 3.4 Thus, sound level difference tests were carried out between the ground floor restaurant/bar space and the most complete room above as well as the office as this was the only complete floor/ceiling suitable for testing.
- 3.5 The sound level difference tests were carried out by generating high noise levels using a pink noise source in the ground floor space using our own loudspeaker independent of the building structure. The source noise levels being generated in the ground floor space were measured as well as the resulting noise levels in the space above.
- 3.6 The results of the sound level difference measurements are shown in Table 2 overleaf.

Table 2: Measured Existing Sound Level Difference

Description	Octave Band Centre Frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Source noise levels	91	95	97	99	95	93	94	77	101
Receiver levels in rear bedroom F1 (no door, incomplete floor)	63	61	49	42	34	29	22	16	48
Difference	28	34	48	57	61	64	72	61	54
Office (with door, complete floor)	58	52	45	45	43	39	28	21	48
Difference	33	43	51	53	52	54	66	56	54

- 3.9 A second visit to measure trading noise levels was made to the premises on the evening of Friday 1st November 2019 which the proprietor informed us was typically the busiest trading period. However, upon arrival it was clear that trading was not busy that evening with low patron numbers.
- 3.10 Nevertheless, for the purpose of our measurements the proprietor turned the music up to levels which they consider would be the loudest they would have the music playing. It was visually confirmed that the PA system was operating at maximum capacity during the trading noise measurements.
- 3.11 The measured peak trading noise levels along with the resulting levels in the hotel rooms on the first floor are shown in Table 3 below.

Table 3: Measured Trading Noise Levels

Description	Octave Band Centre Frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Levels Measured downstairs with music turned up	92	91	84	90	88	80	70	65	92
Levels measured in the bedrooms above	70	60	40	37	31	24	17	14	47
Difference	22	31	44	53	57	56	53	51	44

- 3.14 Whilst there was no significant noise from patrons, the music noise was significant enough so that noise from patrons would have had little effect on the measurements.
- 3.15 The level difference shown in Table 3 indicates that there is less existing sound separation between the spaces than the sound level difference measurements in Table 2 indicate.

- 3.16 This is likely due to noise being transmitted through the building structure where the loudspeakers are attached directly to the building structure and the subwoofers sit on the floor.

Calculations & Assessment

- 3.17 The Manchester City Council (MCC) criteria for residential developments in the same building as music/entertainment venues requires music noise levels to be controlled within absolute values as follows: 47dB in the 63Hz octave band and 41dB in the 125Hz octave band.
- 3.18 Whilst the proposed development is for a hotel, we have adopted the MCC criterion to ensure that future hotel guests are not affected by unreasonable levels of low frequency music noise. We would also recommend controlling the music noise to within NR25 in this case to ensure that mid/high frequency music noise is suitably controlled.
- 3.19 Notwithstanding the substantial cavity structure of the separating floor, in order to achieve the MCC criterion and control the music noise levels to within NR25, the sound insulation of the floor construction will have to be improved as much as practically possible and then the music noise levels in the ground floor space will then need to be adjusted to ensure that the criteria are achieved.
- 3.20 We have used the INSUL sound insulation prediction software to model the effect of incorporating acoustic floor treatments into the existing floor construction to form the basis of our recommendations.

Recommendations

- 3.21 Based on our measurements, analysis and calculations we recommend the following scheme of sound insulation measures and music noise management.
- 3.22 Floor treatment (top down):
- Karma 28 overlay board
 - 15mm t&g floorboard particle board
 - GypFloor Silent with 19mm Gypfloor Plank

- 3.23 Ensure all joints are properly sealed with acoustic sealant, any floor penetrations for services etc. should be avoided. Whilst there is mineral wool visible in parts of the existing floor cavity it should be ensured that the cavity is laid with at least 100mm thick mineral wool insulation.
- 3.24 In order to ensure that music noise is not transmitted via the stairwell up to the hotel rooms above, we recommend that the door on the ground floor leading to the stairwell has a minimum laboratory sound insulation performance of 29 dB Rw for the doorset.
- 3.25 We recommend that the loudspeakers are fixed via proprietary resilient anti-vibration mounts and the subwoofers are placed on proprietary anti-vibration resilient pads in order to isolate them from the building structure and mitigate music noise transfer between the ground floor space and the proposed hotel rooms on the floors above.
- 3.26 We have provided recommendations for significant improvements to the sound insulation of the floor, however in order to ensure that the criteria are met, once the works are complete the PA system should be set up with an electronic automatic volume control limiter calibrated to achieve the criteria.

4.0 SUMMARY & CONCLUSION

- 4.1 Hepworth Acoustics Ltd was commissioned by PH Architecture to carry out a noise assessment in connection with a proposed planning application for a hotel development at 853 Ashton Old Road, Manchester.
- 4.2 The assessment has included evaluation of entertainment noise and plant noise associated with the existing restaurant/bar on the ground floor of the building on the proposed hotel rooms in the floors above.
- 4.3 Noise surveys were carried out to measure plant noise levels, measure indicative sound levels differences between the ground floor and first floor spaces and peak music trading noise levels in the restaurant/bar in the ground floor.
- 4.4 Recommendations have been provided for glazing and ventilation performance specifications with respect to plant noise, as well as acoustic floor treatments and loudspeakers system management solutions in order to suitably mitigate noise impact on the proposed hotel rooms.



Appendix I: Noise Units & Indices

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. The indices used in this report are described below.

- R** This is the 'Sound Reduction Index' as measured in a laboratory, and is a measure of the sound insulation properties of an building element in a stated frequency band.
- R_w** This is the 'Weighted Sound Reduction Index' (L_w), and is a single figure quantity of R, the laboratory measured Sound Reduction Index.
- TL** The Transmission loss is another name for Sound Reduction Index, (R)
- C_{tr}** This is an A-weighted urban traffic noise spectrum, which can be added to $D_{nT,w}$ or R_w in some standards to take into account different source spectra such as low frequency sound.
- D** This is the Level Difference and is a field measurement of the airborne sound insulation between adjacent spaces. As well as being field measurement, this term and all other D terms below therefore include on-site conditions other than direction noise transmission through, for example, a wall (flanking transmission).
- D_n** This is the Normalized Level Difference and is a field measurement of the airborne sound insulation between adjacent spaces.
- D_{nT}** This is the Standardised Level Difference, which is equivalent to the measured D_n and corrected to a standardised reverberation time of 0.5s.
- L_{Aeq}** This is the A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.